11TH INTERNATIONAL CONFERENCE

ON ARCHITECTURE – CHALLENGES IN DESIGN

PROCEEDINGS

strand
SUSTAINABLE URBAN SOCIETY ASSOCIATION

PROCEEDINGS

strand

SUSTAINABLE URBAN SOCIETY ASSOCIATION

Impressum

Title

ON ARCHITECTURE — CHALLENGES IN DESIGN

Proceedings

Publisher

STRAND – Sustainable Urban Society Association

Belgrade

On behalf of the Publisher

Ružica Bogdanović

STRAND – Sustainable Urban Society Association

Editor

Ružica Bogdanović

Reviewers

Aleksa Bijelovic, Aleksandra Stupar, Anastasios Tellios, Christiane Wagner, Denis Ambruš, Figen Beyhan, Giannis Tsaras, Marija Mano, Mateja Kurir, Mirjana Devetaković, Nataša Danilović Hristić, Nora Lefa, Pavlos Lefas, Ranka Gajić, Ružica Bogdanović, Svetlana Batarilo, Senka Ibrisimbegović, Vanessa Tsakalidou

Cover Design

Bogdan Maskimović

Belgrade, 2023

ISBN 978-86-89111-34-7

Preface

At the beginning of the 21st century, faced with the challenges of climate change, depletion of resources, high environmental pollution, and hints at an uncertain future, we are questioning the various roles of architecture. Whether technological development and the use of new concepts in design, the use of new materials in construction, the use of new tools in the creation of concepts can provide an answer, is the theme of the conference and exhibition "Challenges in Design".

The new concept of architectural objects and the use of materials in the isolation of objects and the concept of facade envelope are an inspiration and a challenge in creation. Is art a part or is it against the concept of an architectural work – art vs architecture. Whether architecture and new media and the use of virtual and augmented reality can be tools in architectural design is the question of the position of architecture in the digital era – from parametric design to VR and AI, as tools in design. In addition to new buildings in the transformation of the city and the change in the structure of activities, there are many huge abandoned industrial buildings, which refers to the topic of reconstruction – reworking of the city and architecture – reworking of architecture and the city – reuse of abandoned buildings and places.

The conference will explore and discuss the complexity and different meanings of architecture. These topics will consider the essence of architecture through all its dimensions, always thinking of it as an art and a philosophical reflection on architecture. The essence will be considered through different points, processes and trends that contribute to new aesthetics and functionality: globalization, new approaches to design, innovative technologies, projects, and materials. A special block of topics is focused on the challenges in architecture and urban design in terms of how we can reshape the future in creating sustainability after the pandemic and how we can reset the sustainable development goals for the challenges of the pandemic – from the perspective of research, policy, or practice.

In the past year, many conference programs were focused on that topic, such as the New European Bauhaus initiative for green sustainable cities, or the COP 27 UN conference on climate change and impacts, many also implemented educational programs at universities, as well as charters and declarations in associations. That is why it is particularly interesting how cities will be organized in future development, how to improve the quality of work and life, and how architecture can help through the organization of space and materialization. In particular, the further improvement of information technology, which has made an outstanding contribution, enabling the holding of study programs in the faculties, as well as the holding of conferences and meetings.

Editor

Contents

I **ARCHITECTURE – DESIGN CHALLENGES IN MACRO AND MICRO SCALE**

HERSUS STORY: CHANGING PERCEPTIONS ON SUSTAINABLE BUILT HERITAGE THROUGH EDUCATION
Vladan Đokić

ARCHITECTURE BEYOND BORDERS: EXPLORING THE RELATIONSHIP BETWEEN ARCHITECTURAL CRITIQUE AND PRACTICE IN TRANSNATIONAL ENDEAVORS WITHIN THE BELT AND ROAD INITIATIVE INCIDENTAL
Francesco Carota

INTEGRATED DESIGN: INTELLIGENT ENVIRONMENTS EXPANDING PUBLIC SPACES
Christiane Wagner

STRATEGIC URBAN DESIGN FOR THE JUST CITY
Marija Maruna

IMPACT ON DESIGN AND FUNCTIONALITY OF INTERIOR BY USE OF STEEL STRUCTURES IN THE CONSTRUCTION OF RESIDENTIAL BUILDINGS
Monika Štiklica

ARCHITECTURAL FRAGMENTATION: MODELING A FUTURE OF THE OBJECT
Mila Mojsilović

ARCH - ANTI RADIATION CONTAINMENT HOUSE OF THE FUTURE: OVEREXPOSURE TO ELECTROMAGNETIC RADIATION AS FUTURE SCENARIO
Sanja Nikolić, Marta Grbić

TOWARDS AN AESTHETICALLY LIGHTWEIGHT ARCHITECTURE
AN IDENTIFICATION AND EVALUATION OF TECHNIQUES THAT CONVEY THE SENSATION OF LIGHTNESS
Eleftheria Papadosifou, Giannis Tsaras

(IM)POSSIBILITY OF PARTICIPATORY URBAN PLANNING
Kosta Stojanović

II **TECHNOLOGY AND ARCHITECTURE**

METAVERSE – A POWERFUL NEW INSTRUMENT FOR URBAN PLANNING OR YET ANOTHER UNFULFILLED TECH-PROMISE?
Marina Nenković-Riznić

CLIP AND THE CITY
ADDRESSING THE ARTIFICIAL ENCODING OF CITIES IN MULTIMODAL MACHINE LEARNING MODELS
Iacopo Neri , Darío Negueruela del Castillo

THE SCIENCE OF NETWORKS: URBAN MOVEMENT SYSTEM DESIGN, ANALYTICS, AND NAVIGATION
Dragana Ćirić

METANARRATIVE AND TRANSNATIONAL IN THE CONCEPT OF SOFT POWER ARCHITECTURE
Ivan Filipović

III **REWORKING ARCHITECTURE/ CITY**

HOW TO MAINTAIN THE ROOTS OF HISTORY AND CULTURE AND YET BE CONTEMPORARY
CASE STUDY: MINIMALISM IN ARCHITECTURE
Dragana Vasilski

THE NEW ARCHITECTURE OF THE PALACE OF JUSTICE IN BELGRADE: REMODELING THE SERBIAN BUILT ENVIRONMENT TOWARDS THE SPACES OF INCLUSIVITY
Milica Mađanović , Davor Ereš

UNCOVERING FRAGMENTED DIACHRONIES OF THE TRANSITIONAL SKOPJE 2014
Tamara Koneska

INTERDISCIPLINARY AND INTEGRAL APPROACH TO UNDERSTANDING THE RELATIONSHIP BETWEEN INTERIOR, ARCHITECTURE AND URBANISM - CASE STUDY OF IVO LOLA RIBARA STREET IN KRAGUJEVAC - PEDAGOGICAL AND RESEARCH PROJECT
Bojana V. Pašajlić, Natalija Z. Bogdanović

DELTA - RIJEKA CENTRAL PARK
Denis Ambruš , Vlatko Dusparić

EPHEMERAL SPACES AND WATER: URBAN GREEN HALL OF FACULTY OF MUSIC ARTS
METHODOLOGICAL EXPERIMENT IN THE URBAN DESIGN OF THE NEW BUILDING OF FACULTY OF MUSIC ARTS (FMA) IN BELGRADE IN THE BELGRADE LINEAR PARK
Miloš Stojković Minić , Jelena Ilić Gajić

IV **ART AND ARCHITECTURE**

ON HONESTY IN ARCHITECTURE: A HISTORICAL VERSUS A MATERIAL APPROACH
Mateja Kurir

THE ESSENCE OF PLACE: UNDERSTANDING GENIUS LOCI THROUGH PHENOMENOLOGY
Iva Lokas, Relja Petrović, Ivana Rakonjac

ANESTHETIZING THROUGH THE IMAGE: BETWEEN ETHICS AND AESTHETICS IN ARCHITECTURE
Milena Kordić, Nikolina Sekulović

THE USE OF ARCHITECTURAL DECORATIVE ELEMENTS FROM THE END OF THE 19TH AND THE BEGINNING OF THE 20TH CENTURY AS A DETERMINANT IN THE SERVICE OF DEFINING STYLE
Bojana V. Pašajlić

REIMAGINING MATERIALITY: CIRCULARITY POTENTIAL OF 3D PRINTED ARCHITECTURAL ELEMENTS WITH RECYCLED CLAY
Jelena Milošević, Jelena Brajković, Andrej Josifovski, Maša Žujović, Milijana Živković

THE DEPICTION OF VELOCITY IN ART AND DESIGN AND ITS CONNECTION TO ARCHITECTURE
Despoina Kokkota , Giannis Tsaras

V **NEW MEDIA AND NEW TOOLS IN DESIGN**

DESIGNING WITH AI: EARLY IMPACT OF DEVELOPING TECHNOLOGIES ON URBAN AND ARCHITECTURAL DESIGN
Miloš Milovanović

TOWARD THE UTILITY OF BIM MODELS
Igor Svetel

RE-SHAPING THE “FUTURE PAST” OF ARCHITECTURAL DESIGN: AI-GENERATED DETAILS AND CONCEPTS
Jovana Tošić

VI **CONFERENCE POSTER SESSION**

- *I Architecture – Design Challenges in Macro and Micro Scale*
- *II Technology and Architecture*
- *IV Art and Architecture*
- *V New Media and New Tools in Design*

RETHINKING CITIES: ARCHITECTS AS AGENTS OF CHAOS
POWER, PLANNING AND THE ROLE OF THE ARCHITECT IN THE DIGITAL ERA
Erez Ella

10.10 10-YEAR RETROSPECTIVE OF ARCHITECTURAL EDUCATION OUTCOMES IN 10 THEMES ON THE TOPIC OF *POSTINDUSTRIAL DEVELOPMENT OF THE AREA BETWEEN DUNAVSKA STREET AND THE DANUBE'S BELGRADE WATERFRONT*
Bojana Jerković-Babović

DEMOCRATIZING URBAN PLANNING: INSIGHTS FROM PARTICIPATORY FORUMS IN BELGRADE
Iva Čukić, Jovana Timotijević, Marko Aksentijević, Božena Stojić, Olga Andrić

URBAN EDUCATION FOR FUTURE TRAFFIC ENGINEERS – ALTERNATIVE TRANSPORT MODES, ECOLOGY AND SPACE PROBLEMS OF A LARGE CITY FACING CLIMATE CHANGES
Svetlana Batarilo, Ranka Gajić

DISTANT MOMENTS CONDENSED: MNEMOTECHNICS OF THE CITY.
CASE STUDY: THE WEDDING INSTALLATION
Nora Lefa

"SOUNDSCAPE OF FEMALE EXPERIENCE" – TRANSDISCIPLINARY ACOUSTIC ECOLOGY OF PALIĆ LAKE
Jasna Jovićević

THE ARCHITECTURE OF FLUIDITY
VISUALIZATION OF THE RESEARCH PROCESS OF FIGURATIVE AND NONFIGURATIVE INSTRUMENTALIZATION OF THE FLUIDITY PHENOMENON IN ARCHITECTURE
Bojana Jerković-Babović

I ARCHITECTURE –
– DESIGN CHALLENGES
IN MACRO AND MICRO SCALE

HERSUS Story: Changing Perceptions on Sustainable Built Heritage through Education

Vladan Djokić
University of Belgrade – Faculty of Architecture, MorphoLab, Belgrade, Serbia
vdjokic@arh.bg.ac.rs

Abstract: The keynote will share the story of Erasmus+ Strategic Partnership project HERSUS implemented from 2020-2023 in Serbia, Italy, Cyprus, Greece, and Spain. The HERSUS project, as its full title indicates, aims to enhance heritage awareness and sustainability of the built environment in urban and architectural design higher education. HERSUS is situated in a changing and challenging context of architectural discourse and grounded on co-creative research platform for up-skilling of architectural students through learning/training/teaching activities and spectrum of didactic tools. In the context of multiple influences affecting the development and transformation of cities – such as climate change, green challenges, and social transformation – the problematization of heritage issues in the setting of the city and landscape becomes a priority topic. Within this multilayered research scope, to have far-reaching implications in the practical sense, its integration into existing study programs as well as new study programs is of immense importance. As a result, a new profile of architects/urban designers is needed in the wider architectural field, and a new professional profile, with specific technical, technological, socio-humanistic, and artistic skills is needed to respond to these challenges.

Keywords: Architectural Education; Heritage; Sustainability; Professional Skills and Competences

1 Challenges in Architectural Education

Architectural education is going through an era of new disciplinary and scientific articulation of (a) architecture as a discipline and (b) design as its operational and procedural embodiment. It is already known that architecture is no longer based exclusively on traditional engineering postulates of technical and technological knowledge, nor is it exclusively interpreted in the domain of humanistic perspectives and art – today, architecture represents a kind of interdisciplinary, multidisciplinary and transdisciplinary science (IMT science) that develops in constant dialogue between technological development, artistic precedents and social innovations. Such a new disciplinary order also set a demand for the development of a new professional profile of architects that demonstrates multiple groups of knowledge and their related skills (UIA/UNESCO, 2017). On the other hand, looking at the sphere of thematic complexity, numerous challenges – such as climate change, green challenges, and social transformation – require the establishment of new methodological procedures for better understanding and study of the built environment and heritage. This applies not only to cultural heritage that has a formal protection status, but also to all those emerging patterns that have a value code that can generate the heritage of the future. This indispensable relationship in-between built heritage and architecture puts the foreground on the importance of high-quality adaptive re-use of built heritage, which is also recognized in one of the umbrella initiatives of the EU, the New European Bauhaus, which advocates a specific *line of respect* (NEB High-Level Round Table Group, 2021) – respect for the environment, our cultural heritage and nature – as an integral part of the value framework of architecture as a profession. Additionally, education is recognized 'as a key to creating new incentives for action, changing social conceptions and behaviours, fusing disparate practices into transdisciplinary approaches' thus as a key to both social and environmental sustainability (NEB High-Level Round Table Group, 2021: 4).

2 HERSUS Project Outline

This part of the paper will provide two-fold insight into the HERSUS Project background. First, conceptual framework will be described including Consortium set-up, motivation for project initiation, as well as problem framework to be addressed within project scope. Second, project design will be elaborated including general project structure, activities type and overall HERSUS approach.

2.1 Conceptual Framework

HERSUS brings together 5 Universities (particularly architectural schools) from Serbia, Italy, Cyprus, Greece, and Spain working together to develop courses and pilot them through international workshops, and a jointly built digital sharing platform – University of Belgrade (UB) (lead institution), IUAV University of Venice (IUAV), University of Cyprus (UCY), Aristotle University of Thessaloniki (AUTH), and University of Seville (USE). Beyond core Consortium set-up, HERSUS includes activities of cooperation between research, private and public sectors, targeting both local and regional support towards higher education-practical arena cooperation. By its nature, the HERSUS project is educational-based and research-oriented, with a multilevel approach to engage different stakeholders.

The general motivation for HERSUS conceptualization is based on the dichotomy of creating a new professional profile (focused on students) and creating a new pedagogical profile (focused on university teaching staff). The conceptual framework and idea for the establishment of the consortium arose as a result of a robust need analysis conducted in the form of an informative survey on the developmental level of the teaching process in the field of sustainability and heritage at five architectural schools from HERSUS network. This survey is expert-oriented in nature and was implemented at the beginning of 2020 as support for the development of the project application. The results of the survey indicated four groups of relational problems: (1) *connection between theory and practice* in terms of the lack of know-how methodologies and methods, (2) *acknowledgement of specific relations in urban policies* in terms of the outdated urban design policies, (3) *design practice* in terms of the dominance of economic factors in architecture and urban design, and (4) *education* in terms of the limited amount of courses and inadequate attention to this relation in studio design projects. Urban reconstruction, adaptive re-use and resilience of heritage have been highlighted as the lead approaches for generating sustainable values for historic buildings, cities and landscapes. Following recognized approaches, a key innovated value of the HERSUS is a multi-conceptual and multi-scale framework that includes three main pillars to achieve a sustainable architectural and urban heritage. These 3 "RE" pillars are strategically defined in order to create educational strategies in the form of courses through which knowledge and design skills are acquired for: (1) REconstruction (linking urban and architectural scale) – urban heritage redevelopment used to address urban decay in cities, (2) REuse (linking architectural and detail scale) - the process of reusing an existing architectural heritage for a purpose other than which it was originally built or designed for, (3) REsilience (linking urban, architectural and detail scale) - designing flexible structures that can learn from their environments and creating transformable and sustainable space framework.
The identified problem framework stimulated consortium to develop project strategy which is grounded within five specific scopes of action perceived as a long-term impact benefit for participating universities and beyond:

- *Research and action* – implementation of the analytical, process and problem-based research which is expected to result in a review of good practices in the subject area, a critical questionnaire in the subject area, and a statement for teaching through design for sustainability of the built environment and heritage awareness,
- *Information and enhancing of awareness* – broaden and raise awareness of the importance of sustainability and heritage thematic frameworks while disseminating results at national and European level,
- *Networking* – transnational strategic partnership establishment between urban and architectural design schools in European border areas the network has the potential for rollout to a large number of participating members and address common challenges through cooperation activities,
- *Education and training* – implementation of innovative methods developed through HERSUS workshops and training in order to allow increasing and updating the educational offer in sustainability and heritage thematic framework within urban and architectural study programmes, and
- *Design and development* – the development of new and innovative curricula and teaching methods for urban and architectural design schools in Europe.

The notion of sustainability represents the core feature of HERSUS conceptualization, considered both as a thematic framework and as a challenge within the scope of architectural and urban design higher education. Regarding sustainability, the key objectives of HERSUS are to: (1) identify, study and explain the state-of-the-art in learning and teaching on sustainability in line with the built heritage as a research/design subject, (2) create statements on teaching through design for the sustainability of the built environment and heritage awareness and define main design tools, strategies and approaches for reaching sustainability of the built environment, and (3) design and develop innovative courses and study program within the HERSUS scope.

2.2 Project Design

The project is structured around five types of activities: (1) *Design and development of Intellectual Outputs* (IO) – activities that result in tangible and meaningful outcomes, specifically publications, book of courses, interactive platform, and handbook, (2) *Learning, Training, and Teaching activities* (LTT) – one seminar for teachers, three student workshops, and one training for teachers, (3) *Multiplier events* (ME) – activities for dissemination of intellectual outputs and overall results in a form of public presentations, and Open Houses at participating HEIs, (4) *Transnational Project Meetings* (TPM) – design and development meetings of consortium members, and (5) *Project Management and Implementation activities* (PMI) – communication, dissemination and creating a sustainable framework for implementing results.
From the perspective of the general implementation, HERSUS project engages two parallel approaches which lead towards achieving the project objectives. The first approach is the bottom-up approach, where every partner

is responsible for looking toward the local educational higher education systems' needs. In essence, it starts from universities towards modernizing existing and developing new joint master programs. The overall focus is on improving the quality of the higher education system and enhancing graduates' employability. The second is the multilevel approach (from the European education system towards national education systems), which includes all participants working in collaboration towards achieving common goals at the European level. The consortium seeks to establish a new integrated approach based on activities that rely on a program for teaching. The HERSUS project is designed so it has the LTTs with IOs at the core of implementation while all other activities support and supplement their design and development (Figure 1 and Figure 2). LTTs as a platform for testing principles and methodologies derived from all IOs, Multiplier Events as a platform for dissemination and public presentation of IOs, and Transnational Project Meetings are used for discussion, creative development, and critical reflection of IOs. From the perspective of the particular activities, the following approaches were engaged: (1) Student workshops engaged a place-based approach in order to address the local urban challenges and needs of local communities within the design process, and (2) Intellectual outputs development engaged transdisciplinary approach generated based on the professional and scientific fields of HERSUS Consortium members.
The project scope refers to both multidisciplinary and interdisciplinary approach regarding different specialized areas including (in line with the professional and scientific fields of HERSUS Consortium): Architecture, Urbanism, Architectural Technology, Integral Urbanism, Regional and Urban Planning, Interior Architecture, Energy-efficient and Green Architecture, Urban Renewal, Conservation, Sustainable Development, Vernacular Architecture, Energy and Environmental Design, Urban Sociology. In this sense, HERSUS project is aimed to benefit a large number of students, professionals, representatives of other educational institutions, public bodies, private/public enterprises, representatives of labor market agencies, agencies for sustainability and heritage protection, National government representatives, public and wide society. Through the direct involvement of students in project activities, HERSUS aims to render future young professionals equipped to contribute to the socio-environmental challenges and heritage preservation.

Figure 1 HERSUS Timeline – Part 1.

Figure 2 HERSUS Timeline – Part 2.

3 HERSUS Results Summary

This part of the paper will provide two-fold insight into the HERSUS Project results. First, intellectual outputs are listed in order to provide insight into the scope for knowledge advancement. Second, learning/training/teaching activities for students will be elaborated in order to provide insight into the framework for advancement of existing pedagogies and the development of new ones.

3.1 Intellectual Outputs: Knowledge Advancement

HERSUS Intellectual Outputs (IOs) are transnational, structured, and result-driven outcomes which are perceived as an integral part of the Plan for Sustainability and long-term cooperation of HERSUS Consortium with a two-fold perspective: engagement of IOs as didactic materials, and transferring insights from IOs to process of design and accreditation of new study programs. IO1 Review of the Best Practices - provides comparative insights into educational practices, built projects, and urban policies (Djokić et al, 2021a); IO2 Questionnaire for the State of the Art – provides valuable and in-depth data on the current level of development of study programs and individual curricula within the HERSUS scope which could be useful for the management of heritage-related higher education institutions and teachers in the process of creation and accreditation of study programs (Djokić et al, 2021b); IO3 Statements for Teaching through Design for Sustainability of the Built Environment and Heritage Awareness - presents a strategy containing necessary qualifications that an architect has to obtain in order to be competent for architectural and urban design, as well as an up-to-date qualification that architectural educator needs to obtain in order to advance teaching about the sustainability of the built environment and heritage awareness (Djokić et al, 2021c). The IO3 is prepared in the form of Teaching Vademecum: Statements on Notions, Ideas, Design Strategies, Design Tactics, Tools and Techniques, and Heritage Types relevant to the HERSUS scope; IO4 HERSUS Sharing Platform – developed openaccess repository with identified examples and role models form education, practices, and research (https://hersus-sharingplatform.org/) ; IO5 Book of Courses – conceptualized imaginary master study program which would educate new generations of professionals (Nikezić, 2023); IO6 Handbook for Students in the field of sustainable built heritage - could be engaged as a didactic material at heritage-related higher education institutions (Loren-Méndez, 2023).

3.2 Learning/Training/Teaching Activities for Students: Advancement of Pedagogies

The Learning/Training/Teaching Activities (LTTs) for students within HERSUS considered from a research-by-design perspective in the field of architecture and urbanism. The key objectives of HERSUS student LTTs are to (1) initiate small-scale initiatives in a form of student workshops directed towards generating conceptual designs for heritage areas and buildings, (2) reach out to local areas through place-based approach and stimulate students to critical thinking and problem-based research about the urban challenges related to heritage preservation, and (3) stimulate the implementation of the multiscale approach for research and (re)design of built heritage. In this context, HERSUS Consortium implemented three student workshops: (1) Workshop 1: Sustainable Reconstruction in Urban Areas (Venice, Italy - 22nd–26th November 2021 (onsite)) - The engaged study field was the Valmarana

Salvi Gardens in Vicenza. The primary purpose was to understand how historical gardens could influence contemporary communities and designers and to re-think them through contemporary standpoints; (2) Workshop 2: Adaptive Reuse (Nicosia, Cyprus - 2nd–6th May 2022 (onsite)) - The engaged study field was the walled city of Nicosia. The intention was to provide a holistic view of the area and to develop a different attitude toward cultural heritage and sustainability focusing on the adaptive reuse of vernacular dwellings, semi-open and open spaces; and (3) Workshop 3: Resilience and Future Heritage (Thessaloniki, Greece - 17th–21st October 2022 (onsite)) - The engaged study field was the Market Area of Thessaloniki (Kapani Market). The international team's proposals focused on occupancy and land use, the environmental performance of the urban fabric surrounding the markets, and the future restoration and upgrade of the market building stock.

4 Instead of the Concluding Remarks: Emerging Pedagogies for Sustainability of the Built Environment and Heritage Awareness

The results of the HERSUS project largely reflect the global trends in the development of architectural education, which imply the initiation of a new professional profile of architects that demonstrates multiple groups of knowledge and their associated skills. According to the *UNESCO-UIA Charter on Architectural Education* six groups of knowledge were identified that should represent an integral part of architectural education (UIA/UNESCO, 2017). Having in mind multilayered methodological procedure implemented within the HERSUS lifetime (Djordjević et al, 2022), as well as insights derived both from the intellectual outputs (knowledge advancements) and Learning/Training/Teaching Activities (advancement of pedagogies), its possible to draw out reflections for each group of architectural knowledge from the perspective of heritage and sustainability:

- *Cultural and Artistic Studies* – the need for the integration of Equity and Creativity skills which boost creativity in terms of interculturality and interchange,
- *Social Studies* – enhancement of the participatory skills that raise ability to stimulate heritage awareness and communicate with the society (disseminating its values and preservation mechanisms including communication and presentation skills),
- *Environmental Studies* – the environmental and energetic knowledge regarding sustainability have not a sufficient presence in existing academic programs, and there is a lack of competences to be able to obtain zero-energy buildings, implementing a combination of active and passive measures, as well as the need for skills related to the design approaches of environmentally responsive design, bioclimatic design, design with climate (climate-sensitive design), carbon neutral design, energy conscious design, and passive/active sustainable design,
- *Technical Studies* – the need for learning heritage through digitalization, specific IT skills in terms of practicing different 3D modelling software (Revit, Rhino, AutoCAD 3D, etc.) and simulation software and tools, BIM-based (H-BIM) software, GIS and ICT tools, as well as need for adapting of digital skills to new formats of documentary heritage,
- *Design Studies* – the importance of knowing the transversal skills for sustainability and indicating that a design project is structured on an urban territorial heritage system, as well as need for going beyond preservationist approach and to follow-up the evolution of the concept of built heritage (from emerging to protected built environment), and
- *Professional Studies* – the lack of knowledge on methodological and operative processes for the management and intervention of cultural heritage, acting at its different scales and conditions.

Acknowledgments: This research was funded as a part of the HERSUS project, developed in cooperation with the University of Belgrade, Faculty of Architecture as a Lead organisation, Iuav Universita di Venezia, the University of Cyprus, the Aristotle University of Thessaloniki, and the University of Seville, UNESCO Chair on Built Urban Heritage CREhAR in the digital era, co-funded by the Erasmus+ Programme of the European Union (hersus.org). The creation of these resources was co-funded under grant no. 2020-1-RS01-KA203-065407 (funding period 2020–2023).

References

NEB High-Level Round Table Group. (2021). *New European Bauhaus Concept Paper*, NEB High-Level Round Table, Presented to the President of the European Commission Ursula von der Leyen.
UNESCO-UIA Validation Council for Architectural Education (2017). *Charter UNESCO/UIA for Architectural Education*; International Union of Architects: Paris, France.
Djokić, V.; Philokyprou, M.; Nikezić, A.; Sorbo, E.; Sakantamis, K.; Loren-Méndez, M. (2021a). *REVIEW: Best Practices in Educating Sustainability and Heritage*; University of Belgrade—Faculty of Architecture: Belgrade, Serbia
Djokić, V.; Sakantamis, K.; Chatzidimitriou, A.; Sorbo, E.; Loren-Méndez, M.; Nikezić, A.; Philokyprou, M.; Carrascal-Pérez, M. (2021b). *STUDY: Questionnaire for the State of the Art in Educating Sustainability and Heritage*; University of Belgrade—Faculty of Architecture: Belgrade, Serbia
Djokić, V.; Nikezić, A.; Loren-Méndez, M.; Sakantamis, K.; Philokyprou, M.; Sorbo, E.; Péral-López, J. (2021c). *STATEMENTS: Teaching through Design for Sustainability of the Bult Environment and Heritage Awareness*; University of Belgrade—Faculty of Architecture: Belgrade, Serbia
Nikezić, A.; Radivojević, A.; Živković, J.; Djokić, V.; Loren-Méndez, M.; Sakantamis, K.; Philokyprou, M.; Sorbo, E. (2023). *Book of Courses*; University of Belgrade—Faculty of Architecture: Belgrade, Serbia
Loren-Méndez, M.; Garcia-Casasola, M.; Djokić, V.; Nikezić, A.; Sakantamis, K.; Philokyprou, M.; Sorbo, E. (2023). *International Handbook for Students on Research and Design for the Sustainability of Heritage*; University of Belgrade—Faculty of Architecture: Belgrade, Serbia
Đorđević, A.; Milovanović, A.; Milojević, M.P.; Zorić, A.; Pešić, M.; Ristić Trajković, J.; Nikezić, A.; Djokić, V. (2022). Developing Methodological Framework for Addressing Sustainability and Heritage in Architectural Higher Education—Insights from HERSUS Project. *Sustainability*, 14, 4597.

Architecture Beyond Borders. Exploring the Relationship between Architectural Theory and Practice in Transnational Endeavors within the Belt and Road Initiative

Francesco Carota
University of Kansas, Lawrence, United States
francesco.carota@ku.edu

Abstract: The paper delves into the intricate relationship between architectural critique and design practice within the realm of transnational architecture endeavors, specifically focusing on the global infrastructure development facilitated by the Belt and Road Initiative (BRI). As a monumental project spanning numerous countries and continents, the BRI has sparked a wave of architectural interventions that transcend national boundaries. These endeavors offer a unique opportunity to explore how the circulation of design ideas and practices across nations manifests in tangible architectural artefacts, which have thus far remained on the periphery of mainstream architectural discourse. By drawing upon diverse case studies from different parts of the world, where various stakeholders such as governments, investors, communities, and architectural professionals are involved, this research examines the tensions that arise between global and local architectural practices, the negotiation of cultural identities and the adaptation of design standards to accommodate diverse geographical and sociocultural contexts. Through this investigation, the contribution critically evaluates and challenges the oversimplification of global architecture through taxonomic scientific frameworks, rejecting the notion that urban architecture is a static and universally applicable knowledge object that can be studied using a singular framework. Instead, it sheds light on the complex dynamics at play in the creation of built environments within a multi-dimensional globalized context. The final aim is to promote the development of new concepts and theoretical perspectives that foster a more cosmopolitan and inclusive understanding of architecture and urbanism.

Keywords: Belt and Road Initiative, Transnational Architecture, Practice, Theory, Globalization, Urbanization

1 Introduction

The field of architectural design is undergoing a profound transformation in response to the rapid evolution of global landscapes and urban environments. This metamorphosis is being propelled at an unprecedented pace by the development of global infrastructure networks. Amid this dynamic shift, China's Belt and Road Initiative (BRI) stands as a paramount geoeconomic force catalyzing these transformations (Wiig and Silver, 2019). Nonetheless, this colossal global undertaking, often analyzed in economic and geopolitical terms, has received relatively little attention for its spatial and architectural implications. This paper embarks on a voyage that transcends traditional boundaries, venturing to explore the intricate interplay between design practices and architectural theory within the expansive realm of the Belt and Road Initiative.

The BRI, an ambitious endeavor spanning continents and nations, not only heralds a new era in global infrastructure development but also narrates a fresh tale of urban transformations in regions previously relegated to the "periphery" of the world (Nederveen Pieterse 2018). Beyond the construction of roads and bridges, the BRI has ignited a surge of architectural interventions that transcend the confines of national borders. These endeavors offer a unique opportunity to delve deeply into the dynamics between the circulation of design concepts from the East and the realization of tangible architectural endeavors in places that have long existed beyond the purview of mainstream architectural discourse.

By conducting a concise analysis of several case studies situated across diverse corners of the globe, this paper posits that the BRI encapsulates a transformative narrative encompassing the conceptual and pragmatic redefinition of the delicate equilibrium between global and local architectural practices. As a synthesis of an approach that look closer at the specificities of places, this essay endeavors to unveil this narrative by weaving together theoretical insights and real-world design and construction practices from various global regions. In this manner, the paper aspires to transcend the commonplace, the mainstream, and the established, instead seeking to reveal the extraordinary, the unknown, and the diverse. The quest is to elevate the discourse surrounding the BRI's architectural narrative beyond the mere enumeration of its colossal infrastructure developments, offering fresh perspectives on architectural discourse through the dialogues among architects, communities, and cultures that shape the forms of emerging urban landscapes.

The paper commences with an extensive survey of the BRI, delving into its objectives, significance, and impact on urbanization through the lens of global infrastructure development. Subsequently, it critically explores the transnational circulation of ideas within the architectural domain, contextualizing them within a novel geopolitical framework described by scholars as “multipolar globalization”. Building upon this foundation, the primary argument embarks on an exploration of the intricate interplay between architectural critique and design

practice within the context of this global initiative. The paper delves further into the architectural practices along the BRI by referencing various case studies and evaluating them in terms of their response to local contexts, examining how architects and other stakeholders pragmatically navigate challenges and seize opportunities. Ultimately, the paper questions the oversimplification of global architecture and challenges the application of established notions and concepts makes architectural design a static, universally applicable knowledge object. It concludes by advocating for an approach that, through an investigation of the unique characteristics of architectural practices in a global context, uncovers novel concepts and theoretical perspectives that foster a cosmopolitan and inclusive understanding of architecture and urbanism.

2 The Belt and Road Initiative: from an infrastructural strategy to a driver of urbanization

The Belt and Road Initiative (BRI) exemplifies China's ambitious global vision, having evolved from its inception in the early 21st century into a monumental endeavor with far-reaching impacts on the global economic and infrastructural landscape. This initiative, often referred to as the "Silk Road Economic Belt" and the "21st Century Maritime Silk Road," fundamentally aims to establish connectivity, both geographically and economically, among nations by means of an extensive network of transcontinental infrastructure projects. In the spirit of the Chinese rhetoric, at its core, it seeks to revive the spirit of the ancient Silk Road trade routes, fostering cooperation, cultural exchange, and economic development (Cai and Nolan 2019).

However, from a geopolitical standpoint, the objectives of the BRI are multifaceted, encompassing both intricate economic and geopolitical strategic dimensions. At its economic core, the initiative seeks to bolster connectivity between regions, particularly within the eastern and southern part of the world, facilitating the flow of goods, services, and capital. By doing so, it seeks to stimulate trade, fostering economic growth, and expanding the horizons of China's construction industry beyond its national borders.

Since its official launch in 2014, the BRI has already led to substantial economic investments, with its estimated total value exceeding the trillion-dollar mark. Consequently, it has emerged as a focal point of international attention, sparking debates about its implications for participating nations and the global geopolitical order (Cheung and Hong (2018).

Furthermore, the BRI aspires to promote cultural exchange and the free flow of ideas, transcending national boundaries to nurture people-to-people connections. In strategic terms, the BRI positions China to reinforce its geopolitical influence and bolster its role as a preeminent global economic player. Through strategic investments in critical infrastructure, China seeks to solidify its status as a key actor in international affairs. Consequently, the significance of the BRI in global infrastructure development cannot be overstated. Spanning across over 70 countries, it encompasses diverse regions spanning Asia, Europe, Africa, and beyond. The BRI's infrastructure projects encompass an array of constructions, including railways, highways, ports, energy pipelines, and telecommunications networks. These projects are meticulously designed to bridge geographical divides, creating an integrated network of global trade and commerce. They possess the potential to redefine global supply chains, reconfigure economic power dynamics, and catalyze unprecedented levels of urbanization (Roggeveen 2017).

In this regard, China is disseminating a distinctive model of urbanization through the construction of infrastructure that it owned in its domestic sphere, profoundly influencing diverse regions across the world. In this transformative context, a transnational movement of architectural practices and ideas has emerged, in which architects, planners, and other stakeholders grapple with the multifaceted challenges and opportunities presented by the architectural undertakings within the BRI.

3 Transnational influences within a multipolar globalization

Urban scholar Davide Ponzini (2018) astutely points out that the question of transnational influences in the realm of urban development can manifest more prominently at certain junctures in history than others. In this sense, to inaugurate this exploration, it is imperative to acknowledge that the urban transformations under scrutiny, while significant, are neither entirely unprecedented nor uniquely emblematic of our present epoch. Indeed, transnational urbanization dynamics and architectural practices have previously been and are destined to undergo continuous evolution in the foreseeable future.

Historically, our perspective has predominantly framed transnational movements of architectural practices and discourses as a unilateral flow, often characterized as emanating from the West to the East or from the Global North to the Global South. This dichotomous lens has significantly influenced architectural discourse and its impact on various contexts over the world. However, contemporary scholarship in political and economic studies has recognized a novel condition of "globality," wherein nations and entities engage in competitive interactions on a global scale. This era has been likened to a "flat world," a "spiked world," or even a post-American world (Nederveen Pieterse 2018).

Intriguingly, in these circumstances, the intricacies of transnational relations and the movements of diverse forms of architectural expertise have grown considerably more complex. These interactions now extend to and emanate from countries that were once considered peripheral in the global context and that had long remained at the margins of the architectural discourse as well. Within this context, as aptly acknowledged by Nederveen Pieterse (2009), what transpires is not only a resurgence of modernity but also the staging of entirely new modernities in those parts of the world previously remained mainly overlook in the scientific literature and in the public discourse.

However, it is essential to dispel the notion that this movement is entirely new. In reality, the transnational circulation of Chinese architectural practices possesses some historical roots. Since the era of Mao, China has actively engaged in architectural practices in foreign nations as a form of architectural aid, contributing to the construction of over 1,500 structures encompassing railways, stations, factories, congress and assembly halls, theaters, stadiums, schools, hospitals, and government buildings. These projects were predominantly subsidized by the Chinese government and executed by Chinese professionals, constituting a recurring manifestation of China's exportation of its own modernity (Ding and Xue 2015). This historical precedent now finds itself at the forefront within the framework of the Belt and Road Initiative (BRI).

As Xue and Ding (2022) reminds us, BRI foreign aid projects are only the last stage of a broader process that have facilitated Chinese companies in their expansion into overseas markets, investment endeavors, job creation abroad, economic and cultural exchanges, and the establishment of mutually beneficial partnerships with foreign entities. This historical trajectory has played a pivotal role in shaping the diverse manifestations of transnational architecture, which should be acknowledged as a unique phenomenon. Serving as a symbol of a new multipolar global order, the BRI embodies a paradigm shift in the circulation of transnational architectural practices, each marked by its own characteristics and distinctive attributes. Consequently, new research tools, conceptual lenses and discourses are needed to comprehend the profound interplay between architectural critique and design practices within the complexity of our contemporary world.

4 Architectural practices between global tensions and local adaptations

Within the expansive network of the Belt and Road Initiative (BRI), the intricate relationship between global and local dynamics within the architectural realm takes center stage, constituting a compelling narrative. This narrative is distinguished by a nuanced equilibrium, where architectural practices' and construction firms' undertakings often converge, yet occasionally collide. As previously displayed, even though the discourse about the forms of globalization and architectural practices it is not new, within the framework of the BRI is taking shape with new forms of exchange and contact between architecture firms, construction companies and local governments.

China's active involvement in global infrastructure and architecture since the era of Mao has been portrayed as a manifestation of a pragmatic approach that extends beyond economic and political spheres, permeating its design and construction methodologies (Xue 2022). This pragmatic stance exhibits distinct characteristics, encompassing elements such as cost-effective construction technologies, rapid construction methods, and Chinese standardization practices. However, more significantly, it involves a refined and continuous negotiation of cultural identities. As Charleson (2005) asserts, even in architectural projects where structural or functional aspects take precedence, it remains essential to recognize that architecture extends beyond the mere erection of physical structures, while featuring an intricate interplay of cultural symbols and national identities. In this context, numerous architectural works emerging within the BRI, including the Xian Conference and Trade Exhibition Center designed by GMP, the Lianyungang Industrial Exhibition Center or the Bangladesh-China Friendship Exhibition Centre in Dhaka, exemplify the endeavors undertaken by both Chinese and foreign architects to navigate the constant redefinition of architectural language that, while questing for innovation in structural and technological solutions, it necessitates a renewed emphasis on the application of tectonic principles for symbolic purposes.

Figure 1. Xian Conference Center by GMP Architects, Xian, China (source: Archdaily)

However, in contrast to iconic construction endeavors within defined national boundaries, transnational practices encounter the challenge of reconciling global design standards with the complexities of multiple identities at stake. Projects such as the Sino-Italian Cultural Exchange City Reception Center in Chengdu serve as illustrations of this approach. In Chengdu, spatial elements and architectural features from both Chinese and Italian traditions intertwine, creating a rich tapestry of juxtaposition and overlap. This project's dual sections, separated by water and lush greenery, symbolize the distinct facets of Italian classical architecture and Chinese architectural heritage, respectively. The building seeks to harmoniously blend traditional elements with contemporary reinterpretations. The resulting space, facade, and landscaping are featuring the integration of two architectural styles through intentionally and thoughtfully organized spaces that convey cultural meanings (Bonino, Carota and Marri forthcoming 2024).

Figure 2. Sino-Italian Cultural Exchange City Reception Center by AEO, Chengdu, China (source: Dezeen)

As we delve deeper into the understanding of these architectural endeavors, the negotiation processes involving various actors in the development process emerge as transformative lenses through which we comprehend the intricate relationship between the design process and the materialization of buildings, both in terms of their physical presence and symbolic significance. For instance, in his doctoral work "Architecture for the Others," Pakistani scholar Sohrab Marri (2021) acknowledges the evolving and resolute nature of design proposals for the Gwadar Business Center in Pakistan, presented by the China Communication and Construction Company (CCCC). These proposals encountered a series of trials and tribulations as the local technical task group and other influential stakeholders scrutinized every aspect. Initially, CCCC's design manifested as a modern structure with distinct Chinese characteristics. However, the Pakistani technical task group advocated for a modification that would pay homage to Gwadar's rich architectural heritage, reflecting influences from Arabic and Persian styles that resonate with the passage of time and historical legacies.

Figure 3. Gwadar Free Port Business Center, Gwadar, Pakistan (source: China Pakistan Economic Corridor)

As for the CCCC, traveling Chinese real estate developers and contractors, collaborate with local counterparts, including political, economic, and cultural leaders in host nations, serving as the principal conduits for the global dissemination not only of technical protocols but also spatial imageries and local innovations. For example, the Great Stone Industrial Park on the outskirts of Minsk, Belarus, exhibits spatial characteristics typical of Chinese industrial park typology, as established by China's National Development and Reform Commission (NDRC) under the Ministry of Land and Resources. These characteristics include zoning principles that identify precise boundaries and land use within the park, a central axis around which key facilities are arranged, and both single-story and mid-rise buildings accommodating various functions. Infrastructure development standards, including electricity, roads, water supply, and telecommunications, are derived from Chinese practices and are rigorously implemented. Construction and technical standards, internalized by Chinese enterprises such as CAMC Engineering, inform structural and MEP solutions based on standard sizes and cargo requirements adopted by Chinese companies for goods transportation. These standardized structures, however, feature consideration for specific contextual needs by adapting to local regulations and governmental protocols. Thus, formal features, egress circulations, and structural dimensions may vary from logistical buildings in the Great Stone Industrial Park, a Free Zone in proximity of the Suez Canal, or an international dry port in Khorgos at the border between China and Kazakhstan. As recurrent typologies across BRI projects worldwide, these seamlessly homogenous buildings are the essence of the differences that generates through repetition of design model and practices while circulating worldwide. In this context, the tension between global aspirations and local sensibilities becomes a driving force behind innovative solutions that enhance functionality while aiming to construct hybrid identities that consider both local and global expectations.

Figure 4. Great Stone Industrial Park, Minsk, Belarus (source: GSIP Development Company)

5 Architectural theory between new practices

As elucidated earlier, the transnational practices of architects and construction firms within the BRI demonstrate a unique and pragmatic adaptability to diverse circumstances across the globe. What is particularly intriguing is that these architectural examples, which we have scrutinized, defy classification within existing architectural taxonomies or established scientific frameworks prevalent in mainstream architectural discourse. Some of the structures we have examined bear the hallmarks of modern design with local decorations, while others represent iterative building productions adapting to local regulations, and yet others delineate intricate urban dynamics. These practices operate beyond the confines of established theoretical or professional frameworks, showing a remarkable openness to novel modern ideals and a willingness to adapt to pragmatic contingencies.

However, as we scrutinize the architecture of the new millennium, the notion of architectural practice as "entrepreneurial intelligence," as posited by Professor Michael Speaks (2006), appears inadequate. As new emergencies are taking places into the practices, we have to reestablish an architectural discourse with new vocabularies and modes of understanding, which are grounded on specific places, cultures and transnational dispositions. In this regard, the theoretical understanding that we can retrieve while navigating through the practices and buildings arising within the framework of the BRI is not any kind of a priori given framework reliant on ideas, theories and concepts given in advance, while a method of intellectual and scientific action that is able to extrapolate renewed theoretical perspectives from the outcomes of the practice.

Indeed, in our complex and globalized world, one thing is evident: transnational architectural practices can no longer be adequately encapsulated by overarching grand structural ideas or Western-established theories. As Rainer de Graff (2017), a prominent critic in contemporary architecture, astutely observes, Western academia

often finds itself isolated, governed by its autonomous codes, and constrained by outdated hierarchies and value systems, and, in this manner, it struggles to recognize and address the real forces shaping the built environment. Instead, the most influential architecture practices happening along the global infrastructure, such as the BRI, are today compelled by the need to innovate, to create solutions to problems whose larger implications have not yet been formulated. In this context, I contend that the resulting buildings can only be comprehended through an approach that delves into the specificities of places, cultures, and diverse notions of modernity.

However, as the distinct characteristics of the BRI illustrate, while the prevailing discourse on globalization and internationalization no longer suffices to encapsulate such endeavors, neither does any form of regionalism, whether critical or not, offer a comprehensive solution. Although the concept of "critical regionalism" has raised valuable questions about modernity, tradition, cultural identity, and place, and has shed light on overlooked architectural activities, it hinges on a notion of critique often grounded in Western traditions of critical thought (Eggener 2002). This can pose challenges in contexts where such western traditions may be absent or hold little sway (Botz-Bornstein 2016). Moreover, as Dana Cuff has argued, in hindsight, figures like Kenneth Frampton may have underestimated the profound impact of the global economy on local architectural practices and the possibilities it also opens for innovative design practices that connect communities and intrinsically resist consolidated moral and effectual conjectures (as cited in Kirsten 2001).

Therefore, what we require is not another preconceived framework for evaluating and establishing global practices, but rather a rejuvenated understanding of architecture rooted in new perspectives and narratives of urban development. In essence, we must draw from a diverse array of scholarship to challenge established frameworks, models, and categories, thereby shifting the focal point of architectural theory and practice to broader horizons. This shift serves as a promising starting point for cultivating a more cosmopolitan and inclusive understanding of architecture and urbanism (Bonino, Carota and Marri forthcoming 2024).

6 Conclusions: Towards a Cosmopolitan Understanding of Architecture and Urbanism

In conclusion, the Belt and Road Initiative has undeniably inaugurated a transformative era of transnational architectural exchange, transcending conventional paradigms and illuminating a fresh perspective on architecture and urbanism. As our exploration delved deeper into these architectural endeavors, the negotiation processes among the various actors involved in the development process emerged as a profound lens through which we comprehended the intricate relationship between architectural theory and design practices within our complex contemporary world. The adaptive strategies, the integration of global design standards with different cultural identities, and the dialogues between architects and local stakeholders all stand as vivid testaments to the dynamic and ever-evolving nature of architectural practice within the expansive BRI landscape.

Moving forward, it is imperative, within the global complexity of our contemporary world, that we continue to embrace, engage with, and explore the intricacies of transnational architectural practice. We must acknowledge that the demarcations between the global and local are not fixed but rather fluid and dynamic. Moreover, it is crucial that we account for emerging places, new modernities, and evolving practices within the critical discourse surrounding architecture and urbanism. Indeed, as we, as architects and scholars, endeavor to establish the moral and assessment principles that shape the global architectural discourse, we should heed Habermas' (1990) proposition that these principles should emerge from open, rational discourse among all the parties involved. Such discourse necessitates the recognition of the moral autonomy and dignity of each participant who comes together to engage in a critical dialogue.

In other words, a closer examination of global infrastructure developments, exemplified by the Belt and Road Initiative, should inspire us to contribute to the creation of built environments that not only consider cultural identities but also embrace diversity in a broader sense. Only these farther and closer explorations can enrich the tapestry of our global community, celebrating the uniqueness of each locale while fostering connections that transcend borders. In this sense, an exploration on those considered “peripheries of the world” (Pieterse 2018) should emerge as a catalyst for a more inclusive and cosmopolitan architectural discourse, one that reflects the richness of our interconnected world.

References

Bonino, M., Carota, F., and Marri, S.A. (forthcoming 2024). Grounding the Belt and Road Initiative. A Guide to the Architecture of the New Silk Road. Basel: Birkhauser.
Botz-Bornstein, T. (2016). *Transcultural Architecture: The Limits and Opportunities of Critical Regionalism*. New York: Routledge.
Cai, F., and Nolan, P. (2019). *Routledge Handbook of the Belt and Road*. New York: Routledge, Taylor & Francis Group.
Charleson, A. (2005). *Structure As Architecture: A Source Book For Architects And Structural Engineers*. London: Architectural Press.
Cheung, F. M., and Hong, Y. (2018). *Regional Connection under the Belt and Road Initiative: The Prospects for Economic and Financial Cooperation*. New York: Routledge, Taylor & Francis Group.
Graaf, R. (2017). *Four Walls and a Roof. The Complex Nature of a Simple Profession*. Cambridge, Massachusetts: Harvard University Press
Ding, G. and Xue, C., (2015). China's Architectural Aid: Exporting a transformational modernism. *Habitat International,* 47(1), 136-147.
Eggener, K.L. (2002). Placing Resistance: A Critique of Critical Regionalism. *Journal of Architectural Education, Vol. 55*, No. 4, pp. 228-237
Habermas J. (1990). *Discourse Ethics: Notes on a Program of Philosophical Justification.*
Kirsten, W. (2001). Architectures of Globalization. *Places, 14*(2), 70-73.
Marri, S.A. (2021). *Architecture for Other. China's eclectic pragmatism in developing countries within the framework of the Belt and Road initiative.* Ph.D. Dissertation.
Nederveen Pieterse, J. N. (2009). Multipolarity means thinking plural: modernities, *Protosociology I,* 26, 19–35.
Nederveen Pieterse, J. N. (2018). *Multipolar Globalization: Emerging Economies and Development*. New York: Taylor & Francis Group.
Ponzini, D., 2020. *Transnational Architecture and Urbanism: Rethinking How Cities Plan, Transform, and Learn*. New York: Routledge, Taylor & Francis Group.
Roggeveen, D. (2017). *Progress & Prosperity: The Chinese City as a Global Urban Model.* Rotterdam: Nai010 Publishers.
Speaks, M., 2006. Intelligence after Theory. *Perspecta 38*, 101–106.
Wiig, A. and Silver, J. (2019). Turbulent presents, precarious futures: urbanization and the deployment of global infrastructure. *Regional Studies, 53*:6, 912-923.
Xue, C. and Ding, G., (2022, ed.), *Exporting Chinese Architecture: history, issues and One Belt One Road*. Singapore: Springer.

Integrated Design:
Intelligent Environments Expanding Public Spaces

Christiane Wagner
The Institute for Cultural Inquiry Berlin (ICI Berlin)
University of São Paulo - Institute of Advanced Studies (IEA USP) - USP Global Cities Synthesis Center

Abstract: Digital technologies facilitate design solutions based on functional, ethical, and aesthetic parameters. However, predictions regarding people's quality of life in relation to the United Nations' Sustainable Development Goals are uncertain. Therefore, this study discusses integrated design resolutions and human-centered design. To this end, digital resources—algorithmic rule, the Internet of things, and artificial intelligence (AI)—are analyzed, targeting interactive digital systems. Specifically, this analysis seeks to identify the limits of AI's capacity to solve human problems involving design-based learning (DBL) in three stages of development, namely problem analysis, problem solution, and project reporting. New attempts to resolve problems during the human–machine learning process are analyzed to address problems unsolved by AI by highlighting human values and goodwill in decisions, choices, and solutions regarding when and how a decision can be made. Theoretical and methodological approaches are developed to deepen design questions as social phenomena that incorporate meaning and materiality into creative solutions that enrich urban space, design, and architectural projects aimed at long-term goals. This qualitative research focuses on observations through direct interaction between the researcher and the object of study—namely, intelligent environments expanding public spaces and the mediation between humans and machines—as well as varied experiences of the perceptions, actions, and behaviors of the actors involved in smart city projects. Through a theoretical foundation, the responsibility of design concerning the global and local contexts of São Paulo and Berlin in terms of its potential for social transformation is discussed. This verifies the need for planning based on ethical and aesthetic aspects of public policies for urbanization solutions while considering integrated design.

Keywords: climate change; urban spaces; global cities; architecture design; society solutions.

1 Introduction

Representing space, structures, and objects defines objective images that cross boundaries, creating and providing free access to the imagination beyond the immediate social environment. However, the technical aspects of the image of objects and the environment as well as its conception and visual configuration are due to users' perception through their understanding and comprehension. Perception concerns the relationship of human beings to the environment they inhabit. It is an active process involving the selection, organization, and interpretation of information, which becomes trivial in its representations and structural materializations through the spatialization and dynamization of time. Thus, the importance of physical public spaces in their extension to private and virtual areas takes on a greater dimension, namely as a social experience through integrated design. Based on these arguments, this research concept allows a better understanding of the participation of social actors and their daily practices regarding objects, the environment, and space-time directed toward global social and sustainable transformation issues. Formal innovations arise and are associated with values that meet people's needs for a better quality of life, following criteria aimed at sustainability. Consequently, design responsibility encompasses vital considerations for achieving high commercial acceptance through satisfying people's desires and social needs.

Thus, through a foundation of technical integration, digital resources, and the skills of experts in various fields of design and architecture, the Sustainable Development Goals (SDGs), and responsibility in designing for global and local contexts in their potential for urban and social transformation are discussed in this study. The analysis presented herein focuses on urban and social challenges in sociocultural, political, and economic contexts, considering the daily experiences of the urban environment in a Latin American global city, namely São Paulo, and a European global city, namely Berlin. Emphasis is placed on an ongoing context of evolving living traditions influenced by innovation, which can change and facilitate society's evolution through expanding public spaces. This approach seeks to consider a continuously evolving practice, with the interaction between past, present, and future resulting in a changing urban environment. The metropolis is the main space where innovations are realized through integrated design.[1] According to Papanek ([1971] 2019, 284), the focus is on the human condition, its means, its environment, and its ways of thinking, planning, and manipulating its position and its environment as a whole in a nonlinear, simultaneous, and integrated manner. This premise is still valid and can be traced back to Bauhaus (1919–1933) ideals through the teachings of László Moholy-Nagy,[2] who—regardless of technological advances—demonstrated that the foundation of design withstands in the search for solutions

and updates itself according to each new technology. Therefore, it is valid to assert that the aim is to restructure and redesign both the function and structure of tools, products, shelters, and settlements into an integrated living atmosphere that is able to expand, alter, vary, adjust, and renew itself, as stated Papanek (285).

Therefore, in this study, integrated design and information and communication technologies require two perspectives. The first is an urban spatial model, and the second is a transformational framework that uses new technologies to create realities, artificial environments, and interactive communities. To this end, this paper questions the ability of artificial intelligence (AI) to solve complex human problems related to design-based learning (DBL) in three stages of development: problem analysis, problem solution, and design reporting. For this purpose, the complexity of social reality is discussed, with a scientific understanding sought of its technological and sociocultural development based on the following urban programs: the São Paulo Urban Operations and Sustainable City Program and Berlin Lebenswert Smart (Berlin Liveably Smart) of the Model Projects Smart Cities program.
The design challenges are directed at the social structure and depend on advances in science and technology. These advances involve the complexity of all knowledge in practice and theory. In design, technical ability and intellectual and empirical activities are essential for building knowledge and materializing the resulting ideas in all current urban structures. Therefore, this study discusses design in terms of technical and creative processes in the planning of sustainable development. The historical and theoretical approach to design is based on the relationship between art, technique, and architecture in its industrial conception and the sociocultural consequences of its practice in urbanization and technological development for smart environments. In said environments, information and communication technologies are integrated with infrastructure, everyday objects, and users' presence to address social, economic, and environmental problems in urban and architectural spaces. This approach questions, through grounded and integrated inter- and transdisciplinary visioning, the possibilities of these smart environments to provide solutions and a better quality of life.

2 Integrated Design and Smart Solutions

The demand has been growing for professionals in the economic production sector, who design each product, make its function visible, and enable a clear understanding by users. This specialty is known as product design and graphic design, along with many other branches that have enjoyed recognition and prestige. In addition, design is known to extend beyond the product itself and to answer the question of its essence—namely planning. In design, forms, functions, and senses are not exhausted and, according to the most diverse contexts, could not be independent because they would always be conditioned to the continuous changes and perspectives of the object in the universe surrounding it. Thus, design commands the development of a project, construction of a methodology, calculation of experimental dimensions, manufacturing processes, and the teaching–learning process with the following single objective: to plan, realize, and solve in an integrated manner.

Simultaneously, some aspects of design have been prioritized in scientific research. In this sense, Bürdek (2019) made an important observation, precisely at a time when the term "design" is being trivialized, by reminding us that the idea of Walter Gropius—founder of the forerunner design school the Bauhaus in Weimar—was to find new syntheses of art and technology. However, this subject is known to be obsolete today. Nevertheless, in Germany, the meaning of design remains much closer to the original term employed by Gropius—*Gestaltung* (configuration, planning, and organization). The design literature[3] opens up an essential space for researchers interested in aesthetic effects. The social construction of technology refers precisely to this connection between technology and culture. Social structure can play a central role in technological development, learning, formation, and cultural transformation. Therefore, it is essential to highlight that designers are not inventors of these technologies but rather creatively design through them. Bürdek clarified that designers are the interpreters of technologies, realizing social values.

The challenges in finding solutions lie in the processes of the entire team involved in the project. However, it is not always possible to detect the causes of the problem so that solutions can be developed, and "complex problem-solving is required when one is faced with knowledge-based problems" (Norman 2013, 345). It takes days for problems to be perceived. Furthermore, complex problems can generate new problems in the face of pressure for immediate results. Moreover, understanding human behavior is highly complex compared with understanding systems with knowledge of physics or mathematics. On the one hand, solutions that attribute persistent problems to human error are no solution—on the contrary, employing them is to resist the possibilities of solutions. On the other hand, this complexity of problem solving is found in all possible situations of human behavior. Therefore, it is necessary to apply some criteria to get it right, thereby eliminating the possibility of

error. However, to prevent further errors, one must find not the error but rather how the wrong decisions or actions were taken. That there can be many causes, not just one, is well known. Furthermore, faced with Norman's statements (2013), it seems that one can attribute human error not only in the use of a product or equipment (i.e., to the human user) but also in the design conception itself (i.e., to the designer's human error). Norman admitted the impossibility of solving problems if errors are not admitted. In his long experience as a designer, he reported that blaming people for an error makes it difficult to convince organizations of changes, reorganizations, and the need for redesign to solve problems. However, faced with this situation, Norman argued that "usually the system, the procedures, and social pressures have led to the problems, and the problems won't be fixed without addressing all of these factors" (313). Thinking about this complexity and the role played by the designer is to understand first from the whole and not from the parts, and through a deconstruction of what is known, to enable a reconstruction that seeks new ways of reaching the correct result. The very construction of current knowledge has been guided by problem-based learning (PBL) pedagogy since 1974, which advocates the identification of problems through the observation, analysis, discovery, and recognition of the causes to eliminate them; furthermore, PBL involves verifying the effectiveness of the actions taken to eliminate the problem by comparing the situations executed (before and after). Next, a standardization is defined based on responsibilities, which is necessary to avoid new problems. Finally, all of the steps are reviewed to plan new projects and continually seek improvements. Since 1999, industrial design has adopted DBL in projects, which is based on the PBL model of three distinct stages of development. These stages are problem analysis, problem solution, and project reporting, focusing on the resolution of the problem through analysis.

As a result, DBL prepares the designer to visualize the design integration and, consequently, the innovation ideal, considering the alignment, research, mission, vision, concept, product, and process report. Thus, in seeking solutions to problems through these teaching methods, a crucial distinction stands out between problem-based learning and project-based learning. Whereas problem-based learning focuses on understanding, analyzing, and studying the problem, project-based learning focuses on the learning as problem orientation. Furthermore, project-based learning relies on developing projects based on the division and sharing of activities in a cooperative process. Thus, as a complex process in transformation, design involves many human activities and skills related to the possibilities of projects through techniques and the constant stream of new resources made available by new technologies. The most significant challenges for designers lie in this scenario of novelties. Thus, the DBL methodology guides learning through creative ideas, skills, and competencies, aiming for new values in the face of information and knowledge (Stokholm 2014). However, one must consider that the design process—in all its ramifications—involves thinking as its main characteristic. The Cartesian consideration, based on the method of successive attempts to get something right based on mistakes, consists of finding flaws and consequently finding ways to correct them as solutions. Nevertheless, the search for more adequate and efficient methods for evaluating and predicting problems in projects has become paramount when considering design as a social process project. Thus, significant changes have been considered that involve the transition from the problem-solving process to the problem-formulation process to meet a collective and successful purpose (Beckman and Barry 2007).

Learning by doing is not new to the PBL and DBL methodologies, since the Bauhaus already employed experience in the teaching methodology for its introductory course. Theoretically, this practice is found in the pedagogical theories of John Dewey. Hence, development and adaptation to the current context are highly relevant. Experience has been the focus in the training of designers. Specifically, the concept of experience is fundamental to detecting problems and solving them. According to Dewey, when people experience something, they act upon it and do something with it; then, they suffer or feel the consequences. People do something to the object of experience, and then it does something to them in return. Under such conditions, the action becomes an attempt; one experiences the world to know what it is like, and consequently, what one suffers becomes instruction—that is, the discovery of the relations between things (Dewey [1916] 1997).

Therefore, the designer's major challenge today is not only a methodological one but also a sociocultural one. The human intelligence challenge lies in the search for more knowledge, which forces us to review the central values of Western culture. Although humans have acquired autonomy in the modern world, guided by ethics or moral precepts, resistance to new values has always existed. Consequently, problems always arise in times of change and adaptation, which is something that is essentially human. In this sense, in the face of discoveries, theories of knowledge and pedagogy, and especially the development of science and technology, humanity is conditioned to the new paradigm of AI. AI is the result of an integral part of the digital transformation of all facets of our societies, including education and new designs and redesigns focused on sustainable development. Under these conditions, in general, an awareness of the necessary processes is a determinant of the designer's work for meeting the demands of sustainable development, along with attempts to identify and solve problems. The basis of the sociocultural challenge is already found in the designer's training. It is also found in all social

structures, especially in companies and industries—where designers are essential—that cooperate with programs that aim to achieve the United Nations (UN)'s 17 Sustainable Development Goals (SDGs). Regarding SDG 11 on sustainable cities and communities, the UN reported that "the world is becoming increasingly urbanized. Since 2007, more than half the world's population has been living in cities, and that share is projected to rise to 60 per cent by 2030."[4] This challenge also implies a goal for urban designers and architects, namely planning cities for growth in a more sustainable and inclusive manner.

All social life activities are somehow related to the functions of design. Consequently, one can understand that design must also assume a commitment to the 17 SDGs. Furthermore, much stronger cooperation from the entire global society is required to ensure the functioning of social structures, which depend on economic development as the main factor for enabling the SDGs to be achieved. In this sense, ethical values are at the heart of the designer's work. The ethical notions that should be considered core values of design are technology and innovation, along with their moral and political impacts on individuals and society. Thus, values should be considered during the design process as well as factors that influence projects, users, and third-party involvement in terms of functionality and its intended or unintended consequences. Ultimately, it is about awareness of the possible implications of design and the political and moral value choices that contribute to conscious design.

After Agenda 2030 was adopted by the United Nations (UN), the axis of sustainable city programs was correlated to the 17 SDGs and the 169 UN targets. Although they are of a global nature and can be applied anywhere on Earth, the SDGs are directly linked to local policy and action. Among the main axes, urban design stands out. Integrated design relies on indicators, data, and studies of the urban, transitional, and rural environments, thus applying the concept of sustainability to the city's short-, medium-, and long-term plans. Based on the Sustainable Cities Program in the city of São Paulo, the following solutions stand out: (1) Giving new life to abandoned or socially degraded areas; (2) avoiding urban expansion on a place by focusing on urban density and development in the built space; (3) ensuring that land uses in urban regions work together; and (4) ensuring sufficient conservation, renewal, and use/reuse of the urban cultural heritage. Furthermore, implementing sustainable urban design and construction standards is essential, considering natural resources and phenomena when making decisions (Sustainable Cities Program). In short, solutions should meet SDG 11, which is as follows: "Make cities and human settlements inclusive, safe, resilient and sustainable" (UN).

According to the CAF[5] Development Bank of Latin America, many cities promote urban development to improve people's quality of life, social inclusion, and safety by offering environments for entertainment and recreation in public spaces, integrating the environment with nature, and respect for biodiversity. The following three recommendations for improving public spaces in cities are highlighted from among the numerous converging points regarding public spaces as a result of integrated design, which enables public spaces to fulfill their dual role of permanence and use:

> (1) Improve environmental conditions by expanding urban green infrastructure; (2) provide elements that turn public spaces into comfortable and attractive places for different communities; and (3) test the design and management of our streets, ensuring versatility and safety for a wide range of users and their different forms of mobility. (Zamora 2022)

In this sense, successful projects are found in São Paulo through Urban Operations Through Consortiums.[6] These projects are made possible by the public sector, and concessions enable the construction capacity/flexibility of the private company's use of the area of interest to be increased, being rewarded financially or physically, such as the revitalization of public space or the construction of social housing (Vettori and Zamora 2022). Because urban operations are public transformations or the most intensive transformations oriented to use, they transform the urban landscape clearly and visibly: Urban spaces are redefined; artworks are built; roads are improved; vacant areas are used to build parks or gardens or to construct suitable and sustainable buildings or housing; low-use buildings are renovated; and new structures are built. As an example, in the urban operation for downtown São Paulo, important public spaces are reformed, expanded, and requalified; the number of pedestrian sidewalks is increased to make it easier for pedestrians to move around; spaces with a significant movement of people are represented; and the area is used intensely for fairs, demonstrations, leisure, and cultural gatherings. However, it is worth highlighting that of all the operations in São Paulo, the downtown is the only one that is not consortium-oriented; therefore, it is absent of revenues, which contributes to the planning of public interventions with a better time frame. As constant attempts to find solutions are being made, São Paulo, South America's largest city, is constantly subjected to analysis and diagnosis of the many issues it presents.

Likewise, according to the urban architect Katia Canova, the search to improve methods for formulating proposals and monitoring actions is equally intense. Therefore, statistical data and perceptions of the urban environments should be considered. Canova (2020) conducted empirical research from 2017 to 2020 with a theoretical basis in the studies of Jane Jacobs, Jacques Lévy, and UN-Habitat planning methods to select variables and weigh their classes according to the anthropocentric view common to all of these sources.[7] UN-Habitat proposed a method for the synthesis and refinement of urban planning theory to create a sustainable relationship between the urban dweller and urban space as well as to increase the importance of the urban space. This approach is founded on five principles—namely adequate space for streets and an efficient street network, high density, mixed land-use, social mix, and limited land-use specialization. These support the three key characteristics of a sustainable neighborhood and a city, namely compactness, integration, and connectivity. By means of the aforementioned five principles, a set of quantitative metrics can be applied to analyze a neighborhood, as illustrated in Figure 1:

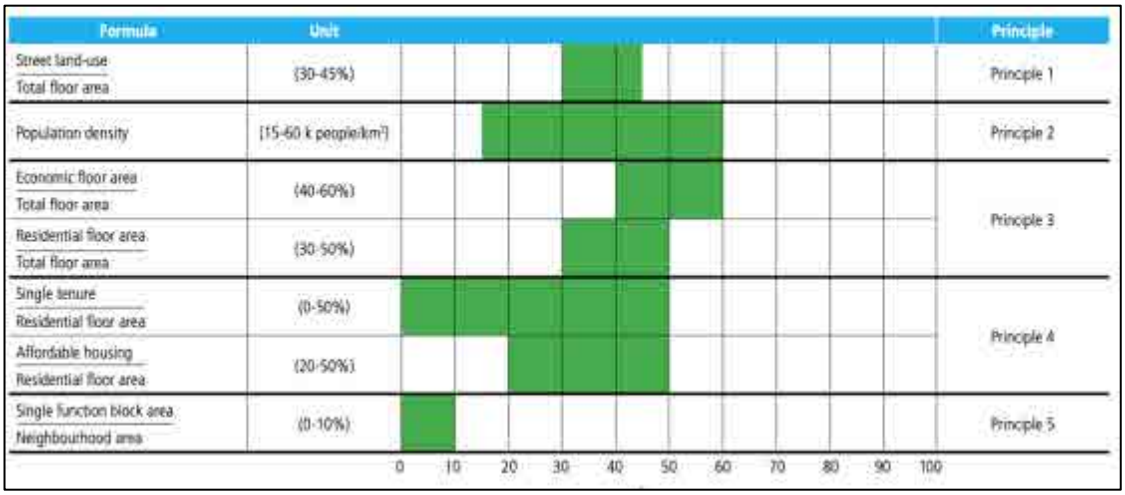


Figure 1. Sustainability analysis of a neighborhood. The figure presents the recommended ranges of quantitative measurements in green (UN-Habitat 2014).

Therefore, many social science and humanities theorists have argued that cities should be measured by their material, social, and sensitive aspects. However, the material aspects are more easily recorded and calculated, while the social and sensitive aspects are more challenging to measure and depend on intensive participation and recording of perceptions. Here, the potential of integrated design work based on qualitative research comes into play. Integrated design is, in general, guided by responsibility, ethics, projects that involve participation, and knowledge on the part of both the designers who produce it and the users. In addition, a smart environment should be applied consciously, aiming at the goals previously presented based in the SDGs and the UN-Habitat principle. Thus, a strategic spatial concept for urban space in Berlin, namely the Urban Development Plan Climate 2.0, guides Berlin the city in achieving the goal of becoming climate neutral by 2045 through acting in the following fields: "Blue-green adaptation of housing stock and new constructions, climate-optimization of green areas and open spaces for a cooler environment, harnessing synergies between the city and water, and taking precautions against strong rains and floods." The plan also includes the spatial setting of the housing project in Berlin. The approach is based on protecting the climate by a short distance of mobility, focusing on the development of Berlin's urban centers and the radius of regional rail stops, ensuring that people can reach them in less than 6 minutes through active mobility, which includes cycling and walking. This plan highlights the opportunities for Berlin to grow sustainably as well as the challenges of constructing new buildings and existing housing stock in the context of climate change. Therefore, the Urban Development Plan Climate 2.0 in part of the Berlin, Liveably Smart program that is conducted in the following three process phases: "(1) The strategic framework of the Smart City Strategy, (2) the unification of the digital strategy and the smart city strategy into the strategy Digital Together: Berlin (*Gemeinsam Digital: Berlin*), [and] (3) Implementation." Digital Together: Berlin is a fusion of the Berlin Digital Strategy and the Smart City Strategy with the goal of thinking about urban development and digitalization together. For the project, "smart" means more than simply digitizing. The city of Berlin understands the term in relation to how challenges are addressed—creatively, openly, and with participation. The city can be smart when digitalization and technology create social benefits and strengthen the

democratic community. This digital transformation also requires cultural change. Such a strategy aims to improve administrative efficiency and encourage new ways of working together. A key design challenge is to ensure that digital and physical elements interact to bring about changes in urban space while also considering their spatial impact. Thus, "at the level of the city as a whole, positive effects in Berlin include the improvement of mobility and infrastructure services in line with needs, as well as the transformation and use of public spaces in a community-oriented way."[8] While the action fields of Digital Together: Berlin define the contents' structure of measures, participation in the process has identified the following three different spatial levels, at which the activities of the strategy can have a different effect:

> At the neighborhood level, possible effects can be seen in an improvement in the immediate quality of life and better networking within the neighborhood, for example. At the level of the city as a whole, positive effects in Berlin include the improvement of mobility and infrastructure services in line with needs, as well as the transformation and use of public spaces in a community-oriented way. Last but not least, (supra-) regional networking is also gaining in importance in terms of cooperative, learning urban development[9] (Figure 2).

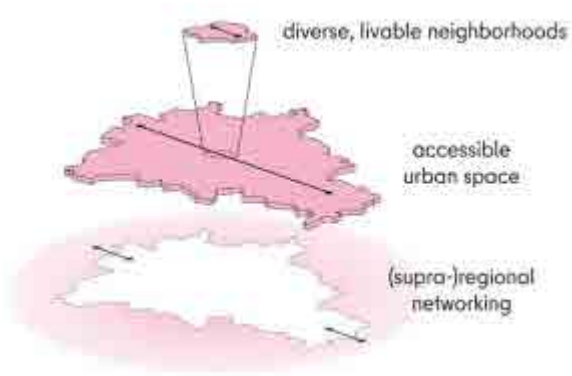


Figure 2. Berlin spatial impact and fields of action.

In a book chapter titled *Is the city becoming computable?*, Antoine Picon and Thomas Shay Hill (2020) present the historical direction of the development of cities and the actors involved in the concept of the smart city. The authors present two visions: One is based on the idea that the city is best apprehended by qualitative means, while the other is quantitatively committed to the notion that cities' structures, patterns, and dynamics can be reduced to numbers. Finally, however, the authors offer the following conclusion:

> The mathematical approaches underlying the current smart city movement do indeed represent significant advances over earlier quantitative methods, both in the richness and scale of the information they can conceivably encompass and also in the assumptions their models make about the nature of social reality. What is clear at this point is that the current impulse towards making the city computable is a far more powerful and expansive endeavor than either of its two predecessors. (2020, 40)

In the face of the digital age, with metaverse-changing environments, AI, the Internet of things, and big data, Picon (2015, 140) argued that it is an illusion that the city would not have its functioning modified but rather enhanced by digital technology. This means that public life, political representation, and decision-making will not remain the same with increased information and communications technology. Moreover, Picon highlighted that "digital technology has both a financial and an environmental cost. Consequently, its use needs to be modulated in relation to the characteristics of the urban areas that it is set to serve." In addition, mapping can provide an alternative approach to collective decision-making. It can be compared to a new kind of physical and digital public space, where initiatives are not only the work of humans but also where they still retain the privilege of defining the values that guide them (Picon 2015). This is the case with Digital Together Berlin: "The strategy provides a methodological framework while at the same time ensuring that individual measures can take effect together and learn from each other." [10] Human intelligence's capacity and evolution must prevail, and consequently, collective intelligence with ethical values must be shared to guide what is correct and fair. In this sense, innovative spaces are laboratories of public life in the digital age, and intelligent cities are destined to produce a new kind of culture.

3 Final Consideration

Faced with this complex relationship and objectives aimed at sustainability, when analyzing the basis of designers' training and its relationship with the different contexts of industrial, economic, and sociocultural development, it was first necessary to understand that the restructuring of the system has come a long way and still has a long way to go. Many transformations are required, which involve every small part of this complex field of production and reproduction. The main points were highlighted regarding the design challenges concerning planning and involvement with the entire social structure. Therefore, this construction of knowledge, identification of problems, and search for solutions as primary factors of the designer's social responsibility are focused on the ethical values of sustainable development. Consequently, achieving sustainable development through not only design but also all actions is dependent on the entire base of education and training in society. To sum up, this paper related sustainable development to the history of design in its relationship with planning, formation, and configurations involving art, technique, and architecture in its industrial conception, as well as the sociocultural consequences of its practice in the process of urbanization and technological development. The complexity of sustainable development lies in planning the entire production chain and urban lifestyle, not only in technological and scientific development but also—and mainly—in training and education. This is complex because of the condition of the social structures, including political-ideological aspects and beliefs. Besides all of the factors discussed here, it is a context in movement and transformation—sustainable development—that generates consequences that result in a back and forth, or evolutions and involutions, with a greater tendency to advance toward sustainability. Finally, through a theoretical foundation based on art, culture, and technological change, this paper recognized the importance of the SDGs and the responsibility of design concerning global and local contexts in their potential for innovation and social transformation.

Notes

[1] Integrated design is a process of the transformation of humans and their skills as a whole. Today, new design specializations have acquired essential significance for the development of a globalized society aiming at sustainability, and they are interdependent, as already Victor Papanek highlighted: "integrated design must include regional and city planning, architecture (both interior and exterior), industrial design (including systems analysis, transportation and bionic research), product design (including clothing), packaging, and all the graphic and film-making skills that can be generally subsumed under the catch-all phrase of visual design" ([1971] 2019, 285).

[2] Moholy-Nagy ([1928, 1947] 2005) employed forty-four adjectives to describe different kinds of spaces to find a synthesis, literally offering a new, grounded, aesthetic vision of the perception of architecture, design, art, and sculpture in methods of integrated application to new work configurations.

[3] Throughout the history of design, many definitions have been given: what concept it would begin with and then what function it would have, what its domain of existence is, and what the main points are. Today, however, this is still no different. In German, until 1945, the word design was not used, but *Gestaltung*.

[4] United Nations. "Sustainable Development Goals."

[5] Corporación Andina de Fomento (CAF). The CAF Development Bank of Latin America supports implementing a sustainable development model in Latin America and the Caribbean through credit, non-refundable resources, and help in the technical and financial structuring of public and private projects.

[6] In Portuguese: Operações Urbanas Consorciadas, OUC, an instrument included in National Law 10.257/2001 "Cities Statute" (Vettori and Zamora 2022). The areas of interest for Urban Operations through Consortiums in São Paulo are provided for in the Strategic Master Plan (Plano Diretor Estratégico), approved by Law No. 16,050 in 2014, within the Metropolitan Structuring Macro Area.

[7] Jacobs (2011), Lévy (1999), UN-Habitat (2, 2014), in Canova. K, 2020.

[8] Gemeinsam Digital: Berlin

[9] Digital Together: Berlin strategy: "The strategy [Digital Together: Berlin] is designed as an enabling strategy that promotes new forms of collaboration inside and outside the administration. For this purpose it formulates fields of action." In in *Gemeinsam* Digital for a Smart City. Available at: https://gemeinsamdigital.berlin.de/en/strategie/handlungsfelder/ (Accessed April 28, 2023)

[10] See "Visionary designs and specific construction plans: the capital's strategy for a smart city" in *Gemeinsam* Digital for a Smart City. Available at: https://gemeinsamdigital.berlin.de/en/ (Accessed April 21, 2023)

References

Beckman, S. L., and Barry M. (2007) "Innovation as a Learning Process: Embedding Design Thinking." *California Management Review* 50, no. 1 (October): 25–56. Available at: https://doi.org/10.2307/41166415 (Accessed: April 5, 2023).
Canova, K. (2020). "Análise Crítica do desempenho das Operações Urbanas em São Paulo" [Critical Analysis of the Performance of Urban Operations in São Paulo]. In *Operações Urbanas Cidade de São Paulo, Caderno Geral*. São Paulo: SP Urbanismo, Secretaria Municipal de Desenvolvimento Urbano.
Bürdek, B. (2015) *Design. The History, Theory and Practice of Product Design.* Basel: Birkhäuser.
Bürdek, B. (2019) "To What Extent is Bauhaus Even Possible Nowadays?" Interview by Christiane Wagner. Special Edition, Art *Style, Art & Culture International Magazine,* v. 2, no. 2 (June): 85–91. Available at: https://doi.org/10.5281/zenodo.4088827 (Accessed: April 20, 2023).
Dewey, J. (1997) *Democracy and Education: An Introduction to the Philosophy of Education* [online]. Available at: https://www.gutenberg.org/files/852/852-h/852-h.htm (Accessed: May 2, 2023).
Jacobs, J. (2011) *Morte e vida de grandes cidades.* [Death and life of big cities]. São Paulo: Martins Fontes.
Lévy, J. (1999). *Le Tournant Géographique - Penser l'espace pour lire le monde.* [The Geographical Turning Point - Thinking Space to Read the World]. Paris: Éditions Belin.
Moholy-Nagy, L. ([1928, 1947] 2005) *The New Vision: Fundamentals of Bauhaus Design, Painting, Sculpture, and Architecture.* Translated by Daphne M. Hoffmann. New York: Dover Publications.
Norman, D. A. (2013) *The Design of Everyday Things.* Revised and Expanded Edition. New York: Based Books.
Papanek, V. ([1971] 2019) *Design for the Real World: Human Ecology and Social Change*. Reprint, New York: Thames & Hudson.
Picon, A. (2015) *Smart Cities: A Spatialised Intelligence*. Chichester, West Sussex: Wiley.
Picon, A.; Hill, T. S. (2020) "Is The City Becoming Computable?" In *Architecture and the Smart City,* edited by Sergio M. Figueiredo, Sukanya Krishnamurthy, and Torsten Schroeder, 29-42. London and New York: Routledge.
Sustainable Cities Program. Available at: https://www.cidadessustentaveis.org.br/institucional/pagina/planejamento-e-desenho urbano?eixos=true (Accessed April 23, 2023).
Sustainable Cities and Communities, Sustainable Development Goals: Available at: https://sdgs.un.org/goals/goal11 (Accessed June 1, 2023).
UN-Habitat. (2014) "A New Strategy of Sustainable Neighbourhood Planning: Five Principles." Urban planning discussion note 3. Urban planning and design branch. Kenya, 2014. Available at: https://unhabitat.org/sites/default/files/download-manager-files/A%20New%20Strategy%20of%20Sustainable%20Neighbourhood%20Planning%20Five%20principles.pdf (Accessed Mai 10, 2023)
United Nations. "Sustainable Development Goals." Available at: https://www.un.org/sustainabledevelopment/sustainable-development-goals/ (Accessed March 31, 2023).
Wagner, C. (2022) *Visualizations of Urban Space: Digital Age, Aesthetics, and Politics.* Advances in Urban Sustainability. London and New York: Routledge.
Zamora, B.; Vettori, D. (2022) "Urban Renovations That Leave Their Mark." AF Development Bank of Latin America. Available at: https://www.caf.com/en/knowledge/views/2022/02/urban-renovations-that leave-their-mark/ (Accessed April 17, 2023)
Zamora, B. (2022) "Three Recommendations to Improve Public Spaces in Cities." CAF Development Bank of Latin America. Available at: https://www.caf.com/en/knowledge/views/2022/04/three recommendations-to-improve-public-spaces-in-cities/ (Accessed April 10, 2023)

Strategic Urban Design for the Just City

Marija Maruna
University of Belgrade – Faculty of Architecture, Department of Urbanism, Belgrade, Serbia
marija.maruna@arh.bg.ac.rs; ORCID: 0000-0001-9015-0683

Abstract: Planning professionals are becoming increasingly vocal in calling for the development of cities and urban environments distinguished by fairness, equity, and social justice for all. Complex challenges and growing inequality in urban areas, compounded by issues of resilience and energy dependence, emphasise the need to ensure equal opportunities, access to resources, and quality of life for all residents, regardless of their social and economic status, race, gender, or other characteristics. It is therefore clear that the impact and longevity of interventions by architects require a cross-cutting approach and a structured process whereby a balance must be struck between space and form, on the one hand, and social, environmental, and economic issues, on the other. As such, planners' responses must seek to integrate knowledge from strategic thinking on equitable development, spatial planning, and urban design.

Strategic urban design has been applied continuously for the past 18 years as an approach to shaping space in the Urban Design Studio offered as part of undergraduate architecture studies at the University of Belgrade. This method was developed over the years through the various formats of the Studio in co-operation with many members of the Urbanism Department, student demonstrators, and visiting academics and professionals. The results of work done in the Studio were collected and presented in numerous publications and national and international exhibitions.

In addition to using this particular methodology, the Studio approach was oriented towards themes and issues relevant to the local community and sought to find modes of improving local quality of life. It was rooted in an understanding of urban design as an activity of especial importance for the quality and way of life in cities and effecting positive change in society. The method emphasised the creative role of design, combining it with a more socially conscious and politically responsible approach to develop effective techniques for facing complex urban issues.

This paper presents a comprehensive overview of work done in the Urban Design Studio and showcases extracts from its methodological approach to learning.

Keywords: strategic urban design; just city; local community; architecture; higher education

1 Introduction

Strategic urban design has been applied since 2005, with a brief hiatus, as an approach to shaping space in the Urban Design Studio offered as part of undergraduate architecture studies. The Urban Design Studio was introduced into the architecture curriculum as a learning format after large-scale reforms launched as part of the Bologna Process when the architecture course received accreditation in 2005. In the first accreditation cycle the Studio was made part of the third year, or fifth semester, of the undergraduate course, only to be moved subsequently to second year, fourth semester. In some accreditation cycles the Studio took the form of a bachelor thesis at the end of three-year undergraduate studies.

The first to introduce strategic urban design in urban planning studies was Professor Dr Nada Lazarević Bajec, who also headed the course in its first few years, managing it together with Marija Maruna, who was initially her associate but subsequently took over the leading role, continuing to apply and refine the concept. More recently, the model has shifted to a joint studio approach, with Docent Dr Danijela Milovanović Rodić also teaching the course. Notable associates involved with the Studio throughout its existence have included Danijela Savkić and Aleksandra Miovanović, as well as Vladimir Mihajlov and Jelena Radosavljević, alongside numerous staff of the Faculty of Architecture Urbanism Department. A major feature of the Studio has been its openness to guest lecturers and trainers with a variety of professional and academic backgrounds.

The Studio's output has been showcased in monographs and at scientific conferences and national and international exhibitions. Particularly noteworthy has been the 2009 monograph *Strateški urbani dizajn i kulturna raznolikost*, authored by Nada Lazarević Bajec and Marija Maruna, and the *Dobro mesto* blog, where articles were published between 2016 and 2018 by Danijela Milovanović Rodić, Marija Maruna, Aleksandra Milovanović, Jelena Radosavljević, and Predrag Milovanović.

This paper will briefly outline the notion of the just city as the key thematic backbone of the Studio. It will then showcase the key aspects of the strategic urban design concept in an extract from a broader discussion published in the monograph of the same title. This is followed by a timeline of the Studio's activities from its inception to the present day, together with a comprehensive overview of the outcomes of the learning process published and

presented to the broader scientific and professional community. The paper concludes with an explanation of some aspects of the methodological approach to urban design applied in working with students in the Studio.

2 The just city

The issue of urban justice is not a new one. The late 18th and early 19th centuries saw a proliferation of critiques of the industrial society and its adverse societal, economic, and political impacts, under the influence of the economic and philosophical ideas of Jean-Jacques Rousseau, Adam Smith, and Georg Wilhelm Friedrich Hegel. These criticisms spurred the creation of suggestions as to how cities ought to be designed and organised, resulting initially in utopias and ideal cities. The major advocates of this line of thinking included Edward Bellamy, William Morris, Thomas More, Tommaso Campanella, Charles Fourier, Pierre-Joseph Proudhon, Etienne Cabet, Peter Kropotkin, and Robert Owen. Even though these utopian ideas were inherently far distant from the reality of their day, they did lay the foundations for a consideration of the visions of a desirable future based on a comprehensive critique and rational explanation of conditions and relationships (Šoe, 1978; Lazarević Bajec, 1987).

Exceeding the bounds of utopian thinking, the notion of the just city continued to be a feature of speculation, from Marxist philosophy to communication theory. Although the concept has been contemplated for centuries, a single definition of a 'just city' is yet to emerge. An increasingly common idea is that the issue of the just city ought to be resolved through the practice of urban policymaking, meaning the reality of city planning and construction. Placing planning at the centre of efforts to find ways to overcome unjust outcomes in spatial solutions shifts the topic of deliberation from individual and societal freedoms to issues of spatial justice.

It is important to distinguish between two dimensions of spatial justice, the distributive and the procedural. Distributive justice concerns the spatial distribution of public goods, resources, and services in a city, whilst the procedural dimension is about the way in which decisions are made to distribute public goods (Rocco et al., 2021). The two dimensions of justice are mutually inseparable and must be viewed together; according to Soja (2010, p. 60), 'the spatiality of (in)justice […] affects society and social life just as much as social processes shape the spatiality or specific geography of (in)justice'. This implies that the emphasis is on looking at the local level as the spatial scope which allows diverse, democratic, and equitable urban policymaking (Fainstein, 2010). Any new approaches must be aimed at fostering co-operation between stakeholders of differing social and economic power, building new, more inclusive institutional structures and empowering the most marginalised groups amongst us (Goh, Loukaitou-Sideris & Mukhija, 2022).

The decades-long impact of the global capitalist economy and neoliberal ideology has made it apparent that economic growth takes place at the expense of social benefits, producing large-scale economic inequalities and injustices (Harvi, 2012). The complex challenges posed by urban environments, compounded by issues resilience and energy dependence, emphasise the need to ensure equal opportunities, access to resources, and quality of life for all residents, regardless of their social and economic status, race, gender, or other characteristics. In recent decades, the planning and architecture communities have witnessed an increase in the awareness of a need for different approaches to urban development that will promote fairness, equity, and social justice for all residents (Fainstein, 2010; Campbell, 2013; Rocco et al., 2021).

The impact and longevity of interventions by architects require a cross-cutting approach and a structured process whereby a balance must be struck between space and form, on the one hand, and social, environmental, and economic issues, on the other. As such, planners' responses must seek to integrate knowledge from strategic thinking on equitable development, spatial planning, and urban design. They must also encompass issues of social relations, institutional structures, public policy, political economy, and other structural components (Goh, Loukaitou-Sideris & Mukhija, 2022). This further implies the need to seek answers in the social sciences, as well as in the historical and local context of any given urban area (Khosroshahi, 2015).

3 Strategic urban design[1]

Strategic urban design is a research-oriented approach to urban design aimed at translating public policy into high-quality urban forms and a value-based, procedurally- and process-oriented analytical framework for creative expression. It starts from an understanding of urban design as an activity of great importance for the quality and way of life in cities and the achievement of positive change in society. It emphasises the creative role of design, combining it with a more socially aware and politically responsible approach to develop effective techniques for addressing complex urban problems. In a wide variety of ways, it operates at the very centre of

[1] The text of this chapter is an excerpt from the book Lazarevic Bajec, N., Maruna, M. (2009) Strategic urban design and cultural diversity. Belgrade: Faculty of Architecture

often conflicting forces that act on the urban community, requiring a change in attitudes towards the professions of planner and designer to meet the challenges brought about by ongoing urban and regional transformations.
As an integral approach, strategic urban design seeks to explore the relationships between a rational, comprehensive planning approach to various areas necessary for revealing under-appreciated relationships, on the one hand, and, on the other, project-oriented urban design, which highlights the importance of features at the micro-level and both individual and group experiences with the immediate environment. Strategic urban design combines process and product management and is more integrated, being focused on understanding both the specific environment and the space-related values and interactions between stakeholders and issues inherent in developing policies and programmes.
Strategic urban design attempts to integrate planning, governance, and design and overcome the 'painful separation' between architecture and planning. This entails focusing on the connections between people, behaviours, structures, places, and the city. Its transformation of the shaping-oriented approach and its connection with more abstract planning methods allows a translation of policies and objectives that can only take place through a better-informed, altered approach to design.
Acceptable answers obviously necessitate a critical re-examination of all stages in the design process, from assessing the problem to proposing and evaluating the solution. It also seems important to shift focus from an exclusive orientation towards solutions to giving equal weight to addressing the problem. This makes urban design at once a means of analysis and an instrument of action, a tool for strategizing spatial intervention. This is particularly important in projects based on the principles of the just city, where it is necessary not only to explore alternative solutions but also to zero in on the problem itself, which requires constant restructuring if it is to be understood.

4 Outcomes of the strategic urban design course

Figure 1 shows a timeline of the results of undergraduate Urban Design Studios over the decades. This summary highlights some key features of the Studio concept:

a) **Thematic focus.** A key characteristic of the Urban Design Studio has been its focus on particular themes and issues. The site selected for the project in its first year, Yuri Gagarin Boulevard in New Belgrade, inspired the choice of Cultural Diversity as the topic, where the Studio addressed the Chinese community centred on the Block 70 shopping mall. This theme was subsequently developed in the Studio and tested in a variety of locations. Spotlighting the local community and its characteristics from the perspective of social justice, the theme underwent modifications over the years to reflect the dominant issues of the sites that were explored. In addition to cultural diversity, later Studios also considered the topics of neighbourhood, interactive communities, the learning city, and green-blue urban communities.
b) **Involvement of guest lecturers and associates.** Its thematic focus made it possible for the Studio to bring in academics or professionals working closely on the issues at hand and so allow the participants to broaden their knowledge. For instance, for the New Belgrade Block 70 project, which looked at issues facing the Chinese community, the guest lecturers were sinologist Dr Ivana Prica and her husband, the architect Vladimir Jereminov, whose area of interest has been the study of physical patterns of traditional Chinese communities. The topic of interactive urban communities was explored with Dr Ana Džokić and Marc Neelen of STEALTH.unlimited, who contributed their long-standing experience in researching urban development in the Western Balkans. For the learning cities topic, the Studio brought in Professor Dr Violeta Orlović Lovren of the Adult Education Department, University of Belgrade Faculty of Philosophy, who presented her expertise in education for sustainable development. Other notable guest lecturers included Serbian civil society organisations advocating community participation in urban development, with Ministarstvo Prostora represented by Iva Čukić and Jovana Timotijević and Nova Planska Praksa by Ljubica Slavković, Jasmina Đokić, and Ana Graovac.

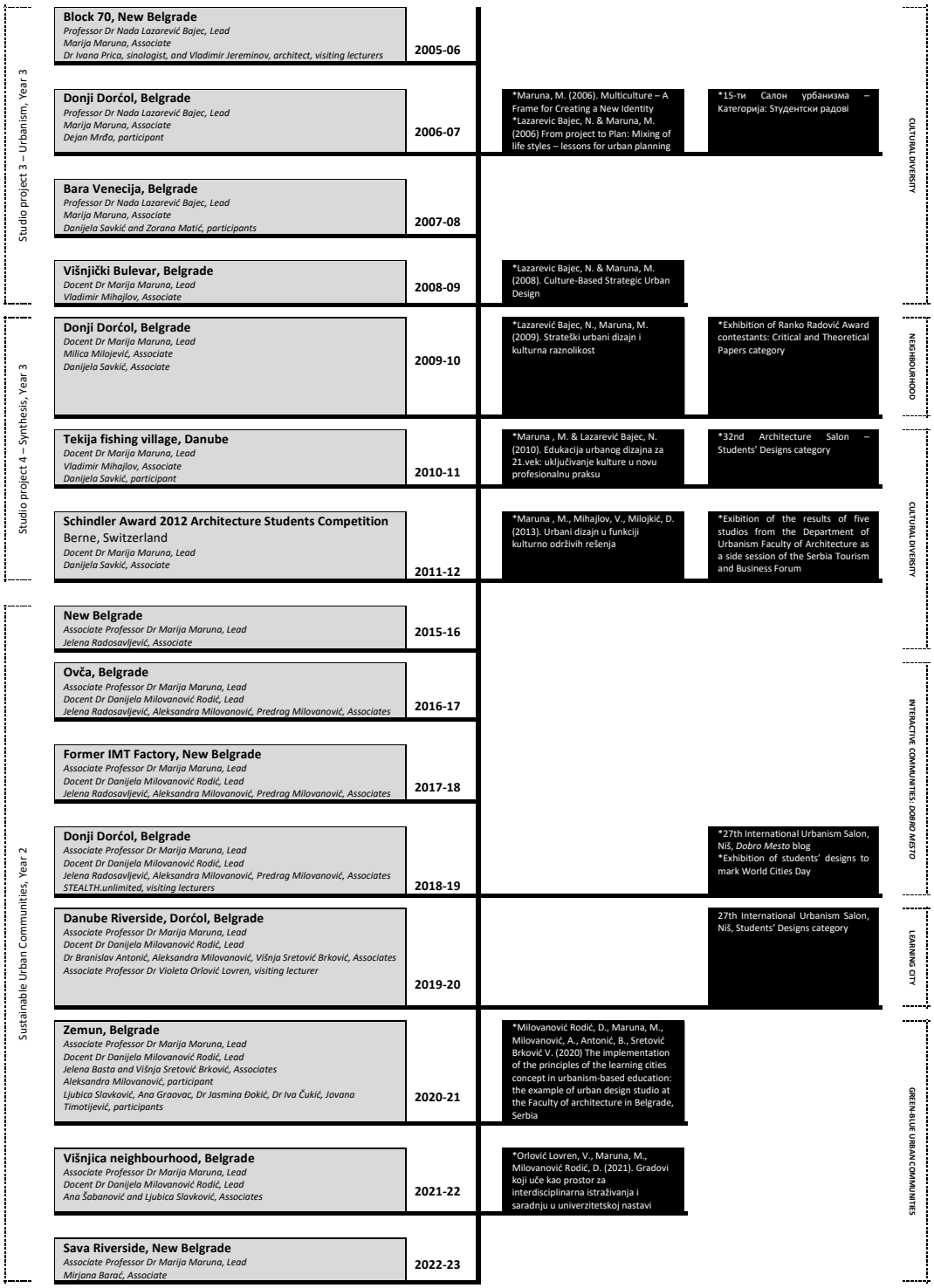


Figure 1 Timeline of courses and learning outcomes

c) **Collaborative joint studio format.** For a number of years, the Studio has been led together by Marija Maruna and Danijela Milovanović Rodić in a spirit of shared understanding of the strategic approach to urban design and issues of social justice in spatial development. The urbanism course initially envisaged two studios operating in parallel in the fourth semester, and these two were combined in a joint studio. Even though this arrangement proved highly demanding due to the challenges in managing the large group, the

collaborative approach resulted in many and varied benefits, primarily the synergies of knowledge available to both teachers and other associates throughout the learning process, from designing studio projects to teaching classes, holding one-on-one consultations with students, to reflecting on the work produced, and, ultimately, to presenting the work to the broader academic and professional community.

d) **Linkages with scientific and research projects.** One major feature of the Studio has been its ability to help teachers and associates enhance their knowledge by engaging in research, with this approach being valuable primarily due to its ability to promote a methodology for constructing scientific knowledge that entails reasoning based on in-depth knowledge of a particular domain. The choice of neighbourhood as the key aspect for investigation in the Studio was largely informed by the knowledge of Dr Milica Milojević, who gained her expertise producing a doctoral dissertation on this topic. In addition, a long-standing climate change research project funded by the Serbian Ministry of Science helped shape an entire body of knowledge important for investigating green-blue urban communities. Lastly, the Studio's exploration of interactive communities was closely linked with Towards Collaborative Governance, a research initiative undertaken together with Ljubica Slavković and the Nova Planska Praksa team.

e) **Presentation of results to the academic community.** The results of applying this methodological approach to teaching in each individual year were presented at four international academic conferences and one local one, as well as in two chapters in national monographs and one monograph of national significance.

f) **Presentation of results to the planning community.** The work produced in the Studio was showcased at two Urbanism Salons, one Architecture Salon, an event to mark World Cities Day, the Serbian Business and Tourism Forum, and the Ranko Radović awards ceremony. Projects developed by four generations of students who attended the Studio were also presented on Dobro Mesto ('The Good Place'), a blog created thanks to selfless efforts by Dr Aleksandra Milovanović, a teaching associate at the time.

5 Methodology highlights

The methodological approach to strategic urban design is a dynamic process that is created and modified as studio projects are developed. In essence, it is an open system of principles that are further refined depending on the chosen annual topic and site. The methodological approaches used in any given academic year were systematised and arranged, as a self-contained teaching package, for various occasions and presented to the broader public, as noted above. This section will showcase two highlights from the methodology deployed in working with students over the years.

(1) The first highlight comes from the approach used in the 2009-10 academic year, when the topic was 'Neighbourhood'. Here the methodology consists of four steps designed so as to follow the trajectory of research leading to a spatial solution in the final outcome: (a) re-examining the notion of neighbourhood; (b) reinterpreting the notion of neighbourhood; (c) neighbourhood values; and (d) Developing an attractive urban image. These steps are illustrated by conceptual diagrams that contain key research topics, which are at the same time the aspects from which knowledge is collected to inform the foundations of the future concept.

   (a) Re-examining the notion of neighbourhood (Figure 2), the first step, is aimed at analysing the local community of one defined territorial area by learning about its complex network of social relationships. The focus of observation here are the values, activities, and convictions shared by the stakeholders. In this context, the project assignment includes identifying the rapport of the local community with pre-existing values, such as preserving the character of the environment, preserving readability and meaning, retaining spatial patterns, facilitating social contacts, and preserving the diversity of street life.

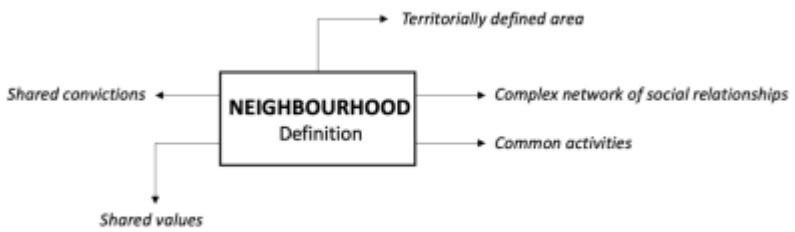


Figure 2 Neighbourhood re-examined

(b) Reinterpreting the notion of neighbourhood (Figure 3), as the second step in this urban design methodology, aims to re-assess the concept of neighbourhood in a modern city. Here the starting point involves understanding the local community as a group of people with multiple identities and underscoring the differences in their interests, habits, and lifestyles. Social ties between individuals are a major pillar of this concept, and their dynamics suggest the direction of thinking about any future spatial organisation. These insights inform options for building the local identity through different spatial responses and in support of new lifestyles.

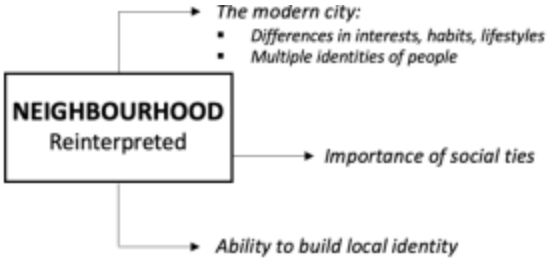


Figure 3 Neighbourhood reinterpreted

(c) Neighbourhood values (Figure 4) aim at identifying the elements making up the community's social and spatial identity. The key values here are a healthy and safe environment and the openness of the community to diversity. The goal of spatial values is to achieve high-quality housing and public amenities, as well as to create a recognisable urban environment. The method for investigating how these requirements can be met entails: (i) focusing on the characteristic fusions of local activities and lifestyle mixes; (ii) striking a balance between spatial and form-oriented topis, on the one hand, and social and economic ones, on the other; and (iii) achieving a detailed understanding of the site and its places where various groups and individuals communicate to create characteristic environments.

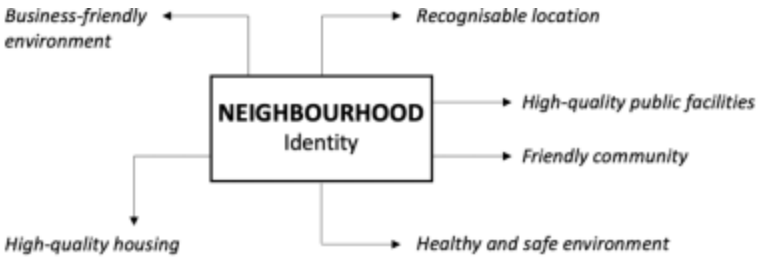


Figure 4 Neighbourhood values

(d) Developing an attractive urban image (Figure 5), the final step in this methodology, looks at how the image of the urban environment is created. In essence, doing so requires nurturing differences and explicitly respecting others' ways of living. This entails recognising the social dimension of the local community and developing an attractive urban image that involves real people and not merely an empty physical stage. It also requires forging links with the economic aspects of community development, a key pillar of sustainability for an urban environment.

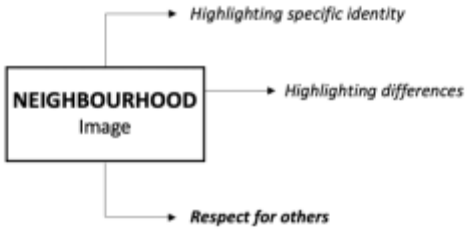


Figure 5 Developing an attractive urban image

(2) The second methodology highlight deals with assessing the likelihood of implementing a solution, which is a discrete step in the development of a design concept (Figure 6). This assessment is informed by an understanding of the importance of the conditions and circumstances that affect development and construction in any given space. The design focuses on the identification of the various social and economic features of the site and the powers that shape development patterns, and their translation into concrete physical variables. The students are expected to identify key stakeholders and their interests underlying spatial transformations. This provides insight into ongoing developmental processes and the power dynamics that underpin particular stakeholder groups and the objectives they seek to attain. This step helps develop awareness of urban design as a means to address problems by advocating various interests, making predictions, finding new solutions, making decisions, and communicating proposals with the aim of achieving desired results. This step is part of an initial stage of any urban design.

Figure 6 Methodological step: assessing the likelihood of a solution being implemented

6 Conclusion

This paper is an initial attempt at structuring the several decades of output generated by using the strategic approach to teaching urban design in undergraduate architecture studies. Collecting the materials revealed a wealth of information produced for and in the teaching process in addition to what has already been published, excluding students' final designs. This extensive body of work requires targeted long-term research that goes beyond the scope of this paper, which presented the Studio's overall development trajectory and a selection of illustrative highlights of the teaching approach as a modest contribution to any debate on how architects can help reduce social inequalities.

Acknowledgements: This research was supported by the Science Fund of the Republic of Serbia, 744648, Empowering Participation in Culture and Architecture: Activating Public Resources for and with Local Community - EPICA.

References

Campbell, S. D. (2013). Sustainable Development and Social Justice: Conflicting Urgencies and the Search for Common Ground in Urban and Regional Planning. *Michigan Journal of Sustainability, 1*(1), 75-91.
Fainstein, S.S. (2010). *The Just City*. Ithaca and London: Cornell University Press
Goh, K., Loukaitou-Sideris, A., Mukhija, V. (Eds.) (2022) *Just Urban Design: The Struggle for a Public City*. The MIT Press
Harvi, D. (2012) *Kratka istorija neoliberalizma*. Novi Sad: Mediterran Publishing.
Khosroshahi, A. (2015) *The just city: a critical discussion on Susan Fainstein's formulation* (doctoral dissertation). Faculty of Architecture and Society, Polytechnic University of Milan.
Lazarević Bajec N. (1987). *Grad između empirije i utopije*. Beograd: IICSSOS

Lazarevic Bajec, N. & Maruna, M. (2006) *From project to Plan: Mixing of lifestyles – lessons for urban planning (The role of Chinese community in New Belgrade)*. Proceedings of the 1st biennial conference of Fudan University International Urban Forum FUIUF (Urbanization China: culture, identity and spatial transformation), Fudan University, Shanghai, China, 3-5 November 2006.
Lazarevic Bajec, N. & Maruna, M. (2008). *Culture-Based Strategic Urban Design*. Proceedings of The SUPS10, Sharjah Urban Planning Symposium (Capital Cities, Wicked Problems: Best Practices in Planning and Policy Response Mechanism). American University of Sharjah, Sharjah, UAE, 23-25 November 2008.
Maruna, M. (2006). Multiculture – A Frame for Creating a New Identity. In V. Milić & V. Djokić (Eds). *Belgrade the Capital* (pp. 262-285). Belgrade, Rotterdam, Aachen: Faculty of Architecture University of Belgrade, Berlage Insistute, Fakultät fur Architektur der RWTH Aachen.
Milovanović Rodić, D., Maruna, M., Milovanović, A., Antonić, B., Sretović Brković V. (2020) *The implementation of the principles of the learning cities concept in urbanism-based education: the example of urban design studio at the Faculty of architecture in Belgrade, Serbia*. LEARNING ARCHITECTURE, 8th International Conference. Sustainable Urban Society Association – STRAND, (pp. 151-157). Belgrade, Serbia, December 4-5, 2020.
Rocco, R., Newton, C., Vergara, L.M., van der Watt, A., Babu, G., Subendran, J., Tellez, N., Caradonna, G., Di Gioia, L. & Pessoa, I.T. (Eds.) (2021). *A Manifesto for the Just City: Cities for all*. Delft: TU Delft OPEN.
Šoe, F. (1978). *Urbanizam, utopija i stvarnost*. Beograd: Građevinska knjiga.
Soja, E. (2010). *Seeking Spatial Justice*. Minneapolis: University of Minnesota Press.
БЛОГ: ДОБРО МЕСТО. https://dobromesto.tumblr.com/
Лазаревић Бајец, Н., Маруна, М. (2009). *Стратешки урбани дизајн и културна разноликост*. Београд: Архитектонски факултет.
Маруна, М. & Лазаревић Бајец, Н. (2010). *Едукација урбаног дизајна за 21.век: укључивање културе у нову професионалну праксу.* Зборник радова 5. Регионалне конференције о интегративној заштити – Нови концепти заштите и обнове урбаних цјелина – интегративна конзервација и одрживи развој, Републички завод за заштиту културно-историјског и природног наслеђа Републике Српске, Бања Лука, Република Српска, БиХ, 25-26. новембар 2010.
Маруна, М., Михајлов, В., Милојкић, Д. (2013). Урбани дизајн у функцији културно одрживих решења. У К. Лаловић & У. Радосављевић (Ур.). *Савремени приступи урбаном дизајну за одрживи туризам Србије* (стр.159-193). Београд: Архитектонски факултет.
Орловић Ловрен, В., Маруна, М., Миловановић Родић, Д. (2021). *Градови који уче као простор за интердисциплинарна истраживања и сарадњу у универзитетској настави.* У В. Џиновић & Т. Никитовић (Ур.), XXVI научна конференција "Педагошка истраживања и школска пракса", Квалитативна истраживања кроз дисциплине и контексте: осмишљавање сличности и разлика (стр.38-43). Институт за педагошка истраживања у Београду и Институт за психологију Филозофског факултета у Београду. Филозофски факултет у Београду, 12-13. март 2021.

List of exhibitions of works produced in the Strategic Urban Design Studio

XV Salon urbanizma. "Multikulturalnost u bloku 70" [25th Urbanism Salon, 'Multiculturality in Block 70']. By Tanja Bajić, Jelena Brašanac, Milica Veličković, and Ivan Vukić. Mentors: Nada Lazarević Bajec, Marija Maruna, Dejan Mrđa, Ivan Rašković, Ivana Prica. Students' Designs category. Niš, 2006.

Izložba učesnika konkursa za dodelu nagrade Ranko Radović. „Strateški urbani dizajn i kulturna raznolikost" [The Ranko Radović Award Exhibition, 'Strategic urban design and cultural diversity']. By Nada Lazarević Bajec and Marija Maruna. Critical and Theoretical Papers on Architecture and Urban Planning category. Mala sala Zadužbine Kolarac, Beograd, 2009.

32. Salon arhitekture. „Urbani dizajn i kulturna raznolikost" [32nd Architecture Salon, 'Urban design and cultural diversity']. By Branka Temunović, Ksenija Lukić, and Vukašin Nikolić. Mentors: Marija Maruna, Vladimir Mihajlov, Đorđe Krsmanović. Students' Designs category. Beograd, 2010.

Exhibition of the results of professors, associates and students on five studios from the Department of Urbanism University of Belgrade Faculty of Architecture in 2010/11 year as a side session of "Serbia Tourism and Business Forum". "Contemporary Approach to Urban Design for Sustainable Tourism of Lower Danube Region": Studio 2. By Marija Maruna, Vladimir Mihajlov, and Danijela Savkić. Hol Jugoslovenskog dramskog pozorišta, Beograd, 2011.

XXVII Međunarodni salon urbanizma. „BLOG: DOBRO MESTO" [27th International Urbanism Salon. '*Dobro Mesto* Blog']. By Marija Maruna, Danijela Milovanović Rodić, Jelena Radosavljević, Aleksandra Milovanović, and Predrag Milovanović. Digital Technologies, Design, and Production in Urbanism and Architecture category. Kulturni centar „Brana Crnčević", Ruma, 2018.

Izložba studentskih radova povodom obeležavanja World Cities Day. „Održivi, rezilijentni, inkluzivni i bezbedni gradovi“. [Exhibition of students' designs to mark World Cities Day: 'Sustainable, resilient, inclusive, and safe cities']. By Pavle Nikolić, Aleksa Bekić, Tijana Radovanović, Jelena Jelačić, Lara Rajković [Economic and Social Resilience – „Ovča kroz boje“] and Aleksandra Đorđević, Jelena Radosavljević [Economic and Social Resilience - „Kulturfabrik“]. Aula arhitektonskog fakulteta, Beograd, 2018.
XXVIII Međunarodni salon urbanizma. „Avenija pijaca“ [28th International Urbanism Salon, 'Market Avenue']. By Katarina Naskovski and Milan Mitrović. Mentors: Marija Maruna, Danijela Milovanović Rodić, Aleksandra Milovanović, and Jelena Radosavljević. Students' Designs category. Niš, 2019.

The Impact on Design and Functionality of Interior Space by Use of Steel Structures in the Construction of Residential Buildings

Monika Štiklica
University of Novi Sad, Faculty of Civil Engineering, Subotica, Serbia
studio@monikastiklica.com

Abstract: The construction of residential buildings using steel structures has been widely implemented around the world for years, but it has only recently started to be considered and applied in the region of Serbia. This type of construction offers several advantages over traditional methods based upon the use of concrete and bricks. Steel structures can be built quickly and efficiently, which can significantly reduce the construction time compared to traditional building methods. They are characterized by higher load-bearing capacity and also represent a more environmentally friendly alternative since steel is a recyclable material. They require less maintenance compared to concrete structures and achieve greater energy efficiency.

When considering the impact on the interior space, steel structures allow for greater flexibility in the design of the building. Since steel components can be easily shaped and adapted, it is possible to achieve different shapes and geometries, larger openings, and rooms without the need for columns and partition walls, thus enabling greater freedom in creating attractive and functional interiors.

Steel structures are flexible and can easily adapt to changes in the interior. Adding or removing partitions, partition walls, or other elements can be relatively straightforward without compromising structural stability. Steel structures facilitate easier electrical installation, plumbing, and other systems. Pre-designed openings and channels for installations can be integrated into steel components, making the installation process easier and faster. Even the subsequent change of space purpose is more achievable with minimal intervention in relocating installations. It is also possible to realize complex geometric shapes, curved lines, and other creative solutions that contribute aesthetic value to the space.

In conclusion, constructing buildings with steel structures offers faster construction, greater durability, flexibility in design, and functionality of the interior. It allows for larger openings, more spacious rooms, innovative shapes, and easier adaptation to changes.

Keywords: interior design, steel structures, residential buildings, living space, aesthetics, functionality.

1 Introduction

In today's dynamic environment and changing needs of residents, the design of residential buildings has become a crucial and indispensable aspect in creating functional, aesthetically designed, comfortable, and sustainable homes.

Traditional approaches to construction and design of residential spaces often face certain limitations in terms of limited space, energy efficiency, and aesthetics. In this context, steel structures offer unique opportunities that are continually explored and improved upon to enhance the quality of life.

The motivation for this study primarily arises from the growing interest of architects, interior designers, and investors in integrating steel structures into residential buildings. It also stems from personal experience in practice, which has shown numerous advantages of using steel structures compared to traditional construction methods. Steel structures offer a wide range of benefits, including faster construction, larger openings, more creative design possibilities, and the potential for reducing environmental impact.

The main objective of this work is to explore how steel structures can be used in the interior design of residential buildings to achieve clear goals. Firstly, it is essential to understand the advantages that steel structures offer, examine various application methods, analyze the aesthetic aspects of integrating steel structures into interior spaces, including apartments, family homes, luxury residences, and restoration and renovation projects. Furthermore, it is crucial to investigate the functional aspects of steel structures in residential interiors, such as steel stairs, partitions, and the integration of technical installations. Finally, we will consider the sustainability and environmental aspects of using steel structures in residential buildings, including recycling and energy efficiency.

This study uses an interdisciplinary approach, that includes literature analysis, case studies review, and data collection from relevant sources, to achieve the set objectives. Moreover, the research will focus on examples from practice, in order to better understand the specific aspects of integration. Through a detailed analysis, we can contribute to understanding the advantages and challenges of using steel structures in residential interiors and provide guidance for designers and architects on how to better utilize the potential of this material in creating innovative and functional residential spaces.

2 Advantages of Using Steel Structures in Residential Interiors

One of the most significant advantages of using steel structures in residential buildings is the rapid construction and high design adaptability they provide. Steel structures are manufactured in controlled factory conditions with a high degree of quality control and precision. Prefabricated steel components accelerate the construction process, which is crucial in today's modern construction environment. Due to its strength, steel provides support for larger openings and greater interior volume without the need for numerous columns or partition walls. Larger openings often offer impressive views of the surroundings, creating an attractive and aesthetically pleasing ambiance.

Thanks to the high load-bearing capacity of steel, ceilings can be raised to greater heights. Higher ceilings often contribute to a sense of luxury and spaciousness within residential spaces. Increasing ceiling height can also be beneficial for integrating advanced technical systems, such as smart home systems, HVAC, lighting, and security systems, without compromising the functionality of living spaces. From an aesthetic perspective, higher ceilings allow for creative lighting setups, including the placement of oversized light fixtures. In terms of space functionality, they enable better utilization of vertical space for storage or even the creation of mezzanine levels for additional functions like workspaces or sleeping galleries. This results in modern, open, and spacious interiors, often associated with improved light and air circulation, which can improve the quality of life of the residents.

The versatility of steel makes it an extremely attractive material for designing residential interiors. Steel can be used in various forms and finishes to achieve the desired aesthetic effect. Depending on the design strategy and spatial concept, different finishes can be applied in various styles. For example, raw steel with visible welding marks can create an industrial look, which is a popular interior design trend in residential units. On the other hand, steel structures can be coated with paints or finishes that offer a wide range of aesthetic possibilities and interventions. Combining steel with other materials, such as glass, wood, or concrete, allows for creating contrasts and harmonious design solutions.

The ability of steel to be shaped into different forms, including curved lines and complex geometries, enables designers to achieve unique visual effects and create interiors that stand out for their originality.

In addition to all the mentioned advantages, steel structures also provide the opportunity for increased energy efficiency in residential interiors. This is achieved through more efficient installation of thermal insulation materials with high efficiency without compromising structural stability, which contributes to reducing heat and cold loss from the space. As a result, there are reduced heating and cooling costs for the building. The ability to integrate advanced temperature control systems enables precise management of indoor conditions and reduced energy consumption.

3 Application of Steel Structures in Residential Buildings According to Different Types

In modern urban environments, steel structures have become a crucial element in the design of luxury and contemporary apartments.

In urban settings where space is often limited, rapid construction is essential. Steel structures are prefabricated and can be assembled on-site, resulting in a significant acceleration of the construction process. This quick installation is ideal for residential apartments in densely populated urban areas (Figure 1).

Furthermore, steel structures enable open floor plans, a characteristic feature of modern architecture. Residents can enjoy open, multifunctional spaces that can easily adapt to their needs. Steel is often used as a decorative element in modern apartments (Figure 2).

Figure 1.

Figure2.

Open beams, columns, and other steel elements are often left exposed in modern residential design. This design approach is frequently combined with other contemporary materials like concrete, stone, wood, and glass. Steel elements can also be used as part of furniture, such as supporting floating shelves, table structures, or as part of lighting design (figure 3). Steel staircases and galleries are also common features in modern apartments (figure 4).

Figure 3.

Figure 4.

In small apartments, every square meter is valuable, and steel structures allow its efficient use of space. For example, mezzanine levels and galleries are often planned to create additional useful space, which is easily, economically, and quickly achievable with this construction method.

Through the analysis of all these elements, we can say that steel structures play a crucial role in creating modern homes that are efficient, functional, aesthetically designed, and tailored to the needs of contemporary lifestyles. Family homes with integrated steel structures represent an interesting combination of practicality, aesthetics, and functionality. They often require adaptable interiors to meet the needs of all family members, and steel structures enable open floor plans and minimize the need of beams and columns, allowing free movement through the space and easier adaptability of the interior. Considering that family homes often have their own yards and the need to connect with nature, precisely these large openings, which are possible thanks to this construction method, allow joining and blending the interior and exterior space. The exceptional stability and resistance to external influences provided by steel structures make the house safer in case of natural disasters such as earthquakes and storms.

When it comes to aesthetic appreciation and achieving luxury through the use of steel, it should be emphasized that steel structures are often used to create unique and spectacular design elements, such as suspended steel bridges, spiral staircases, and even artistic steel sculptures. As with the construction of apartments and family homes, luxury residential spaces often aim for open floor plans, large openings, high ceilings, and increased spatial volume, all of which can be easily provided by this construction method.

The renovation of old and historical buildings often requires the preservation of original characteristics while simultaneously aiming to increase functionality. Steel structures are essential for this type of project for several reasons. Primarily, they allow for the preservation of the historical value by supporting the original structures of old buildings. Old buildings are often not adapted to modern lifestyles, and steel structures enable the modernization of the functionality of these structures, including the addition of modern kitchens, bathrooms, and energy-efficient systems on one hand, and on the other hand, their use solves static problems when creating new openings, partially demolishing load-bearing walls, and providing support for safety. In aesthetic terms, in the combination of old and new design, steel structures are used to create a contrast with the original elements, achieving an aesthetically attractive effect. Often, old industrial buildings are repurposed into residential spaces, and it can be freely said that steel structures are crucial for this type of transformation.

4 Aesthetic Aspects

There are multiple ways in which steel can contribute to the visual experience of residential interiors, creating attractive, original, and functional indoor spaces.

The use of steel elements in minimalist design emphasizes simplicity and a clean aesthetic. Smooth surfaces, straight lines, and neutral colors are often employed to achieve a minimalist appearance. In the context of an industrial style, steel beams and columns are deliberately left visible, with welding emphasized. This raw and rugged look is frequently combined with materials such as concrete and iron. In terms of aesthetics in this direction, significant cost savings can be achieved during construction, as there is no need to conceal the structure with various types of decorative coverings, which also speeds up the construction process. Additionally, through smart design planning, this construction approach can be applied to interiors of all styles, either by exposing the structural elements or by applying specific colors and finishes to the steel to integrate it seamlessly into the final appearance without additional concealment. This allows for advanced cost rationalization and shorter construction times. Steel structures can be shaped into various forms, including curved lines, unconventional shapes, and complex geometries, enabling designers to achieve unique visual effects.

The combination of steel with other materials, the aesthetics of all interior styles can be achieved, which will be visually and functionally aligned whith the designer's intended theme. The combination of steel and glass is often used to create modern and transparent interiors (figure 5).

Figure 5.

Figure 6.

Glass panels supported by steel frames allow for an abundance of natural light and spectacular views, and functionally, this combination is also used when creating interior partitions or designing shower areas in bathrooms.

The fusion of steel and wood creates a contrast between the warm and natural textures of wood and the cold industrial steel surfaces, resulting in a warm and rustic appearance. Additionally, this combination is often used to span large distances, where the steel structure serves as a structural element providing strength, while wood acts as the finish, achieving the desired appearance in the form of finishing touches such as wooden stair designs, large pieces of furniture, gallery spaces, and more. (figure 6).

The combination of steel and stone can create an elegant and luxurious effect in interior design. Steel elements often serve as a contrast to the substantial stone surfaces, adding a sense of balance and sophistication to the space (figure 7).

Figure 7.

Figure 8.

When it comes to colors and finishes of metal, the primary association with metal, tends to be metallic shades such as gray, steel gray as the natural color, or anthracite and black. These shades contribute to a modern and industrial look, supporting the appearance of metal in its natural effect. However, steel can be painted in a full spectrum of colors if necessary to achieve a specific interior look. Additionally, steel structures can be finished using various techniques, including grinding, polishing, powder coating, or oxidation.

Steel elements can serve as the foundation for artistic sculptures and installations within residential interiors, in which case steel plays a leading role in creating the artistic character of the interior, directly influencing the aesthetics of the space in its entirety. Artistic impressions can be achieved as integral parts of room dividers or shapes, as steel panels with carved or perforated patterns are often used as decorative elements on various surfaces in the space. By incorporating steel in correlation with a light source, unique lighting effects can be achieved.

Aesthetic aspects of steel structures play a crucial role in shaping and defining the characteristics of residential interiors. Through careful material selection, design, and finishing touches, steel structures can add depth, style, and authenticity to any space (figure 8).

5 Sustainability and Environmental Aspects

In the modern era, with increasing awareness of environmental issues and the need for planet conservation, sustainability and environmental aspects of steel structures are becoming highly valued and recognized. Their use in residential interiors is becoming essential for several reasons.

Steel is one of the few materials that can be recycled without losing quality. A significant amount of the steel used in construction projects is produced from recycled material. This reduces the need for mining and conserves natural resources. Steel structures can be relatively easily dismantled and reused, which means they can be relocated and used in other projects, reducing waste and resource consumption. As previously mentioned, they also allow the installation of highly efficient thermal insulation, resulting in reduced energy consumption for heating and cooling, making them an indispensable and logical choice in residential construction nowadays. When it comes to energy savings, their application in creating large openings and allowing natural light to penetrate greatly reduces the need for artificial lighting and electricity consumption.

Steel structures are manufactured in factory conditions, leading to a reduction in construction waste at building sites. Their production in modern steel mills is becoming increasingly efficient and cleaner, reducing the emission of harmful gases.

Steel is an extremely durable material that requires minimal maintenance over time. This reduces the need for frequent replacement work and decreases the overall impact on the environment. Steel structures typically require less maintenance compared to other materials such as wood or concrete.
The use of steel in interiors can contribute to better air quality, especially when coatings with low volatile organic compound (VOC) emissions are used. The smooth surfaces of steel are often less prone to the accumulation of dust and allergens compared to some other materials.
From all the points mentioned, it is clear that steel structures can contribute to the sustainability of residential interiors in multiple ways, including recycling, energy efficiency, waste management, durability, and more. They enable the creation of environmentally friendly living spaces that are energy-efficient and have a reduced impact on the environment.

6 Conclusion

In this research, we have highlighted numerous advantages of using steel structures in residential interiors, including fast construction, high durability, energy efficiency, and aesthetic flexibility. We explored various applications of steel structures in different types of residential properties, including modern apartments, family homes, luxury residential spaces, and the renovation of older buildings. We delved deeper into the aesthetic aspects and how steel structures contribute to the visual experience of interiors, including the design of steel elements, material combinations, and creative forms. A significant portion of our research was dedicated to the environmental aspects of using steel structures, including sustainability, energy efficiency, the use of recycled steel, and waste reduction.
We conclude that steel structures have become a key element in modern residential interior design due to their flexibility, durability, and aesthetic appeal. Fast construction using steel structures enables the acceleration of the residential construction process, which is particularly important in urban environments. Their use empowers designers and architects to create unique, modernly designed interiors with original visual effects. In today's era, where sustainability is of great importance, steel structures contribute to sustainable residential design through the use of recycled steel, energy efficiency, and waste reduction.
Looking ahead, we can expect further advancements in technologies and materials that will enhance the performance of steel structures in residential interiors, including even greater energy efficiency and waste reduction. Designers and architects are likely to focus even more on integrating sustainable practices and materials into interior design to address growing environmental challenges. The wealth of experience and best practice examples from real-world projects involving the use of steel structures can inspire future projects and improve the design of residential interiors.
Considering all the mentioned advantages of use, it is essential to emphasize the need for further research and application of these techniques in future projects.

References

Zarić,B., Buđevac,D., Stipanić,B. (2009). Čelične konstrukcije u građevinarstvu. Beograd, Građevinska knjiga
Stockhammer,D., Staufer, A., Meyer,D. (2019). Building Additions: The Architecture of Verical Extensions. Zurich, Switzerland ,ZHAW Zurich University of Applied Sciences, Institute of Constructive Design, Parks Books
Burgdorf,I., Fischli-Bonson,P., Furrer,P., Mader,S., Meili,M., Meyer,D., Nikolla,N., Reimer,T., Staufer,A., Tschanz,M. (2019). At Home in Steel: Residential Construction in Steel- Thoughts on Space and Structure. Zurich, Switzerland, ZHAW Zurich University of Applied Sciences, Institute of Constructive Design, Parks Books
Scharff,R. (1996). Residential Steel Framing Handbook, New York, USA, McGraw Hill

Architectural Fragmentation: Modeling a Future of the Object

Mila Mojsilović
University of Belgrade, Faculty of Architecture, Belgrade, Serbia
milamojsilovic@yahoo.com

Abstract: Contemporary architectural forms can no longer be seen within the familiar framework of architectural modernity if their appearance is not opposed by the idea of decomposition and fragmentation, which enables the visibility of their internal formal and structural laws. Architectural form in the modern key is no longer a totality in itself. The shift in architectural discourse, driven by digital tools and virtual spaces, is characterized by the fragmentation of a formerly homogeneous linear flow of time, with displacement serving as the mechanism for a new temporal experience. Space and time become the formal content of contingency. The development of new models and techniques in architectural design incorporates fragmentation as both a philosophical framework and an architectural method that unlocks the alteration of form. This means that the conceptualization of distinctive points, where form appears, is expressed through the particularity of endless variations. In this philosophical key, fragmentation is a process and the pure potential of the possible, in which the essence of processes is found in their capacities to reveal the layers of internal relations that structure them. The structure is interpreted as a juxtaposition of elements that thus enable a polyvalent reading. This means that the fragment becomes an incomplete but self-sufficient form. Complete in its incompleteness, the fragment is not just a detached part, but a specific totality that carries within itself the information of the whole. The conceptualization of fragmented forms occurs virtually, depicting their own outlines through digital code. This process makes variability and unpredictability a design challenge, constituting both a task and a problem. Fragmentation is a model for interpreting reality - a determined and designed intention to leave concepts, forms and structures open to new interpretations. The dual nature of all things imposes questions of transcending in one's own reality, taking the process itself as a production of new states.

Keywords: fragmentation, deconstruction, dematerialistaion, architectural form, architectural object

1. The concept of fragmentation

Fragment (lat. fragmentum): a broken, detached, isolated, incomplete part or torn part of a whole; what is not completed, unfinished. Fragmentation (lat. fragmentatio) – cutting, dismembering. Fragmentary (lat. fragmentarius): unfinished, incomplete; which is preserved only in parts, in fragments. In art: a part of a literary or musical work, painting or sculpture viewed as a separate whole.

The concept of fragmentation, based on composition and merging of different elements, appears in the tradition of Antiquity and later in the Renaissance as a principle and method for exploring the perfect entity. Renaissance artists such as Dürer, Michelangelo, and Leonardo often began their work with the deconstruction of the body or objects. Dürer drew human figures by looking through a grid that fragmented the observed object, while Michelangelo and Leonardo's work was based on anatomical studies. Paradoxically, the idea of finding a perfect form through collage, fragmentation, deconstruction and decomposition affirms the impossibility of the formal singularity of a perfect and complete object. However, the valuation of fragments and fragmentation as a specific quality or aesthetic category gained momentum with early German Romanticism, where the fragment was placed as a central philosophical idea through the expression of philosophical limitation and its transcendence - simultaneously, as a concept and as an idea of form (Sandford, 2016). In the history of contemporary art, the fragment has a dual meaning, as a nostalgic reminder of the past, once complete and now shattered by relentless passage of time, and as an incomplete part of a whole carrying within itself the potentiality of future harmony and utopia (Vidler, 2000). The contemporary concept of fragmentation separates itself from Romantic conceptions of ruins, detached and broken parts and nostalgic narratives of valuing the past and positions itself as essential potentiality of the object. Fragmentation is caused by the subjective experience of specific moments that carry within them an ability that transcends time. Time, which frames the present and the potential of the future, in its variability, embraces the speed of change as an inseparable part of physical appearance. Architectural experience thus becomes a dynamic process in which the form is transformed, leaving in each new shape a trace of the previous one. The form of the fragment becomes a question of the degree of incompleteness - projected relations, given circumstances, and contingencies, emphasizing its own specificity (singularity) as the

pure potential and quality of an architectural object. In the openness of the fragment, its structure and traces of what is now absent become visible - not indicating an end but rather a new beginning. Fragmentation, in its full sense, is the idea of something whole in itself but essentially incomplete. This means that the fragment becomes a self-sufficient form - *each fragment stands for itself, as well as for the whole from which it is detached* (Lacoue-Labarthe, Nancy, 1988). Ambivalent and paradoxical, the fragment is the idea of representing the unrepresentable. In other words, the fragment is not just a separate or broken part but a specific totality that carries all the information of the whole within itself - *in its separation or isolation, fragmentation corresponds to totality* (Lacoue-Labarthe, Nancy, 1988). In this sense, if the property of the fragment is simultaneously found in the whole and in each of its parts – then, it is an essential specificity and peculiarity (elementary particle) of the object.

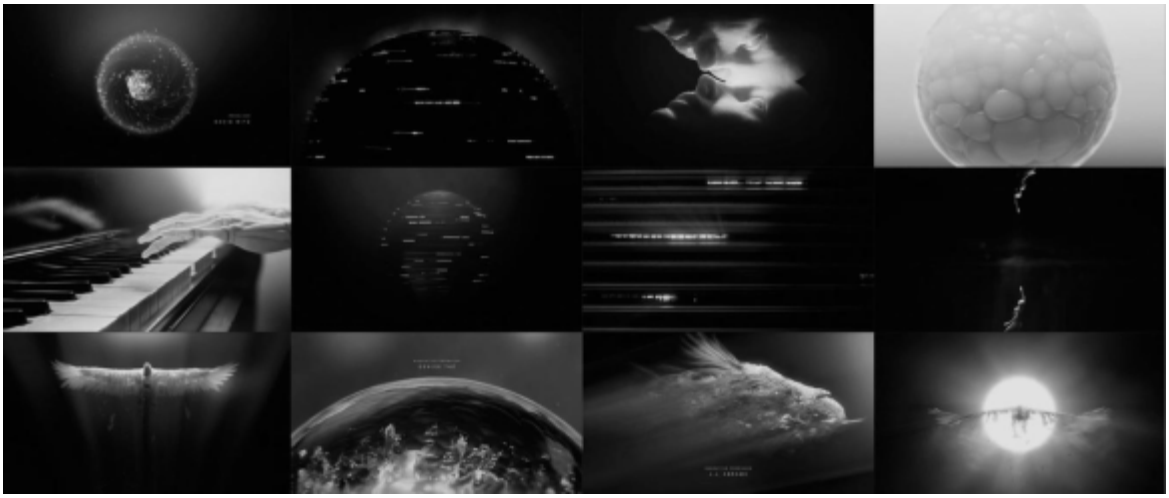


Figure 1. Westworld, opening sequences (TV Series 2016–2022)

Fragmentation is a unique and intermittent experience. It destabilizes the intimate connection between the unity of a thing and its internal plurality revealing its structural specificity. Paradoxically, it assumes a general interconnectedness and mutual dependence as a condition for the openness of the world, systems, and objects. This means that fragments have partial autonomy, their separate lives (past and future) in a reality that is independent. These temporary endpoints of forms and relations give meaning to the idea of unattainable finitude. No potentiality exists independently of the world and everything in the world, nor are its *modes of existence* (Souriau, 2009) independent of the influences with which they coexist. Fragmentation, therefore, refers to parts that are neither directed toward totality or final outcomes nor forms, but structure a world in which each part has a corresponding role - like a *puzzle that can never be completed but is never in its pieces*, or vice versa. The appearance of fragmentary form contains within itself the unreachable character of incompleteness, indicating the *multiplicity of ways of existence* in the sense of existential pluralism (Souriau, 2009), which presupposes that each thing can exist in multiple ways. Fragments operate between reality and illusory depth by creating a perceptual tension produced by real materiality and compositional structure of the objects. The overlapping of the past, present and future reexamines the timeless values of objects and space and simultaneously transforms their appearance into a specific spatial and aesthetic event. Different types of transformations of forms, space, and perception are, as Deleuze defined, a constant process of emergence and carry within themselves infinite potential (Deleuze's postmodern model of existence). The fragmentary nature of the world, between appearing and disappearing, enables the creation of a new structural object, although according to Harman - *nothing can simply be reduced to its own parts* (Harman, 2018). The overlapping of multiple realities shapes a new post-digital aesthetics and becomes a condition for understanding the contemporary context of art and architecture.

2. Object deconstruction

The increasing autonomy of technology from reality has shifted its role from being a means to becoming a goal itself. The creation and proliferation of infinite images and their fragments through *technological reproduction* of objects (Baudrillard, Nouvel, 2008) have allowed for divergence and detachment from the strict literalness of reality. The virtual realm assumes the role of both, a model and a method, for exploring the potential and

ultimate possibilities of an object, spanning all aspects of life including architecture. According to Deleuze, the new status of the object discards spatial templates as fixed relations between form and matter, relying on temporal modulation, which implies continuous variation and continuous evolvent. This does not only apply to the temporal component of the object but also to the concepts in which the object becomes an event (Deleuze, 1993). Deleuze's positioning of the nature of the object and its context as active agency of change in defining new spatial and temporal relations and formal possibilities, on a broader scale connects the subject, object, context, spatial and material properties and in the same time making them characteristics of a dynamized purely creative capacity. The active agency refers to joint action of the human subject and the environment in the field of spatial and material organization or to their dynamic interaction. For these dynamic interactions to be possible at all, the existence of an open system is necessary. The completeness of the form cease to be the goal, positioning the object in the field of architectural reality through endless continuous variation. The creative capacity of architecture in the context of digital technologies can be understood as an open system based on the mutual relations of the defining elements. It involves incorporating the context in which the object appears, realizing potentialities by surpassing its formal characteristics. Form and function are not separate entities and do not follow each other – they are interconnected and interdependent through the potentiality of different spatial organization modalities. The ambiguity of the open system as a field of possibilities is a pure *structural potentiality* in which the context can be changed by meaning but also by multiplication of meaning and as well by its reduction. The open system is structured by elements and their mutual relations that are in constant evolution - transitioning from one state to another, from one position to another, thus changing the context in which they appear. Objects create and shape their reality in relation to the world, while space can be understood as reflexively produced and as an immanent state of subjective experience. Objects do not exist independently of the subject; they come into being before us only *when they are shaped by all their sensory attributes* (Hensel, 2010). This interpretation of subjectivity problematizes the possibility of objective production of environment in witch things apears and it testifies to the necessity of understanding context and space as heterogeneous.

Figure 2. Memento : The Laboratory of the Future
M. Mojsilović, B. Martić, I. Beriša (2022, competition for the pavilion of Serbia, The 18th International Architecture Exhibition La Biennale di Venezia)

Layering of architecture's appearance, with overlapping images and narratives, embodies the polyvalence of what the object truly represents and what arises as its reflection. This kind of overlap leads to the systematic deconstruction of the object, its dematerialization and the variability of geometry. This means that variability can be seen as an intensification of the potential for form and structure alteration in a way that always retains the origin of its own shape. Different transformation of spatial categories, as Deleuze defined, are a constant process of creation (*becoming*) and carry within themselves the idea of infinite potential as a model of architecture's subsistence, along with the right to anew. Differences still serve for the conceptualization of spatial categories, in the form of their fragments and interpretations, beyond confirmed formulations. Its textures tend to exist autonomously, only in relation to each other and to themselves, reaching a meaning that is always somewhere outside - outside the material world we know, in a position from which the other is – not only the visibility of potential but also its reality. Setting complexity as a context, displacement as a method, and variability as a model for understanding architectural reality, spatial and temporal indeterminacy becomes a feature of fragmentation and destabilization of spatial relation becomes its reflection. In this sense, indeterminacy is understood as

openness to the *other* and different from the current (here and now) - as the idea of a continuous process that constitutes all *becomings*. Variability and indeterminacy are taken as what constitutes the very field of appearance (Masumi, 2011). Opening up the field of possibilities and multiplicity sets matter as morphogenetic potential. For architecture, this means that space is seen as a variety of intensity of movement in which mechanisms for generating form are realized through digital media. The elusive nature of all things in constant openness to the newness surpasses its own limitations and it's being thematized through places of change, separation and fragmentation. In this way, new forms of reality and existence emerge between indeterminacy and undefinedness - in the zone of their overlap, space and time become fragmented. The stratification of space in open fragmentation hides the logic of the system, which, as an organizational principle, uses its opposite. In the field of architectural production, this means that the neutral framework of universal space has been translated into the digital in a way that generates the openness of a contingent system.

3. Form alteration – The question of transcendence

Post digital culture, faced with the conditions of dematerialization of the world and reality, opens a new field of understanding the concepts of visual experiences. In the shifting landscape between reality and fiction, virtual and real, the disappearance of the material introduces an ambivalent interplay of appearances and disappearances, offering itself as a conceptual condition of the new post digital reality. The digital space becomes the context and means of variability of forms, space and their relations. The essence of every virtuality, as the emergence of infinite possibilities, is the constitution of the elusiveness of the digital field of fragmented experience of the world, reality and images. Fragmentation of space, concepts, and forms is a double game of continuous exchange of the present and absent, visible and invisible, real and imaginary, actual and virtual in an unchanging transition from one to the other. The curvature of the world and perspective opens up the field of infinite variations through displacement beyond existing formulations. The intricate interplay of appearances and disappearances represents the concept of altering objects and forms within any reality. The disappearance of one reveals something else, hidden within itself, as future and new (a question of projection). Following Baudrillard's line of thought, technology and the digital should not be seen as a means of reformulating the spatial and temporal aspects of appearance but merely as a capacity for reproduction and simulation of appearances within an already determined spatial-temporal context, where the concept of form as a completeness is destabilized (Baudrillard, 2001). This means that technologically framed appearances disrupt the unity of the image in their attempt to reproduce reality. By multiplying images, their primary character changes, and instead of representing reality, they create a new more real reality that appears as a pale reflection of the image. Only in the liberation from reality, in transcending the boundaries of visibility, positioning itself outside space and time, between the blur and distortion of perspective, it is possible to free oneself from the object, its representation, and all its transcendental illusions. Capacities for variability and incompleteness are assigned to the object. It involves embracing diversity as the utmost quality in a realm where nothing remains static or predetermined. This means that ambivalence of belonging and non-belonging is moved outside existing concepts that transform into the visibility of change. Their placement on the same conceptual plane, between real and potential reality, opens up the possibility of multivalence. It's a designed deflection which in digital conditions stretches perception infinitely in the same sense that shifting the focus layers the reality. According to Tschumi, architecture arises and survives as an expression of deficiency, flaw, and incompleteness, always leaving something - "reality or concept." We can say that architecture survives only if it negates the form expected of it, if it denies itself and transcends its own boundaries.

Figure 3. Imaginary Beings: Mythologies of the Not Yet
Neri Oxman (2014, Centre Pompidou, Paris, France)

The contemporary inclination to transcend technology as a way of life serves a reality where physical existence is divided between the real and the hyperreal - between continuous presence and interrupted experiences. If the digital is an endless movement or alteration that withdraws into and out itself - then it is a double game of appearance and disappearance. It is always unfinished but also defined by the frameworks of its own origin (form and/or structure) visible even or primarily in the absence of wholeness. This means that defining the place of specificity unlocks the possibility of the genesis of the new - in the folds of forms that capture the void. Aestheticization of visual experience, with access to information that surpasses the mere visual content of the image it produces, defines a new communication code based on technological logic. The interweaving of the relation between the physical and the digital, or the virtual, reveals the inner laws of the digital image and its form. The world of the visible is shaped by a series of fragmentary autonomous images that structure a new visual experience. The dematerialization and derealization of the world are depicted as a newly designed state where the image (fragment) prevails over the present object, where the virtual eclipses the real. Virilio, Debord, and Baudrillard believe that the world has permanently lost its future due to complete visibility - without mystique and seduction, never blurred, ambiguous, distant, and precisely because of that, because of the impossibility of understanding its capacities and dispositions, incredibly empty and worthless. This relates to the idea that technology has disrupted the existing paradigm of appearance, in its emancipation from reality - *behind every image something has already disappeared, and that is the source of its fascination* (Baudrillard, 2009). Behind the virtual reality in all its forms of appearance, the real and a real moment in which it happens have disappeared.

4. Visibility of inner structure

Understanding of the appearances, based on Benjamin's conceptions, recognizes the ideas of discontinuity and interruption of forms and places them as central themes in contemporary architectural discourse. The digitization of information and its expression in binary codes through simulations and computer reproductions alter our perception of space, time, and materiality. It involves shifting the understanding of the real world into the field of individual experience and imagination. By developing mechanisms for image production and the instrumentalization of what eludes the eye, the autonomy of human perception is questioned. By capturing the graspable and breaking it down, by changing the speed of perception (slow motion, high-speed), the form and the idea of it are deconstructed. Technology and the digitization of the world not only change our perception and visual culture but also shift the dominance of the visual over experience, altering the nature of culture itself (Debord, Baudrillard, Virilio, Jameson). By replacing the real world with digital images as models of everyday life, spaces are opened for something else. An attempt to create a space that is not legible and is a *mental extension of what we see*, like a virtual space of illusion, whose boundaries blur and disappear, is an area of destabilization of visual experience. In a world enveloped by the digital, variability becomes a condition for moving from stable forms to fluid geometries, and along with it, a condition for formal instability and variability. The newly acquired capacity to produce, multiply, and distribute images shifts and blurs the boundaries of visual experience. The technological ability to reproduce images outlines a world where perception occurs through the absence of the once-complete wholeness, creating conditions for a novel visual experience. Discontinuity becomes the context in which fragmented forms emerge, crafting an interrupted experience of architecture and the world - shifting it out of focus, paradoxically, to keep it within. This means that fragmentation becomes a condition of existence in a discontinuous reality. The loss of the real and the dematerialization of the world define phenomenon that follow the logic of the digital and allow for diverse interpretations through discontinuity. The coherence of perception lies beyond knowledge - in gaps and peculiar pauses (Macphee, 2002). The autonomy of the image, achieved through transcendence and fragmentation, unlocks the field of conceptualizing variable meanings and models of *becoming*. This means that unpredictability can be controlled to some extent by coding the conditions of their genesis. In this sense, fragmentation can be understood as a field of possibilities (events) in one of the *possible worlds* (Bensusan, 2016). Form is no longer a physical manifestation of matter or a mere result of realized forces; instead, it represents a temporary state of equilibrium achieved among forces. This means that in a world shaped by singularities and differences, the conceptualization of form occurs at another level. The algorithmic nature of the world and objects makes changes, variations, and internal structure visible.

Figure 4. Westworld, opening sequences (TV Series 2016–2022)

The idea of the supremacy of processes over pure form in architectural discourse places form and structure in the second plan in relation to dynamics and open movement, or, in other words, establishes variability as a categorical imperative (constructed through relations). Form becomes more than one - it is presented as just one in a series - as one of the possibilities. It is dynamic and based on movement, variations, and differences through its own virtuality. Therefore, the visibility of the internal structure becomes the greatest architectural value of altered forms. This means that all things are duplicated through the actual and virtual, making the object an event arising from the interplay of virtual relations and actual forms. What is presented to us is just one of the possible realities. Architectural reality becomes the reality of complex relations within a system of potentiality and multiplicity. So, it'snot about a dualistic understanding of reality but about two sides of the same process of *becoming* and their inseparability. The goal is to maintain a state of tension through the non-realization of all possibilities and potentialities and to enable the conceptualization of *becoming* as an extension of life forms. States of tension, as Deleuze concludes, appear as differentiations that erase the boundaries between subject and object, making the permeation of their differences visible, leading to resolution. These are changes that remain in the realm of potentiality in all their uniqueness and specificity in relation to all others and oneself. In this way, multiplicity participates in conceptualizing individual ideas about form and their lives, unlocking space for projecting a precise image in which both the object of perception and the intersecting line of its possibilities are seen. For architecture, control (projection) of the conditions in which potentiality operates and where actualizations and potentialities appear is taken as metamodeling for the spatial and temporal framework of future encoding. This dual nature of all things raises the question of transgressions imposed by discourses in their own multiple reality, taking the process itself as the object. Thus, the virtual becomes an "abstract event potential," while the appearance (semblance) is conceptualized as the "experienced reality of the virtual," that is, the appearance is the way the virtual appears in reality (Massumi, 2011). The virtual is presented as one of the truths or as one of the models of its own reality. The goal is to make the invisible visible and the visible invisible through reflections and specific virtuality in which the disappearance of reality, or its shifting, becomes a question of the art of framing.

5. Conclusion - Modeling a future of the object

Through the destabilization of reality by means of the virtual, events unfurl within the immediate visible realm. The world of the visible transforms into visibility of autonomous images, offering a visual experience fragmented in itself, allowing the individualization of the object. In this context, reality emerges as merely one among numerous potential realities, molded by the circumstances of the post-digital landscape. By abandoning the concepts of completeness in design, space, and form models of metastability are structured based on maintaining a state of tension. The resultant reality of architecture, existing between an alternative reality and the variability of perception, embodies a sense of discontinuity.This means that an object becomes open and relational and what is shown in its own variability. The virtual nature of objects suggests an inaccessibility that transcends established relationships, gradually emerging through distraction. Thus, the specificities of the origin of forms directly influence the production and conceptualization of shape and structure. The dynamism of an object arises from its activated capacities and the complex relations of open processes. This literally means that objects are no longer finite or complete; instead, they become intensified, unpredictable, and driven by their own variations. Their most significant qualities are reveald only in the very act of transition into something else

- something different, distinct and novel. Shifting beyond reality, as architectural position, involves surpassing reality by destabilizing and altering relations beyond already defined frameworks. Fragmentation serves as a model for interpreting reality - a deliberate and projected intention to leave objects, concepts, forms, and structures open to new interpretations. We can say that this is a position of instability and potential, both spatial and temporal, and as such, it contradicts the idea of the perception of architecture as a whole. Displacement is offered as a zone of discourse destabilization, opening the potential for rethinking its problems, including equally the position of the possibility of one's own unfulfillment. This kind of creation of new models of architectural reality returns the imaginary to architecture. The dual nature of all things imposes questions of transcending one's own reality, taking the process itself as a production of new states.

References

Baudrillard, J. (2009). *Why Hasn't Everything Already Disappeared?*. Seagull Books
Baudrillard, J., Nouvel, J. (2008). *Singularni objekti- arhitektura I filozofija*. AGM Zagreb
Bodrijar, Ž. (2001) *O zavodjenju.* Oktoih
Bensusan, H. (2016). *Being Up for Grabs: On Speculative Anarcheology*. Open Humanities Press
Benjamin, W. (2003). *The Origin of German Tragic Drama*. Verso
Cache, B. (1995). *Earth Moves. The Furnishing of Territories*. The MIT Press
Deleuze, G. (1993). *The Fold. Leibniz and the Baroque*. University of Minnesota Press.
Grosz, E. (2001). *Architecture from the Outside.* MIT Press Cambridge
Harman, G. (2018) *Object-Oriented Ontology: A New Theory of Everything*. Pelican
Hensel, M. (2010). "Performance-oriented architecture - towards a biological paradigm for architectural design and the built environment," *FORMakademisk 3*
Lacoue-Labarthe, P., Nancy, J.L. (1988) *The Literary Absolute: The Theory of Literature in German Romanticism*. SUNY Press.
Macphee, G. (2002). *The architecture of the visible.* Continuum
Massumi, B. (2011). *Smeblance and Event: Activist Philosophy ant the Occurent Arts*. The MIT Press
Mojsilovic, M., Milenkovic, V. (2018). The Concept Of Fragmentation: Between Form And Formless. *Facta universitatis*, Volume 16, 517-528.
Mojsilović, M., Mitrović, J., Milenković, V. (2020). Geometrical breakthrough in contemporary Architectural Design: Meta-Materiality and Fragmentation. *SAJ - Serbian Architectural Journal*, Volume 12, 36-52.
Sandford, S. (2016) "The dream is a fragment Freud, transdisciplinarity and early German Romanticism," *Radical Philosophy NO.198*, 25-35.
Souriau, E. (2009). *Les différents modes d'existence.* Paris: PUF
Tschumi, B. (2004). *Arhitektura i disjunkcija*. AGM
Vidler, A. (2000). *Warped Space Art, Architecture, and Anxiety in Modern Culture*. The MIT Press.

ARCH - Anti Radiation Containment House of the Future:
Overexposure to electromagnetic radiation as future scenario

Sanja Nikolić[1], Marta Grbić[2]
[1] Research Scholar of Ministry of Science, Technological Development and Innovation of the Republic of Serbia engaged at Institute of Architecture and Urban & Spatial Planning of Serbia (IAUS), Belgrade, Serbia
PhD candidate at Faculty of Architecture, University of Belgrade, Serbia
[2] Teaching Assistant at Faculty of Technical Sciences in Kosovska Mitrovica, Department of Design and Urbanism, University of Priština , Kosovska Mitrovica, Serbia
PhD candidate at Faculty of Technical Sciences, Department of Architecture, University of Novi Sad, Serbia
sanja_gogic@yahoo.com, ORCID: https://orcid.org/0000-0003-4926-0826
marta.grbic@pr.ac.rs, ORCID: https://orcid.org/0000-0001-9396-7744

Abstract: Every moment in the history of humanity is devoted to the creation of tools, thoughts and plans for tomorrow, opening a wide spectrum of possibilities to imagine and predict new ways of living. The further ahead in the future we try to imagine, the more intriguing and challenging it becomes for the design process. The belief and intention of the presented project for the house of the future was to meet the poetry and the issues of 'today's tomorrow'. As concepts usually present the answers for specific challenges, while observing the attractive topic of the harmfulness of electromagnetic (EM) radiation, we imagined the future scenario as overexposure to EM waves. In order to better understand and anticipate the challenges of the future, it was important to explain main effects of electromagnetic radiation on contemporary ways of living and to select existing examples from architectural practice that could prove the necessity of designing against high levels of EM radiation. Having that environment as a starting point, in order to prevent or heal the bodies and minds of users by blocking or minimizing the effects of EM radiation, the project is designed as *Anti Radiation Contamination House* (ARCH) capsule. It is shaped as a prototype living unit that can be positioned as a single mini house or as a house framed in Faraday cage system, possibly located in various areas with high and always invisible radiation level. This project experiments with the application of metamaterials currently used only as part of industrial and medical equipment, different from traditionally used materials because of specific modifications of their natural structures. It is designed as a new domestic environment in the cage formed with EM shielding nets or the agglomeration of single capsules without the cage. The cage is designed as a platform that detaches the house from the ground and makes the base for urban garden environment. The main feature of this domestic interior is the possibility to turn on and turn off the protection from electromagnetic radiation. It is reached by application of nets used as curtains in the interior, by setting PU foam based pyramid absorbers in facade walls instead of traditional insulation and occasionally by setting the house into designed Faraday cage. Different settings of mentioned elements can create different 'on and off' modes of the usage of the project. This house tests the boundaries of architecture in its battle against electromagnetic radiation in inevitable future EM environments.

Keywords: house of the future, capsule, electromagnetic radiation, metamaterials, Faraday cage.

1 Radiation and architecture: Risks and motivation for the design

As currently there is a mass of urgent questions and ongoing research on the topic of the relationship between technology and the genetic modifications of the human being, there is an opportunity to bring up the question how architecture could assist overcoming the addictions to technological appliances and the changes humanity is succumbed to from the same reason. Having that in mind, we defined the aim of the project *ARCH house* as prevention or the way of 'healing' the mind and the body from inevitable influence of technology and its accompanying electromagnetic (EM) radiation, all included in the full name of the project: *Anti Radiation Containment House of the Future*.

This project was designed as the result of two research topics: the history of future mini housing concepts and research of the link of radiation and *metamaterials* with architectural design. Classification of houses of the future, specifically mini housing prototypes and the extraction of their concepts and design strategies will be excluded from this presentation of our design project, while the second part of the research concerning design challenges of radiation, coming from technological appliances we are surrounded by and materials which could be applied, is included.

1.1 Why are these changes bad anyway?

In the first place, becoming conscious and more aware of the variety of sensations means understanding that there are things that are distracting us from reality which we should naturally perceive from the environment,

including its sounds, smells and other sensations. Daily habits simply show us the most obvious symptoms and the quantity of menaces we are suffering from because of the overuse of technological appliances and 'gadgets'. Second, the phenomenon of electromagnetic radiation is almost always present while the gadgets and appliances we use are activated. Therefore, the bad impact of technology on the human being can simply be explained through two terms further explained.

1.1.1 Loss of mindfulness

In general terms, mindfulness is a mental state achieved by concentrating on the present moment, while calmly accepting the feelings and thoughts that come to the body and mind (Oxford Learner's Dictionaries), also being the way for body and mind to reconnect.

1.1.2 Electromagnetic radiation

Electromagnetic radiation (EMR) is a way that energy moves around at the universal speed of light in the form of electric and magnetic fields making electromagnetic (EM) waves, e.g. radio waves, visible light, gamma rays etc. (World Health Organization). Low levels of radiation are present almost everywhere as background radiation with the possibility to damage the cells that make up the human body. Low levels of radiation should not be dangerous, but medium levels can lead to sickness, headaches, vomiting and a fever, while high levels can cause damage to internal organs, being difficult to treat after high radiation exposure.

2 Effects of EM radiation

In next few lines we intend to explain basic meaning of electromagnetic radiation and its significance in contemporary societies and its connection with our living spaces. It is about the invisible way that energy moves around, giving us all advantages of technology and wireless communication. On the other hand, the harmful side effects are nowadays being widely revealed in public. We will present the main events in terms of new technologies that appear as electromagnetic radiation and we will use the definitions from medical and psychological research that warn us about the risk level we reach while using these technologies. In such a way, we wanted to be sure if this topic is valid to become the new imagined environment for new house of the future. Later, through two relevant architectural projects, already built in 20th century, we tried to point out the importance of this topic and show how architects dealt with the same problem and provided security and privacy from EM waves technologies previously.

Like any new phenomenon in technology, science or weather changes often make fresh challenges for architects and designers. 5G came as a technological improvement with both concerns and advantages for society. Therefore, we will address this issue by briefly presenting results of academic research of post effects of human biological reactions and explain the predictions of the way 5G will be developed, since it emits the frequencies above 24GHz up to 72GHz which are in the group of highly harmful frequency. Empirical evidence showed that waves produced by mobile phone radiation in the range of 300 MHz to 3 GHz can be harmful for human health, because, simply, human body gets in the state of disharmony caused by the electromagnetic waves, which further causes the list of diseases (Kish & Stowe, 2019). Thus, whether we are receiving the notification or not, each phone is constantly sending and receiving information using radio waves, which are a form of electromagnetic radiation. Therefore, every cell tower and every router - they are constantly pulsing, so we are constantly exposed to harmful effects of the radiation. The aim of this chapter was to make clear which biological effects are scientifically proven and to show that exactly now is the time for architecture to react and create new principles of building which will protect us as soon as soon as they get adopted. All in all, this is just the trigger to make us think of the new ways we could use metamaterials and build the future protected from harmful effects of new communication systems.

As we already explained, we are, as human beings, electromagnetic electrical organisms, transmitters and receivers of information. When our electromagnetic fields are in balance and harmony, we are in good health. We are psychologically healthy, and we are also physically healthy. If either of these two types of health is lacking, we attest disharmony and disbalance that leads to physical and mental, emotional, psychological disease.

The more obvious example of the relation between wave frequency and emotions are people's reactions on different sounds that actually eradiate various frequencies. Therefore, considering this fact, it will be easier to understand and imagine the untouchable connection of electromagnetic waves and our emotions (Science Daily, 2019).

It is analyzed that the high frequencies affect speech, language, retention, executing functioning, processing speed, while low frequencies affect attention, behavior, emotions, balance and coordination. This means that we could be influenced without being conscious of it (Robertson, 2017).

Concerns between medical, psychological and political professionals and their approval of the threats we will

have if we continue living in such an environment, defined the scenario for our design. The aim should be to create a housing unit that prevents or minimizes the risks of damages to our bodies and minds caused by technological appliances followed by EM radiation. We can even dramatically imagine it as an apocalyptic scenario, which is less objective. In any event, if we design for 'dramatic' overexposure to EM radiation and get prepared for that, later it is easier to implement same design strategies in less dangerous but still harmful environments. New house, designed from scratch, can later get split in the parts and be implemented in the refurbishment of existing housing systems that also need to fight against the EM radiation.

3 Architecture vs. radiation

The relationship between architecture and radiation has been embodied in only a few buildings and installations.

3.1 NSA Headquarters

There is also a list of EM blocking installations showing the development of EM shielding systems. The threat of 'espionage' sensitive information has its tradition starting from the Cold War. This wireless spying technique known as TEMPEST and a device like Leon Theremin's Thing make remote listening possible by 'illuminating' antenna with sufficient frequency. One of occasions where security was taken to the next level is 2013 Papal Conclave when the Sistine Chapel was protected by Faraday Cage System and GSM jammers. Anyway, the project constructed in late 1950s by architects Eggers and Higgins for Headquarters of National Security Agency with 280,000 m^2 of floor space is probably the oldest example of a building covered with one-way dark glass, lined with copper shielding preventing 'eaves- dropping' by trapping in signals and sounds, at the same time reflecting light off the opaque slick glass panels (Mack, 1996).

Figure 1 NSA Headquarters, Fort Meade, Maryland, United States

3. 2 119 Central Signal Box, Herzog & Meuron (1998-1999)

Herzog & de Meuron realised the prototype solution for buildings, suitable for surrounding of electrical infrastructure of railway, that are "blind" to electromagnetism. The first constructed one is Signal Box with copper strips facade wrapped around concrete shell which forms a dynamic architectural skin. Each copper strip is 20 cm wide and twisted properly in a way that it can admit enough daylight. However, the determinant of the spacing between strips is wavelength of the signal. The whole building presents a Faraday cage with its facade which provides the protection of electrical equipment inside the building from low frequency EM impulses (60Hz) (Herzon & de Meuron). At the same time, the copper strips reflect the idea or railway tracks and differ the building from conventional industrial typology. The floor division is not detectable on the exterior. Great optimization of the Signal Box made it become a standardized structure that already has its 'pair' within main

Signal Tower. The other railway utility building, located in Switzerland as the previous project, also designed by Herzog & de Meuron features same principle of shielding the facade. Position of the structures and their relationships with the neighbourhood mainly differentiate them. While the Signal Box has a significant distance from the other buildings, the Signal Tower relates as much to the city as it does to the railroad yards, which could stay for the first example of anti-radiation building visible in urban landscape (Savić, 2018).

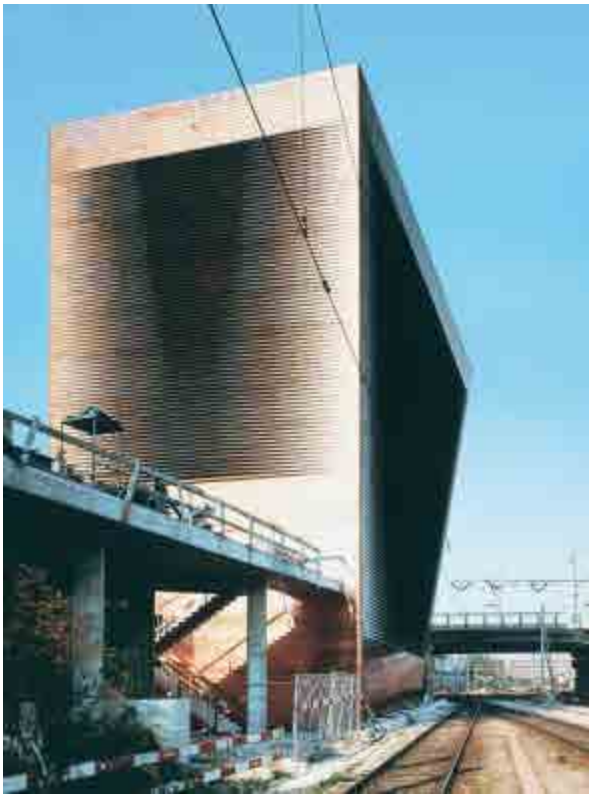


Figure 2 119 Central Signal Box, Herzon & Meuron

4 Definition and history of metamaterials

The prefix *meta-* indicates that the characteristics of the material are beyond what we see in nature, they are artificial composites with electromagnetic properties. They are made from assemblies of multiple elements fashioned from composite materials such as metals and plastics. Metamaterials are usually arrays of structures which are smaller than the wavelength they interact with. These structures have the capability to control electromagnetic radiation in unique ways that are not exhibited by conventional materials. It is the spacing and shape of a given metamaterial's components that define its use and the way it controls electromagnetic radiation. Unlike most conventional materials, researchers in this field can physically control electromagnetic radiation by altering the geometry of the material's components (Sun & Litchinitser, 2016).

Metamaterial's structures are used in a wide range of applications and across a broad frequency range from radio frequencies to microwave, terahertz, across the infrared spectrum and almost up to visible wavelengths. They are an emergent new technological discipline with numerous research groups around the world active both in fundamental research and in the search for applications. Oxford Metamaterials Centre was set up by researchers in Physics, Materials and Engineering, to stimulate interdisciplinary collaboration between groups working on metamaterials, to facilitate effective use of existing human/equipment resources.

The main difference between materials and metamaterials is that the first one is often arranged in patterns that are repeating. In contrast, metamaterials obtain specification not from the base material, but their newly designed structures. Suitably designed metamaterials can impact waves of electromagnetic radiation or sound in a way not perceived in bulk materials. One of the main applications of metamaterials that include their use in architecture is in smart solar power management, high-frequency battlefield communication, improving ultrasonic sensors, and even shielding structures from earthquakes (Fan, 2016).

The history of these materials is first mentioned after World War II when these were used as artificial dielectrics in microwave engineering and for manipulating electromagnetic waves at the end of 19th century. Therefore, the history of metamaterials is fundamentally a history of the evolution of indisputable types of manufactured materials, which interact at radio frequency, microwave, and later optical frequencies. Research has advanced

so that these materials are now commercially available as well. Metamaterials have a diverse range of uses across disciplines. Hence, there are multiple divisions of them: elastic, acoustic, structural, nonlinear, hall metamaterials, thermo-electric metamaterials. In addition to that there are terahertz, photonic, tunable and plasmonic metamaterials. The ones that we have focused on and are implemented in this project are absorbers.

4.1 Absorbers

An electromagnetic absorber's features don't allow reflections nor transmissions of the incident radiation, while its performance depends on its thickness, morphology and materials used to fabricate it (Alici *et al.*). Typical materials used for electromagnetic shielding include sheet metal, metal screen, and metal foam. Any holes in the shield or mesh must be significantly smaller than the wavelength of the radiation that is being kept out, or the enclosure will not effectively approximate an unbroken conducting surface.

4.2 Holland Shielding Systems B.V.

'Nowadays, every company in the electronics industry is faced with CE/EMI demands. The use of electronical devices is increasing, as is the exposure to a wide range of frequencies. Radiation and immunity have to be taken into account in early stages of the development of new products' (Holland Shielding Systems BV).

Holland Shielding Systems produce a wide range of EMI/RFI shielding products like EMI gaskets, fingerstrips, conductive tapes, and honeycomb windows. This company designs and installs complete Faraday Cages, for hospitals as well as military bunkers and tempest rooms. We chose this company, because of their diverse product range and their ability to resolve every shielding problem and their ability to design and manufacture custom-made products in a short period of time. They fabricate shielded doors, tents, filters, ventilation, enclosures and windows. Their shielding solutions are cost-effective, easy-to-apply and it is the most prevalent method used to decrease EMI.

The products from this company implemented in our project are further explained by main features and application.

4.3 PU foam based pyramid absorbers 3640

Broadband Pyramidal Absorber is a low density polyurethane foam, filled with high loss dielectric material in open cell structure. They are composed of pyramidal, full tip SAM or truncated SMT pulsing the matching layer to separate the pyramidal part from the ferrite part. Generally an environmental protective adhesive is used to paste the absorbers on the shield body (inside of the Faraday cage). It is used as an isolation part between the layer of polycarbonate and inner part of the facade-amcor foil.

4.4 Amucor Faraday cages / Amucor wall covering system

It is used at higher frequencies than traditional shielding and can also be used with other EMI/RFI shields to extend frequency range. Amucor foil 4701 has high attenuation properties in the electrical field (up to 110 dB) as well as in the magnetic field. Amucor foil in the interior can be finished with an extra finishing layer of plaster board, foam tiles or plywood.

4.5 Waveguides 7850

Waveguides are metal tubes specially designed to block electromagnetic waves. They are available in almost any size depending on the frequency. Any non-metallic material can be fed through the waveguide such as optical fiber, water, gas or air.

4.6 Energy applications: Solar Cells

Solar cells are new solar film technology engineered to help advance the solar energy industry and offer a more viable alternative to traditional fossil fuels, bringing one step closer to an environmentally sustainable future. Company META's technology will be able to increase the absorption of sunlight in solar panels by trapping light from all angles, without the need for concentrators or tracking systems and utilizes the latest achievements in optical science, semiconductors and nanotechnologies.

4.7 High-performance Faraday cage windows

In ARCH project, we used high-performance Faraday cage windows on the roof and on both facade sides of the capsule, replacing isolation and providing light and protection from EMI rays.

These windows guarantee very high EMI/RFI/EMC-shielding performance and they can be manufactured in any dimension. A Faraday cage window is made up of several EMI/RFI-shielding products. The aluminium frame is provided with an electrically conductive 6800 series Amucor gasket to ensure good electrical contact with the

Faraday cage. Wire mesh is fixed between two glass or plastic windows. EMI/RFI shielded mesh foil can be made from your existing windows or can be supplied as a new window.

4.8 Electrical stair lift kit with remote control

The electrical stairs are made of steel and able to lift in complete safety and hide at the height of the mezzanine. This way mezzanine/ beam is a constructive part of the stairs, and they can easily fit into the interior or exterior space. Thus, the useful area below will increase in a quick, comfortable and simple way. Regarding its features, these types of stairs fit into the construction of the cage and capsule. Therefore, when closed after use, together with the rest of the cage, they are blocking electromagnetic rays.

When they are needed again, stairs can be easily opened and used. The mechanism produced by Mezzanines kit is operated by a remote control which allows lifting, lower and stops the stairs at any time (Mezzanines). The system stops automatically when the rise is finished, and they can go up and down in approximately 30 seconds. The motor is blocked in any position even without electric current, making it impossible that the stairs fall. In this way, they can be controlled also in the “offline” mode of the house.

Figure 3 Selection of sample material kit provided by Holland Shielding Systems B.V.

As we can finally say, metamaterials are materials that behave according to their structure, rather than their base material composition. By handling internal microstructures in them, they can display characteristics that would not, in another way, be found in a naturally occurring material.

When looking at it from an architectural perspective, the proposed uses of metamaterials are mainly focused on those designed to manipulate electromagnetic waves, which are assumed to be usable in cloaking devices to protect military buildings from radar detection. On the other hand, they could be used in buildings as seismic and acoustic protection, also through wave manipulation.

5 ARcH *Anti Radiation Containment House of the Future*

The aim of the battle against technology, previously defined as bringing back mindfulness and protecting users from EMR in a scenario of overexposure to technology, in this case is reached through the concept of switching '*on and off*' the connection of the house with the surrounding, using the strategy of isolating radiation from emitting devices.

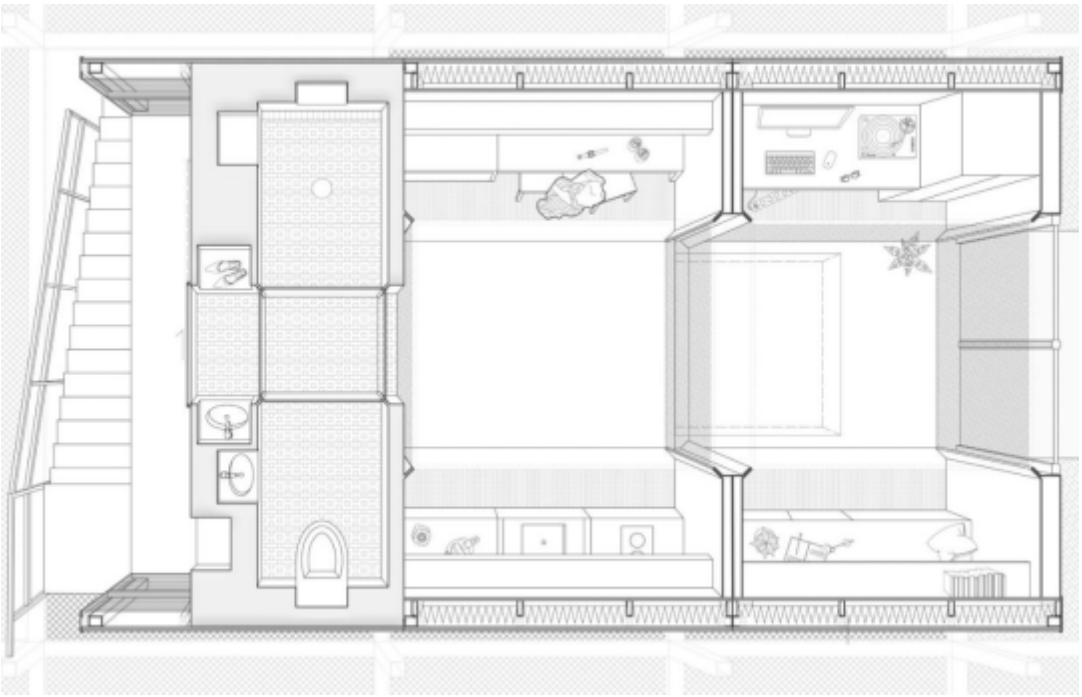


Figure 4 Plan of ARCH in perspective view

5.1 Mode of operation

The essential part of the house is the '*nucleus*' with the role to isolate radiation emitting devices with possibility to switch the connection on or off. According to that, spaces have their different connection positive (+) and connection negative (-) modes of use. The main architectural tool for switching '*on and off*' different modes are metal shielding curtains. According to their position, kitchen, working space and dining space which contain radiation emitting devices can be open for use and closed back isolating the devices and bringing the central part of the house in zero connection (-) mode.

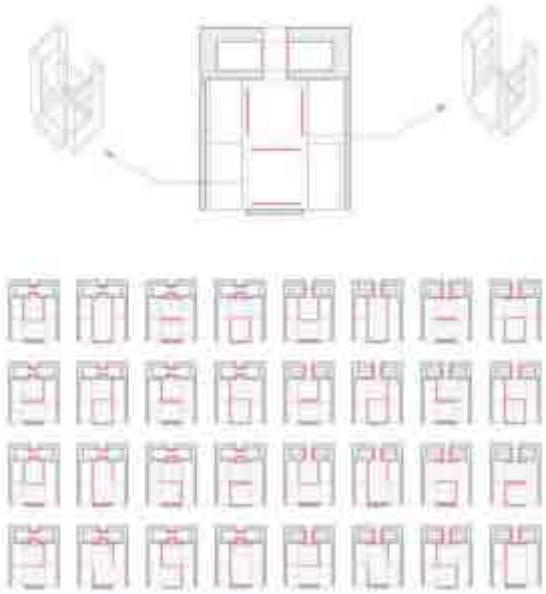


Figure 5 Modes of operation of ARCH

Therefore, the curtains together with the facade wall materials (EMI/RFI) limit the spreading of EM waves and make the effect of Faraday cage. What adds another feature of collecting the energy absorbed from the radiation (EM waves, solar energy) is the cage. It is the steel construction that supports the house, detaching it from the ground, but also detaching it from the environment of EM waves as the second layer of isolation. This is how the negative effects of the radiation are excluded and positive (energy) are absorbed and used further. The point is to prove that the humanity still did not reach *fait accompli* state regarding its 'slavery' to technology. Needed step is to overtake the predictions that the evolution of the human being has reached its peak and that the technology and artificial intelligence will bear down humanity and start its own evolution out of human's control.

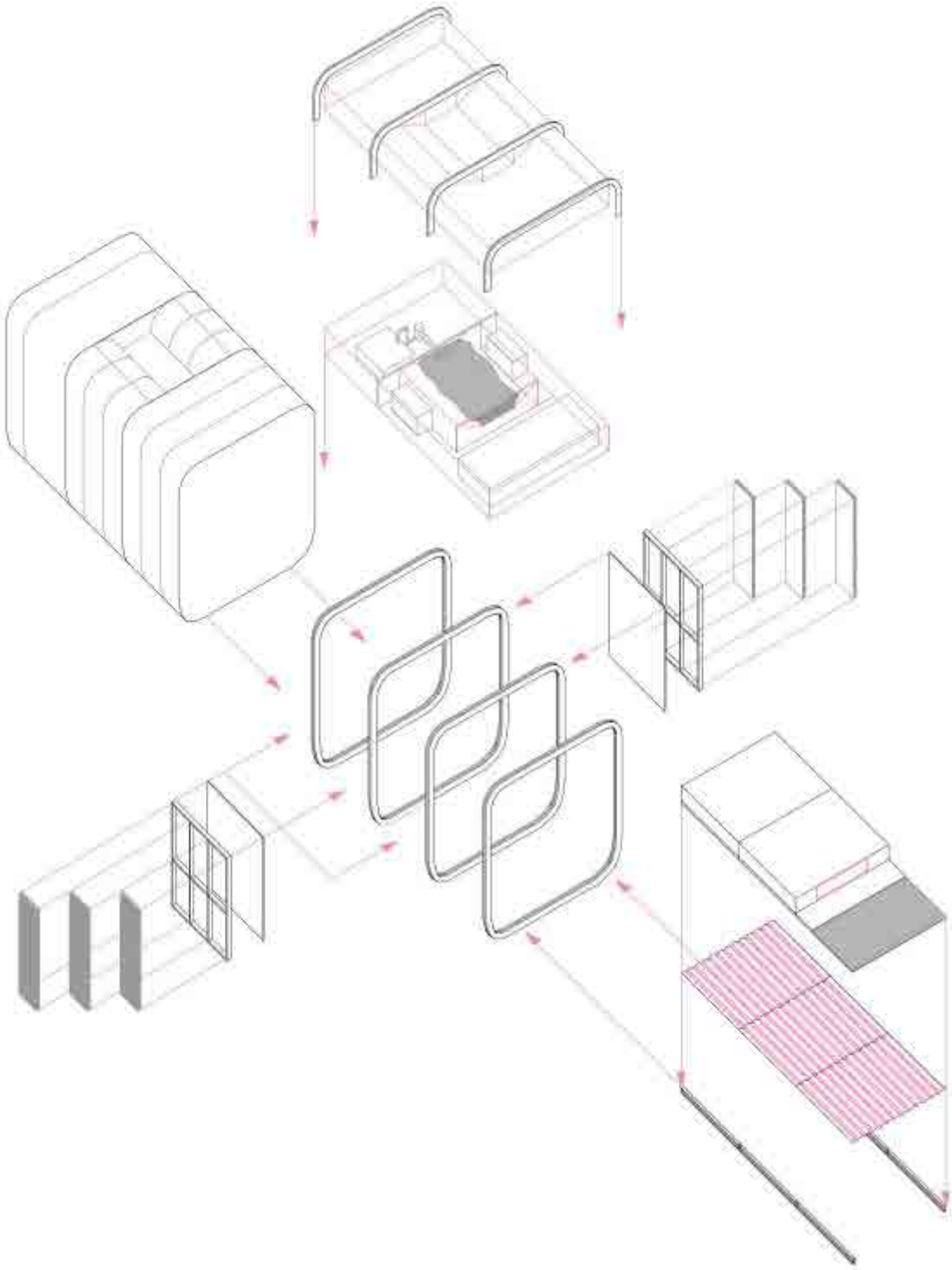


Figure 6 ARCH house assembly in axonometric view

Movement of capsule is supported by suspended rollers (with superconductors) – constructive connection between the cage and capsule. They enable contactless handling of objects without friction, which represents a great solution for transport or implementing of the object into the existing structure. This mechanism allows dust-free and abrasion-free operations for transporting buildings in high-purity conditions.
Superconductors are materials that can 'freeze' the field of a permanent magnet below a certain temperature predefined distance and thus keep it in a floating state (Festo Holding). The resulting air gap remains stable without regardless of position in space. This means that objects can be positioned without using any control technologies and can be moved with minimal energy consumption.
Two cryostats with superconductors are mounted on one electric axis, and above each of them there are magnetic transport rollers with floating suspension. The flat worktop support rests on rollers. The axis moves the superconducting elements horizontally. Between them and the rollers there is a cover with openings through which the rollers are retracted when the cryostats are lowered - the worktop bracket then lies on top of the cover. Superconducting technology also has another positive feature, the application requires almost no maintenance and is extremely long-lasting. It works quietly and the air gap has insulating properties.

5.2 House configurations

The designed unit works independently as self-sustainable system. On the other hand, the initial minimal size of 25m^2 and the structure with frames allow increasing the surface of kitchen, working area, dining area and storage. As the bathroom is the only space designed with thick core walls and clearly specified connection to the roof and water tank system, we decided to keep the 'slice' where the entrance and the bathroom are situated always with the same dimension (4.4x4.4x2.4m). By increasing the surface, we can reach the total number of 16 options of final shape of the house. The shifting of 'slices' enables positioning new window opening where the bigger slice steps out from the initial silhouette of the house.

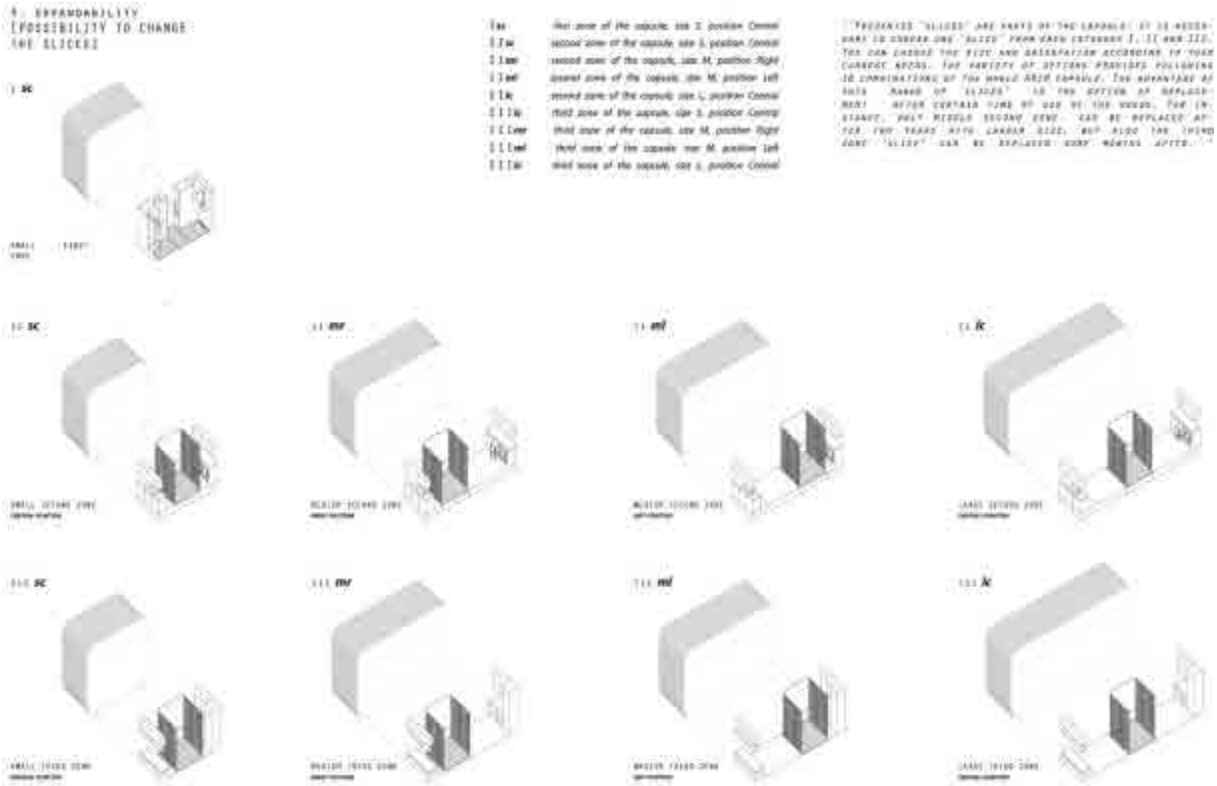


Figure 7 Expandability options of ARCH

Furthermore, now when the house got the shifted slices, it provides the possibility not only to observe the house as an isolated unit, but to merge more houses and create different agglomerations. The three pieces, so called slices, of the house, come in different following dimensions: (1) entrance+bathroom; (2) internal slice and (3) opening slice. The first part is always kept ((1) entrance+bathroom). However, it does not mean that, if the user changes his habits over time, he cannot change and expand only the middle slice, but also afterwards put back the old size when the habits get changed again.

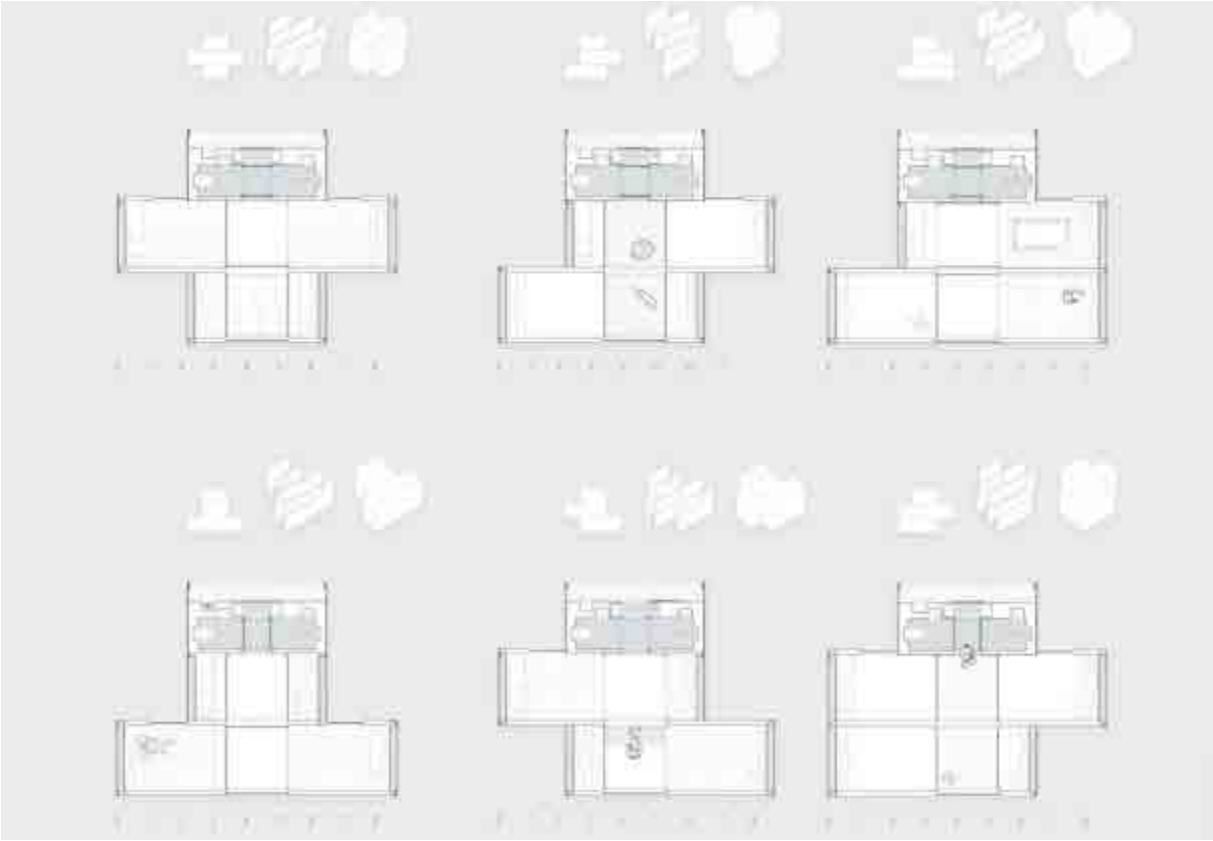


Figure 8 Various options of house configurations

5.3 Scenarios

The setting of ARCH micro home independently opposes its settings within the cage observing the social impact of the unit. The cage, besides its physical and environmental advantages, creates the ground under the house convenient for gatherings. The house is detached from the floor by 2.4 meters, making the shadow and allowing the pedestrians and bikers to pass under it, stay, move under the shadow of the cage, observe hanging plants and experience protection from the radiation.

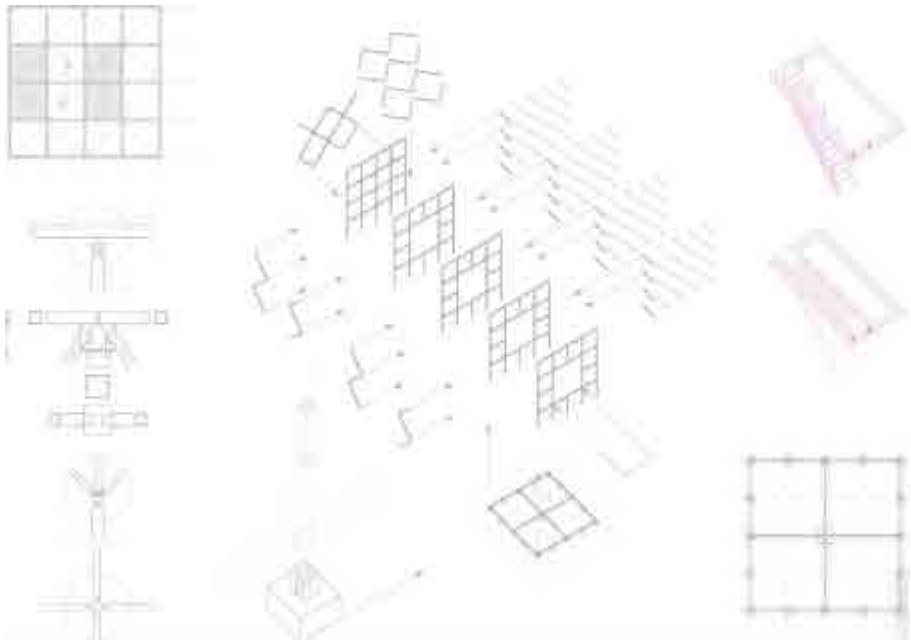


Figure 9 Cage assembly

Our proposal suggests two already mentioned ways of merging the house in the environment: (1) micro home and (2) micro home + cage. Out of these main combinations, more scenarios can be born. First comes the simple agglomeration of units. Various combinations of different sizes of units fit in different environments. The assumption is that ARCH is urgently needed in areas with the highest emission of radiation which means dense city areas, but also empty areas close to the transmitters cell stations when one needs to be populated. These empty areas sometimes can seem like untouched nature. However, we can never be sure if the level of radiation in the area is harmful or not, the invisibility of the EM waves can easily deceive anyone.
One unit can fit on one flat roof in the city. Merged units correspond with empty areas, while the cage (with house or without) is suitable for urban public zones.

Figure 10 Render of ARCH in natural environment

All in all, the scenarios can be categorized: (1) single unit; (2) agglomeration of units; (3) single unit + cage and (4) cage.

5.4 Agglomeration

The study of agglomeration could be an entirely new topic, so we provided rough proposals for composing the system of more units. The result are longitudinal arrays of houses expressed in two versions: (1) the one with entrances strictly oriented on one side of the system and (2) the system with intermittently positioned entrances on both sides. The first option is suitable for situations in which the orientation of the terrace/big window, considering the sunlight and the view, dictates the same position for terraces/big windows for all houses in a row. The second option provides more privacy with a bigger distance between terraces and entrances.

6 Conclusion

This experimentation based on historical research of concepts of housing for the future, new knowledge about electromagnetic radiation and design of the ARCH capsule, altogether were challenging on different levels. The process included free imagination as much as practical implementation of new material technologies. It encompasses the link between physics and architecture, as well as many different outreach disciplines. As the most important outcome, it develops new prevention and protection strategy against imagined future

electromagnetic environments. A new way of thinking, where we tend to use technology against harmful effects of technology makes new way of living and new domestic interiors.
Furthermore, the feasibility of the project and discussion about materials with the producing company of metamaterials convince us in the future of this concept even more. The greatest potential of this topic lays in new discoveries about radiation that are constantly being published almost every day. On the whole, this thesis demonstrates that architecture as discipline has the power to protect us from rapid development and harmfulness of technology.

Acknowledgements: This conference article is a result of wider research for master thesis project '*Anti Radiation Containment House of the Future - Overexposure to electromagnetic radiation as future scenario*' done at Politecnico di Milano, School of Architecture and Urban Planning, Built Environment Interiors in 2020, mainly supported by our mentor Jacopo Leveratto, architect and PhD. Considering that this article is theoretical experimentation of application of existing shielding materials, it was of great importance that Holland Shielding Systems B.V. manufacturer from Dordrecht, Netherlands sent us sample package to support our research.

References

119 central signal box (no date) *Herzog & de Meuron*. Available at: https://www.herzogdemeuron.com/projects/119-central-signal-box/ (Accessed: 17 September 2023).
Alici, B. K., Bilotti, F., Vegni, L. and Ozbay, E. (2010) 'Experimental verification of metamaterial based subwavelength microwave absorbers', *Journal of Applied Physics,* 108, 083113. doi:10.1063/1.3493736.
Fan, J. (2016). *What are metamaterials and why do we need them*, *Stanford University School of Engineering*. Available at: https://engineering.stanford.edu/magazine/article/what-are-metamaterials-and-why-do-we-need-them (Accessed: 12 September 2023).
Holland Shielding Systems BV. Available at: https://hollandshielding.com/ (Accessed: 27 August 2023).
Kish, A. and Stowe, L. (2019). *Fifth Generation Wireless (5G) Effects on Human Biology.* Orcho Aerospace Advanced Scientific Research Division ASRD, The Stowe Foundation Medical Evidence.
Mack, G. (2005). *Band / Volume 3 Herzog & de Meuron 1992-1996*. Birkhäuser.
Mezzanines online. Available at: https://www.mezzaninesonline.com/electrical-stair-lift-kit-with-remote-control (Accessed: 30 July 2023).
Oxford Learner's Dictionaries. Available at: https://www.oxfordlearnersdictionaries.com/definition/english/mindfulness?q=mindfulness+
Pneumatic & electric automation technology: Festo USA. Available at: https://www.festo.com (Accessed: 20 July 2023).
Radiation and health (no date) *World Health Organization*. Available at: https://www.who.int/news-room/questions-and-answers/item/radiation-and-health (Accessed: 17 September 2023).
Robertson, B. (2017) 'Science 101: 'Can Electromagnetic Waves Affect Emotions?, *Science and Children,* vol. 55 no. 1, pp.66-69.
Savić, S. (2018) *'Architecture: between weather and electromagnetic radiation– part 2'*. Available at: http://digicult.it/news/architettura-tra-condizioni-atmosferiche-e-radiazioni-elettromagnetiche-parte-2/ (Accessed: 5 September 2023).
Science Daily (2019) Université de Genève '*How our body 'listens' to vibrations'.* Available at: https://www.sciencedaily.com/releases/2019/03/190320101941.htm (Accessed: 20 August 2023).
Sun, J., Litchinitser, N.M. (2016) '9 - Metamaterials', *Fundamentals and Applications of Nanophotonics*, Woodhead Publishing, pp. 253-307. https://doi.org/10.1016/B978-1-78242-464-2.00009-9.

Towards an Aesthetically Lightweight Architecture
An Identification and Evaluation of Techniques that Convey the Sensation of Lightness

Eleftheria Papadosifou, Giannis Tsaras
Technical University of Crete, School of Architecture
papadosifouele@gmail.com
itsaras@tuc.gr

Abstract: The aim of this essay is to identify the architectural techniques that convey the sense of "aesthetically lightweight" in construction and aesthetics and assess each one's level of impact on perception. To achieve this goal, the essay examines and categorizes existing techniques that are already often employed by architects. Subsequently, two questionnaires were administered to individuals with architectural education and the general public. Regarding the questionnaire given to the first group, it is based on comparing the architectural manipulations on a cube placed on a surface within a neutral environment, an image created using a 3D design software. The questionnaire given to the second group compared the manipulations, this time illustrated on selected buildings using Photoshop.
The comparison of the results of these questionnaires provides a clearer view of which techniques effectively convey the sensation of lightness. This can be used to create an architectural manual that prioritizes user-friendly design and sensory experience of the space. Future research could explore the parameterization of these techniques and validate the questionnaire findings through empirical testing.

Keywords: aesthetic lightness, architectural manipulation, questionnaire-based assessment, user-centric architectural design, design guidelines

1. Introduction

In architectural vocabulary, the concept of "aesthetically light" has been extensively used; however, it lacks a strict definition or methodology for achieving it. It is a fact that the contemporary era exhibits a trend towards "lightness" in both the construction and aesthetic field. In this context, after observing the architectural manipulations that appear to be repeatedly employed by architects, the proccess of identifying the manipulations assosiated with the sense of lightness was deemed as an fascinating topic.
However, the perception of lightness is influenced by numerous factors. From the physical properties of the object to the final judgement on its aesthetic lightness, the observer's interpretation plays an pivotal role. Therefore, by its very nature, the sense of lightness resides within the realm of subjectivity.

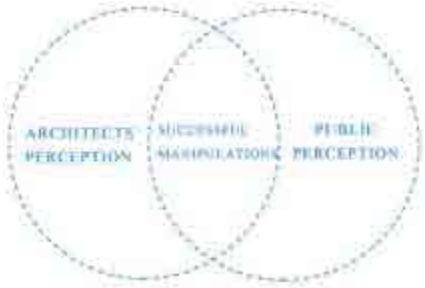


Figure 1: Definition of successful manipulations

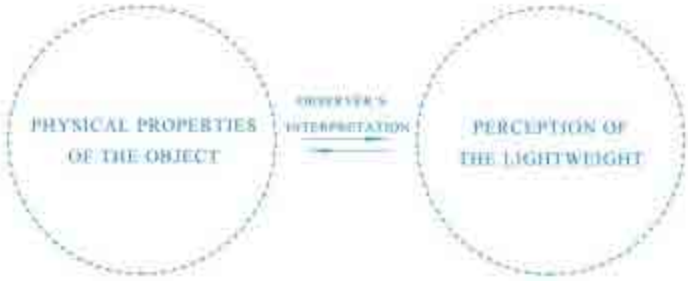


Figure 2: The process of perceiving the aesthetically light

The observer's perception of an object is crucially influenced by diverse components, needing an interdisciplinary approach that bridges the traits of humanities and sciences. Defining objective design regulations is challenging due to this complexity. However, architects have adopted recurring design manipulations, indicating an informal design syntax. Analyzing and categorizing these patterns can provide useful guidelines for considering influential factors.
Bearing in mind that the goal is successful communication between the architect and the general public**,** it is useful to compare the perceptions of both sides. At the intersection of this comparison, successful architectural manipulations can compose and methodize the design components that make something appear lightweight.

2. Methodology

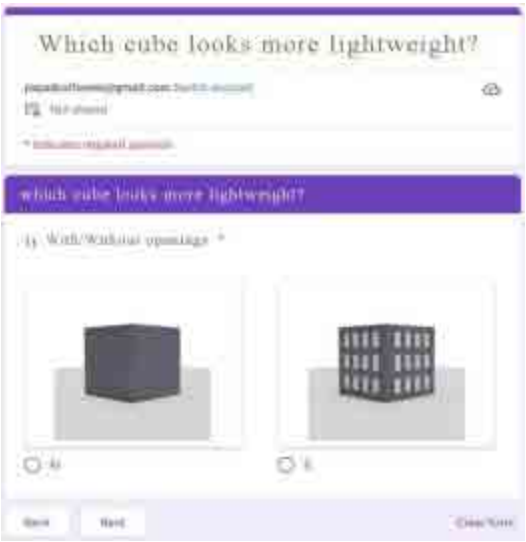
Survey-based research was undertaken with the aim of achieving the outlined objectives. To realize this, two distinct surveys were crafted, each catered to a unique audience.

The first group comprised both professional architects as well as architecture students. There wasn't a specific criteria regarding their years of study or professional experience. Their survey centered on exploring architectural manipulations made to a basic cube. These participants were reached out through personal messages within the community known by the authors. Due to the anonymous nature of the survey, a specific demographic was not obtained, and details such as age or gender were unknown.

The second group catered to the general public, specifically targeting individuals without any official artistic or technical training. This approach was taken to ensure that their perceptions weren't influenced by any prior technical or artistic references. For this group, the survey delved into architectural manipulations visualized using Photoshop on selected buildings. The buildings chosen were perceived as either aesthetically light or the opposite. The focus here is on the specific architectural modifications applied to these particular buildings. It's essential to note that the emphasis isn't placed on the architects themselves, as other pieces of their work might differ in aesthetic and design. Like the first group, participants from the general public were also approached via personal messages within the community familiar with the authors. Similar to the first group, demographic specifics like age and gender remained undisclosed due to the survey's anonymity.

The surveys were distributed using Google Forms and were open to responses from 02/01/23 to 03/01/23. Altogether, 134 individuals responded, with each of the two surveys garnering feedback from 67 participants. All respondents were given the task of identifying which version they perceived as aesthetically "lighter" or "less heavy" (in Greek).

The following depicts the initial page of the questionnaire designed respectively for architects/architecture students as well as the general public.



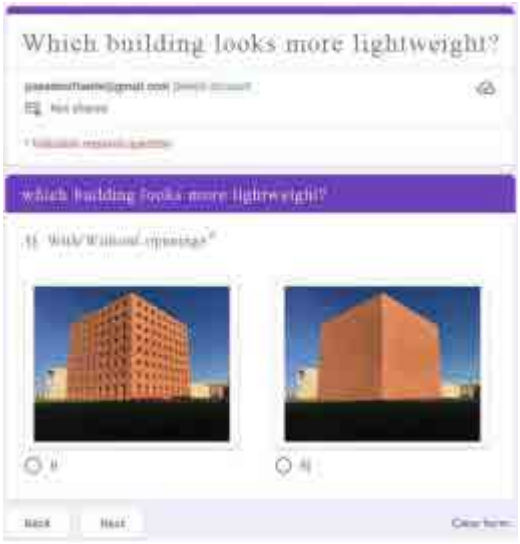


Figure 3 : Cube - editing with Rhino and Vray **Figure 4**: Buildings - editing with Photoshop

3. Categories analysis- findings:

In the following tables the prevailing choice for each group is indicated with thicker border

3.1 Openings

Openings are defined as material removal. The building selected for analysis is the main volume of Aldo Rossi's San Cataldo Cemetery, situated in the city of Modena, Italy. This building was considered appropriate due to the simplicity of its facade and the identical openings. The percentage of the openings in each question, except for a and b, remains the same.

	Architects Questionnaire	Architects (%)	General public Questionnaire	General public (%)	Result
ai)With openings		76.1		85.1	With openings
aii)Without openings		23.9		14.9	
bi) More openings		85.1		82.1	More openings
bii)Less openings		14.9		17.9	
ci) Bigger openings		47.8		65.7	–
cii) Smaller openings		52.2		34.3	
di) Great proximity of openings		62.7		71.6	Great proximity of openings
dii) Small proximity of openings		37.3		28.4	
ei) Dispersion openings		65.7		53.7	Dispersion openings
eii)Concentration of openings		34.3		46.3	

fi) Placement Above		46.3		58.2	
fii)Placement Below		53.7		41.8	
gi) Placement Below		55.2		26.9	
gii)Placement in the Middle		44.8		73.1	
li) Placement Above		40.3		34.3	Placement in the Middle
lii) Placement in the Middle		59.7		65.7	

Table 1: Recording and evaluation of responses in the openings category

Both teams choose: openings over their absence, greater percentage of openings over less, openings in greater proximity over lesser proximity, dispersion of openings over concentration and placement of openings in the middle over the upper third.

3.2 Transparency

In this segment, the focus is the concept of transparency, exploring how the facade's permeability influences a building's essence. Serving as the primary reference is the Glass Cube in Madrid, Spain, a creation by Alfonso Millanes. Millanes' design ambition was to attain unparalleled transparency. This aspiration, combined with the building's minimalist design, positioned it as a quintessential example for delving into the nuances of architectural transparency.

	Architects Questionnaire	Architects (%)	General public Questionnaire	General public (%)	Result
ai) Opaque		0.5		13.4	Transparent
aii) Transparent		95.5		86.6	

bi) Bordered		22.4		16.4	Borderless
bii) Borderless		77.6		83.6	
ci) Upward increasing transparency		34.3		62.7	-
cii)Downward increasing transparency		65.7		37.3	

Table 2: Recording and evaluation of responses in the transparency category

Both teams choose: transparent over opaque, borderless over bordered.

3.3 Levitation

In this section, the concept of levitation in architectural design is examined, specifically looking at how far the primary volume of a structure is raised from the ground.

The reference for full levitation is the "Aerocene," an architectural sculpture by Tomas Saraceno. Contrasting this, representing the solid base category, we have the workshop at Fabrikstrasse 10 in Basel, Switzerland, designed by Yoshio Taniguchi. With its minimalist form and deliberate material choice, this structure conjures up an impression of a "floating box". This prompts curiosity about how its base might contribute to such an effect.

For structures supported by columns, the archetype is the iconic Villa Savoye, nestled on the periphery of Paris, France, and designed by Le Corbusier. Beyond its famed status which naturally draws interest, the structure's distinct and meticulous design makes it an apt candidate for this analytical journey.

	Architects Questionnaire	Architects (%)	General public Questionnaire	General Public(%)	Result
ai) Levitation		91		73.1	Levitation

aii) Grounded		9		26.9	
bi) Bigger base height		73.1		76.1	Bigger base height
bii) Smaller base height		26.9		23.9	
ci) Larger base area		13.4		53.7	-
cii) Smaller base area		86.6		46.3	
di) Solid base		13.4		9	Columns
dii) Columns		86.6		91	
ei) Columns inline		22.4		49.3	Columns inset

eii)Columns inset		77.6		50.7	
fi) Thinner columns		89.6		61.2	Thinner columns
fii)Thicker columns		10.4		38.8	
gi) More columns		11.9		25.4	Less columns
gii)Less columns		88.1		74.6	

Table 3: Recording and evaluation of responses in the levitation category

Both teams choose: levitation of the main volume over grounded, larger height of base over smaller, pillars over solid base, thinner, fewer columns inset.

3.4 Volume distribution

This section delves into the architectural implications of distributing volume vertically. Each structure is conceptually segmented into three vertical tiers. Depending on the particular example, either the top, middle, or bottom segment is chosen to extend outwards.

The example is Tadao Ando's 4x4 House, located in Kobe, Japan. This residence is one-half of a pair of twin buildings, situated alongside its architectural counterpart and boasting a serene connection to the sea. A defining feature of the design is a prominent cubic addition. Given Ando's renowned flair for sophisticated design, a closer look at this cube's placement and its impact on the entire architectural harmony is both compelling and insightful.

	Architects Questionnaire	Architects (%)	General public Questionnaire	General public (%)	Result

ai) Volume addition Upper ⅓		55.2		62.7	Volume addition Upper ⅓
αii)Volume addition Lower ⅓		44.8		37.3	
bi)Volume addition Middle ⅓		59.7		61.2	Volume addition Middle ⅓
bii)Volume addition Lower ⅓		40.3		38.8	
ci)Volume addition Middle ⅓		58.2		41.8	-
cii) Volume addition Upper ⅓		41.8		58.2	

Table 4: Recording and evaluation of responses in the category of volume distribution

Both teams choose: volume addition on the upper 1/3 over the lower, volume addition in the middle over the lower 1/3.

3.5 Facade Elements

This section examines geometrical elements commonly utilized by architects on facades. These specific elements serve as auxiliary to the composition and do not affect the volume of the original structure. Other than the vertical and horizontal elements which are the most commonly used, the geometry of hexagonal cells was also used.

The hexagonal structure was specifically chosen because it's considered the structure with the minimum total contour length that can be used to cover a surface. While it is commonly used In modern architecture, often to cover large surfaces, such as skyscraper facades (see MAD Architects' Honeycomb Skyscraper).

The building chosen to be processed is Alberto Campo Baeza's Raumplan House in Madrid, Spain. This residence epitomizes minimalist design. Beyond the fact that minimalism is often conflated with aesthetic lightness as a term, its blank aspect provides the appropriate canvas for the aforementioned comparisons.

	Architects Questionnaire	Architects (%)	General public Questionnaire	General public (%)	Result
ai) None		58.2		43.3	-
aii)Vertical		41.8		56.7	
bi) None		50.7		59.7	None
bii)Horizontal		49.3		40.3	
ci)None		46.3		52.2	-
cii)Bigger hexagonal cells		53.7		47.8	
ei) None		41.8		59.7	-
eii) Smaller hexagonal cells		58.2		40.3	

fi) horizontal		32.8		28.4	Vertical
fii)Vertical		67.2		71.6	
gi)Bigger hexagonal cells		46.3		64.2	-
gii) Smaller hexagonal cells		53.7		35.8	

Table 5: Recording and evaluation of responses in the category of facade elements

Both teams choose: absence of face elements over horizontal, vertical facade elements over horizontal

3.6 Materiality

In this segment, two fundamental construction materials, stone and concrete, are examined. Though numerous materials exist, these two have been selected as the foundation of the investigation due to their straightforward representation and widespread familiarity.

Starting with stone, our reference is the Ohel Jakob Synagogue in Munich, Germany, a design by Rena Wandel-Hoefer and Wolfgang Lorch. The building showcases a cubic base made of concrete, elegantly clad in travertine stone, crowned by a contemporary glass roof. This melding of materials lends a modern touch to an otherwise solid and monumental impression. Given this, it's captivating to contemplate how altering the size of the foundational stones might shift the perception of the structure.

Shifting focus to concrete, the Schaulager Art Museum in Basel, Switzerland, a creation by Herzog & de Meuron, is analysed. The museum's distinct concrete texture is a result of an innovative method: mixing in local pebbles and hand-hammering the facade. This tactile finish is reminiscent of natural sedimentary processes, aptly symbolizing the museum's role as a sanctuary for art storage and preservation. This raises the intriguing question of whether the textured facade amplifies the building's monumental feel.

	Architects Questionnaire	Architects(%)	General public Questionnaire	General public(%)	Result
ai) Bigger stones		29.9		43.3	Smaller stones

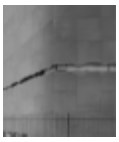
aii)Smaller stones		70.1		56.7	
bi) Smooth concrete		53.7		79.1	Smooth concrete
bii)Textured concrete		46.3		20.9	

Table 6: Record and evaluation of responses in the category of materials

Both teams choose**:** smaller versus larger stones , smooth concrete over textured

3.7 Relationship to the Environment

In this section, the focus is on understanding how a building's immediate environment, encompassing both terrain and adjacent structures, influences the perception of that building. The subcategories under investigation include:

- The implications of placing a building on either sloping or flat terrain.
- The role of ground reflections in shaping a building's impression.
- Tonal relationships between a structure and the ground it sits on.
- The distance between buildings that share identical design, using such identicality to single out the impact of each factor.

The exploration of terrain dynamics features Peter Zumthor's Zinc Mine Museum in Allmannajuvet, Norway. Many of the museum's structures seem to meld seamlessly with the environment, upheld by slender wooden supports. The design resonates deeply with Norway's rugged nature, indicating a respect for its surrounding landscape. A central inquiry here is if the placement of these structures heightens their perceived lightness.
Turning to the Salk Institute in San Diego, USA, designed by Louis Kahn, an architectural space is identified by its central courtyard, flanked by towers that share an identical design, placed at consistent intervals. Given its proximity to the ocean, it prompts speculation about whether Kahn aimed to ensure the institute harmoniously coexisted with its natural backdrop.

Reflecting on architectural reflections, attention is given to Tadao Ando's Langen Foundation Art Museum in Neuss, Germany. A core concrete edifice is wrapped in a shimmering glass skin, anchored by steel frameworks. Reflections play off the museum's surface and the neighboring water body, seemingly merging built and natural elements, and instilling a sense of weightlessness.
Lastly, the discussion pivots to the contrast of tonal values between architecture and the land it graces. The focal point is Zaha Hadid's Heydar Aliyev Center in Baku, Azerbaijan. Its sinuous form, harmonizing in color with the terrain, evokes imagery of a structure emerging organically from the earth.

	Questionnaire of architects	Architects (%)	Questionnaire of general public	General public (%)	Result
ai)Inclined ground		80.6		55.2	Inclined ground
aii)Flat ground		19.4		44.8	
bi)Placement In contact		9		25.4	Placement in distance
bii)Placement in distance		91		74.6	
ci)Ground Reflection		70.1		74.6	Reflection
cii)No ground reflection		29.9		25.4	
di)Same tone-light		76.1		97	Same tone-light

dii)Dark cube-light ground		23.9		3	
ei) Same tone-dark		40.3		25.4	Dark cube-light ground
eii)Dark cube-light ground		59.7		74.6	
fi)Same tone- light		86.6		91	Same tone-light
fii)Same tone- dark		13.4		9	
gi) Light cube-dark ground		71.6		11.9	-
gii)Same tone-dark		28.4		88.1	

hi)Same tone-light		58.2		73.1	Same tone-light
hii)Light cube-dark ground		41.8		26.9	
Ii)Light cube-dark ground		89.6		67.2	Light cube-dark ground
Iii)Dark cube-light ground		10.4		32.8	

Table 7: Recording and evaluation of responses in the category of relationship with the environment

Both teams choose**:** placement on sloping ground over flat, structure at a distance ,overall light.

4. Overview

Revisiting the initial hypotheses, the chosen manipulations and the buildings that exemplify them appear to affirm these hypotheses. As a result, we can conclude that the architects effectively conveyed the intended feeling. The only manipulation that didn't achieve the same consensus as the others was the absence of face elements. However, it is still perceived as aesthetically lighter compared to several other alternatives.

Manipulations deemed successful (✓) Doubt – need for further research (?)

Figure 5: Overview of the success of the initial hypotheses

5. Conclusion

The survey results emphasize the shared perspectives between architects and the public across various aspects and levels. When we analyze and compare responses from each group, it's evident there's a consistent internal system governing perception. This consistency is clearer when we break down the modifications to their fundamental components, highlighting shared patterns.

The few areas of disagreement between the groups are likely due to their different educational backgrounds. This suggests that our interpretation of architectural designs is influenced as much by our knowledge and training as by the design itself.

In conclusion, certain architectural changes effectively convey a sense of lightness. These findings can serve as the foundation for an architectural editorial on both construction techniques and aesthetics.

6. Application & Further Research

This research is unique in its exploration of how specific architectural changes convey a feeling of lightness and its focus on a central, unexplored theme.

Using the data gathered, there's an opportunity to create an architectural guide that marries functional building techniques with aesthetics. Such a guide would be valuable to architectural professionals and the general public alike.

In the grand scheme of architectural theory, the importance of this study shines through. Delving into different architectural movements and studying the work of celebrated architects yields valuable insights. This shared knowledge offers a special perspective for assessing renowned designs and theoretical principles. Recognizing universally admired techniques can introduce new perspectives to iconic designs and architectural theory.

Future studies should dig deeper into these findings, pinpointing shared views and measuring the effects of each design change. After this, refining the results will enhance our comprehension. There's an opportunity to further quantify these techniques and affirm the results of this survey. This research could also set the stage for more extensive interdisciplinary studies, bridging the aesthetic and technical sides of architecture.

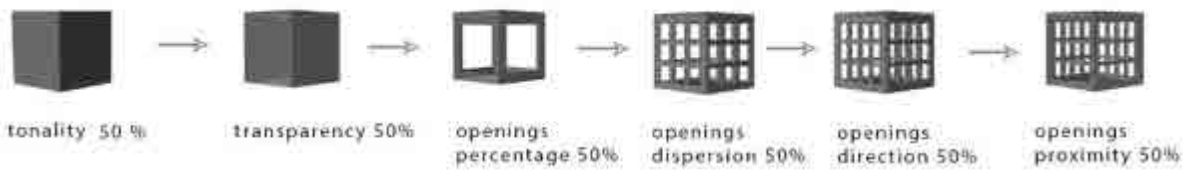


Figure 6: Parameterization of successful manipulations

Bibliographic sources

Beukers Adriaan and Ed van Hinte, “Lightness: The Inevitable Renaissance of Minimum Energy Structures.” 010 publishers, Rotterdam, 2005
Janković, Sanja, and Danica Stanković. "EPHEMERAL ARCHITECTURE-A PROPOSAL FOR INTERVENTIONS IN PUBLIC SPACE." Facta Universitatis. Series: Visual Arts and Music, 2020
Kronenburg, Robert. "Fabric architecture and flexible design." Architectural Design 76.6, 2006
Armada, Jacqueline. "Sustainable Ephemeral: Temporary Spaces with Lasting Impact." 2012 .
Ban, Shigeru. "Shigeru Ban." Humanitarian Architecture. Routledge, 2014.00
Shall, Scott. "Design Like You Give a Damn: Architectural Responses to Humanitarian Crises-Architecture for Humanity and Expanding Architecture: Design as Activism-Edited by Bryan Bell and Katie Wakeford.", 2009
Pinto, Catarina. "Emergency architecture: from materiality to architectural design."
Jureviciute Gabriele, Plastic < EMERGENCY > Architecture, Institute for Advanced Architecture of Catalonia, (2019)
Antoniou Dimitris, Giorgos Dimopoulos, Dimitris Kontaxakis, Ioanna Symeonidou, Nikos Tsinikas, ''Lightweight Constructions - Biomimetic, Ephemeral, Digital'', Thessaloniki, University Studio Press, 2020

Images

Figure 1-6: custom creation
Original image of San Cataldo Cemetery,Aldo Rossi:Unknown, https://www.adfwebmagazine.jp/en/architect/san-cataldo-cemetery-by-aldo-rossi/ accessed 10/10/2022
Original image of Glass Cube,Alfonso Millanes: Unknown,https://www.theplan.it/eng/architecture/the-cube , accessed: 15/01/2023
Original image of Aerocene sculpture, Tomas Saraceno:Unknown,https:// www.makery.info/en/2018/11/06/vol-de-montgolfiere-aerosolaire-a-fontainebleau-avec-tomas-saraceno/ accessed: 05/11/2022
Original image of Fabrikstrasse 10,Yoshio Taniguchi: Johannes Marbur, https://divisare.com/projects/332840-yoshio-taniguchi-johannes-marburg-fabrikstrasse-10 , accessed: 08/11/2022
Original image of Villa Savoye,Le Corbusier: Unknown,https://en.wikipedia.org/wiki/Villa_Savoye accessed: 08/11/2022
Original image of 4x4 House ,Tadao Ando:Unknown, https://archestudy.com/4x4-house-by-tadao-ando/ , accessed: 15/01/2023
Original image of Raumplan House, Alberto Campo Baeza:Javier Callejas ,https://www.archdaily.com/781211/raumplan-house-alberto-campo-baeza accessed: 08/11/2022
Original image of Ohel Jakob Synagogue, Rena Wandel-Hoefer and Wolfgang Lorch: Unknown,https://www.archdaily.com/317862/the-jewish-center-in-munich-wandel-hoefer-lorch-hirsch , accessed 01/27/2023
Original image of Schaulager Art Museum, Herzog & de Meuron: Roland Halbe ,https://schaulager.org/en/schaulager/concept/architecture accessed: 27/11/2022
Original image of Zinc Mine Museum,Peter Zumthor:Unknown, https://www.archdaily.com/tag/sauda , accessed: 01/11/2022
Original image of Salk Institute, Louis Kahn:Unknown, https://www.archdaily.com/61288/ad-classics-salk-institute-louis-kahn , accessed: 01/27/2023
Original image of : Langen Foundation Art Museum, Tadao Ando:Unknown, https://architectuul.com/architecture/museum-langen-foundation , accessed : 13/11/2022
Original image of Heydar Aliyev Center, Zaha Hadid:Unknown, https://en.wikipedia.org/wiki/Heydar_Aliyev_Center, accessed: 11/11/2022

(Im)Possibility of Participatory Urban Planning

Kosta Stojanović
Student of University of Belgrade- Faculty of Architecture
Contact email kostastojanovic1@gmail.com

Abstract: The approach to urban planning and development has shifted in the last thirty years. Through the development of democracy and having the civil sector and citizens more included participatory urban planning came into prominence. Participatory urban planning represents an approach to designing open, vibrant, accessible, and community-driven cities. It is grounded in the belief that merging local knowledge and expert knowledge leads to stronger outcomes.
This paper seeks to observe the strengths and weaknesses of this approach in planning and designing and its applicability in Belgrade. Changes in society and the will of people to be more involved in planning and decision-making have the consequence that public participation nowadays is a necessity. These presented case studies show how the process of participation was performed in other European countries and how it was performed in Belgrade. A comparative analysis of the case studies demonstrates the strengths and weaknesses of participatory urban planning. Even though this approach is initially good and has many positive effects, we will see how it can be used to manipulate citizens in favour of stakeholders.
Apart from providing an overview of the advantages and disadvantages of including citizens in the design process, the outcome of the research will be highlighted as a set of applicable guidelines for future developments, both practical and theoretical. As urban planning practices for new developments increasingly disregard the requirements of public spaces and even turn some of them into public plots we will discuss how participatory urban planning can restrict these practices, but how it can be used as an excuse in corrupted societies with poor democracies. In the end, we will discuss as well applicability of this approach on a Belgrade as a polygon

Keywords: participation, urban planning, public spaces, democracy, corruption

1 Introduction

As the title says, this paper will explain the (im)possibility of participatory urban planning, or in other words, aims to draw attention to the strengths and weaknesses of the participatory urban approach.
In the last thirty years (from the late 1980s), the practices and strategies in urban planning have shifted. Nowadays there are different tendencies and approaches in urban planning like sustainable development, smart cities, resilient and adaptive planning, mixed-use and compact development, the concept of health and well-being, etc. With global warming and the will of decision-makers to make sustainable and resilient urban environments that have emerged in response to evolving societal, environmental, and economic challenges, the approach to achieving these goals has also shifted.
Participatory and collaborative planning came into prominence as a model that can address all the above-listed topics but at the same time satisfy both, stakeholders and the local community. By addressing these challenges and working through participatory urban planning, urban planners can create cities that are more liveable, equitable, resilient, and responsive to the needs of their inhabitants. On the other side, the process of negotiation between stakeholders and the local community can create many disputes

2 An overview of participatory urban planning

Participatory urban planning is a multifaceted and inclusive approach to urban development that actively involves various stakeholders in the decision-making process. It seeks to empower and engage community members, local organizations, government agencies, and other relevant actors in shaping the future of cities. This collaborative and democratic process aims to ensure that urban planning reflects the diverse needs, aspirations, and knowledge of the people who live and work in the affected areas. (Robertson and Simonsen, 2012)
One definition of participatory urban planning emphasizes the importance of citizen engagement and active involvement in decision-making processes. It recognizes that residents possess valuable local knowledge and insights about their neighbourhoods, and their perspectives should be integrated into the planning process. This definition highlights the need for inclusive platforms and mechanisms that enable meaningful participation, such as public consultations, workshops, focus groups, and community-driven initiatives.
Another definition of participatory urban planning emphasizes the transformative potential of the approach. It views participation not only as a means to gather input and feedback but also as a way to challenge power

dynamics, promote social justice, and address systemic inequalities. This definition recognizes that participatory processes can empower marginalized communities, amplify their voices, and foster more equitable and sustainable urban development outcomes.

Furthermore, participatory urban planning can be seen as a process that goes beyond traditional top-down approaches. It involves collaborative decision-making, shared responsibilities, and co-creation of solutions. This definition emphasizes the importance of building partnerships and fostering trust among stakeholders, including residents, community organizations, local businesses, and government entities (Spinuzzi, 2005). It recognizes that effective participatory processes require ongoing dialogue, negotiation, and consensus-building to achieve mutually beneficial outcomes.

The process of participatory urban planning typically involves several key steps:

1. Identifying stakeholders: This step involves identifying and engaging all relevant stakeholders, including residents, community organizations, local businesses, government agencies, and other interested parties. It is important to ensure that the participation is representative of the diversity within the community.
2. Building partnerships: Establishing partnerships and collaborations between stakeholders is crucial for effective participatory planning. This can involve forming community advisory boards, task forces, or working groups that bring together different perspectives and expertise.
3. Information sharing: Providing clear and accessible information about the planning process, including goals, objectives, and potential impacts, is essential for meaningful participation. This can be done through public meetings, workshops, online platforms, and other communication channels.
4. Consultation and engagement: Actively involving the community in the decision-making process is a key aspect of participatory urban planning. This can include public consultations, focus groups, surveys, and workshops where residents can share their ideas, concerns, and aspirations for their neighbourhoods.
5. Collaborative design and decision-making: Engaging stakeholders in the design and decision-making process helps ensure that the final plans and projects reflect the community's priorities and values. This can involve collaborative workshops, design charrettes, or participatory budgeting exercises.
6. Implementation and monitoring: Once the plans are finalized, it is important to ensure that they are effectively implemented and monitored. This can involve ongoing engagement with the community, regular progress updates, and mechanisms for feedback and evaluation.

In summary, participatory urban planning can be defined as a comprehensive and inclusive approach that actively involves stakeholders in the decision-making process, empowers communities, challenges power dynamics, promotes social justice, and fosters equitable and sustainable urban development. It requires meaningful citizen engagement, collaborative decision-making, and transformative processes to ensure that cities reflect their inhabitants' diverse needs and aspirations. For this research, the aspect of collaboration in the design process is especially important, since it can be really hard and challenging for architects and planners to satisfy both sides within the process (Luck, 2018).

3 Advantages of the participatory approach

Participatory urban planning offers numerous advantages that contribute to more inclusive, sustainable, and effective urban development. By actively involving stakeholders in the decision-making process, participatory approaches can lead to better outcomes that reflect the needs, aspirations, and knowledge of the community. The following text discusses some of the key advantages of participatory urban planning:

Enhancing community ownership, participatory urban planning fosters a sense of ownership and empowerment within the community. Involving residents, community organizations, and other stakeholders in the decision-making process, increases their commitment and support for the implementation of projects. When people have a voice and are actively engaged in shaping their neighbourhoods, they are more likely to take pride in their surroundings and contribute to their improvement and maintenance. (Asaro, 2000).

Improving decision-making, participatory urban planning brings diverse perspectives and local knowledge to the table, leading to more informed and balanced decisions. By involving stakeholders who have direct experience and understanding of the local context, planners can gain valuable insights into the specific needs, challenges, and opportunities of the community. This inclusive approach helps identify and address potential issues that may have been overlooked in traditional top-down planning processes, resulting in more effective and contextually appropriate solutions.

Increasing transparency and accountability, through this process, transparency is promoted by making the planning process accessible and inclusive. It provides opportunities for stakeholders to be informed about the decision-making process, project goals, and potential impacts. This transparency helps build trust between the

community and decision-makers, as well as hold them accountable for the outcomes. By involving stakeholders in the planning process, it becomes easier to track progress, evaluate performance, and ensure that decisions align with the interests and aspirations of the community.

Sustainable and Equitable Development, participatory urban planning ensures that development projects are socially, economically, and environmentally sustainable. By involving all stakeholders, including marginalized groups and vulnerable populations, participatory approaches help address social inequalities and promote social cohesion. The inclusion of diverse perspectives can lead to more equitable distribution of resources, improved access to services, and the consideration of social justice issues. Additionally, participatory processes can integrate environmental considerations, leading to more sustainable and resilient urban development outcomes.

Strengthening social networks and community cohesion, this approach in planning itself can foster stronger social networks and community cohesion. By bringing people together to discuss and work towards common goals, participatory urban planning creates opportunities for collaboration, dialogue, and relationship-building. This sense of community and shared purpose can lead to increased social capital, improved social cohesion, and a stronger sense of belonging among residents.

Enhancement of innovation and creativity, participatory urban planning encourages the making of innovative ideas and creative solutions. By involving diverse stakeholders, participatory processes tap into a wide range of perspectives, experiences, and expertise. This diversity can spark new ideas, challenge conventional thinking, and lead to innovative approaches to urban development. The collaborative nature of participatory planning also fosters a sense of collective ownership over the solutions, increasing the likelihood of successful implementation. (Bannon, Bardzell and Bødker 2018).

4 Disadvantages of the participatory approach

Participatory urban planning, while offering numerous advantages, also presents certain disadvantages that need to be acknowledged and addressed. It is important to recognize these challenges to ensure effective implementation and maximize the potential benefits of participatory processes. The following comprehensive text discusses some of the key disadvantages of participatory urban planning. This list is important for understanding why this process can sometimes take too much time and resources and why they are making it (im)possible.

Time and resource-intensive, participatory urban planning requires significant time, effort, and resources to engage stakeholders, gather input, and reach consensus. The process of organizing and facilitating participatory activities, such as public consultations, workshops, and focus groups, can be time-consuming and costly. This can lead to delays in project implementation and increased costs, which may pose challenges for municipalities and organizations with limited resources. (Kensing and Blomberg, 1998).

Power dynamics and representation, ensuring equal representation and meaningful participation of all stakeholders can be challenging. Power imbalances, such as unequal access to resources or decision-making processes, may limit the effectiveness of participatory urban planning. Marginalized groups, including low-income communities, ethnic minorities, and vulnerable populations, may face barriers to participation, resulting in their voices being underrepresented or unheard. Addressing power dynamics and promoting inclusive participation is crucial to avoid reinforcing existing inequalities.

Conflicting interests and priorities, participatory processes involve engaging multiple stakeholders with diverse interests, priorities, and perspectives. Balancing competing demands and finding common ground can be complex and time-consuming. Conflicts may arise between different groups or individuals, leading to challenges in reaching consensus. Resolving conflicts and managing divergent interests requires skilled facilitation, negotiation, and compromise.

Expertise and technical knowledge, this approach in urban planning often involves complex technical aspects, such as land use regulations, infrastructure design, and environmental considerations. Engaging community members who may lack technical expertise can pose challenges in understanding and evaluating technical information. Ensuring that participants have access to relevant information and providing opportunities for capacity building and education can help address this disadvantage.

With limited scalability and generalizability, participatory urban planning processes are often context-specific and tailored to the unique characteristics of a particular community or neighbourhood. While this allows for localized solutions and increased community ownership, it can limit the scalability and generalizability of successful approaches. Replicating participatory processes in different contexts may require adaptation and customization to suit local conditions, which can be resource-intensive and time-consuming.

Decision-making efficiency, and participatory urban planning processes, by their nature, involve multiple stakeholders and seek to incorporate diverse perspectives. While this inclusivity is a strength, it can also slow down decision-making processes. Reaching consensus among stakeholders may take longer than traditional top-down approaches, potentially leading to delays in project implementation. Balancing the need for thorough participation with the need for timely decision-making is a challenge that needs to be carefully managed.

5 Case studies

In the following case studies, we will discuss different participatory approaches in Curitiba (Brazil), Barcelona (Spain), and Belgrade (Serbia). In Curitiba participatory approach includes neighborhood associations, Citizen Streets, and participatory budgeting, allowing residents to actively shape their city's development priorities, resulting in a sustainable, inclusive, and environmentally conscious urban model that has garnered international recognition and serves as an inspiration for cities globally, in Belgrade there is a similar situation with a lot of local associations who want take part in a planning process, but, unfortunately, there is a no recognition from the stakeholders and government. Barcelona's participatory urban planning approach, exemplified by the "Barcelona en Comú" movement and the Superblocks project, has successfully engaged citizens in local decision-making processes, resulting in improved public spaces, sustainable mobility, and social housing initiatives. However, scaling up these initiatives city-wide has encountered challenges, including resistance to change, limited resources, political and administrative hurdles, difficulties in community engagement, and the need for continuous evaluation and adaptation. These obstacles have raised questions about the feasibility and inclusivity of broader participatory planning efforts in the city. From this example, we can learn how to connect these local initiatives since Belgrade has a lot of local initiatives that already cooperate but there is a need for better cooperation and institutionalization of these initiatives. In the example of Rasa Popov Square in Belgrade, we can see how the local initiative was recognized by the city council, but unfortunately, the locals from which the initiative first came were not included in the process of planning the remodelled square.

5.1 Barcelona, Spain: The challenges of scaling up

Barcelona has gained international recognition for its innovative approach to participatory urban planning. The "Barcelona en Comú" movement promotes citizen involvement through digital platforms and neighbourhood assemblies. These initiatives have successfully engaged citizens in local decision-making processes, resulting in the revitalization of public spaces, the promotion of sustainable mobility, and the implementation of social housing projects. However, scaling up participatory processes to the city-wide level has proven challenging. The complexity of large-scale projects, such as urban regeneration or infrastructure development, often requires technical expertise and specialized knowledge. This raises questions about the feasibility of participatory planning on a broader scale and the potential exclusion of citizens who lack the necessary skills or resources to engage effectively.

The Superblocks project aimed to transform the city's urban fabric by reconfiguring the use of streets and public spaces to prioritize pedestrians and reduce traffic congestion. The concept involved grouping several blocks and limiting vehicle access within these areas, creating more space for pedestrians, greenery, and community activities. While the initial implementation of Superblocks in certain neighbourhoods received positive feedback and demonstrated potential benefits, scaling up the project city-wide faced several challenges.

1. Resistance to Change: Scaling up the Superblocks initiative required significant changes to the existing urban infrastructure and transportation systems. This faced resistance from various stakeholders, including residents, businesses, and even some local politicians. Concerns were raised about potential disruptions to daily routines, impacts on local businesses, and the redistribution of traffic congestion to surrounding areas.

2. Limited Resources: Implementing Superblocks on a larger scale required substantial financial resources and coordination among different government departments. Allocating the necessary funding and ensuring effective collaboration between departments proved to be a challenge. Additionally, the project required extensive planning, design, and construction efforts, which further strained available resources.

3. Political and Administrative Hurdles: Scaling up the Superblocks initiative required political will and support from local authorities. However, changes in political leadership and differing priorities among decision-makers posed challenges to the continuity and commitment needed for successful implementation. Administrative hurdles, such as bureaucratic processes and interdepartmental coordination, also slowed down the scaling-up process.

4. Community Engagement and Participation: The success of the Superblocks initiative relied heavily on community engagement and participation. However, scaling up the project made it more challenging to involve a diverse range of stakeholders and ensure their meaningful participation. Engaging residents, businesses, and community organizations in decision-making processes and addressing their concerns became more complex as the project expanded.

5. Evaluation and Adaptation: As the Superblocks initiative scaled up, the need for continuous evaluation and adaptation became crucial. Monitoring the impacts of the project, gathering feedback from residents, and making necessary adjustments to address any unintended consequences or challenges required dedicated resources and a robust evaluation framework.

5.2 Curitiba, Brazil: Sustainability and resistance

Curitiba, the capital city of the state of Paraná in Brazil, is renowned for its innovative and successful participatory urban planning approach. The city has been widely recognized for its sustainable and inclusive development strategies, which have transformed it into a model for urban planning worldwide.

Curitiba's participatory urban planning approach is rooted in the belief that citizens should actively participate in shaping their city's future. The city government, under the leadership of renowned urban planner Jaime Lerner, implemented a range of initiatives to engage residents in decision-making processes and ensure their voices were heard.

One of the key elements of Curitiba's participatory urban planning approach is the creation of neighbourhood associations. These associations serve as platforms for residents to come together, discuss local issues, and actively participate in the planning and development of their neighbourhoods. Through regular meetings and consultations, residents have the opportunity to voice their concerns, propose ideas, and contribute to the decision-making process.

To further enhance citizen participation, Curitiba established a network of Citizen Streets, where residents can access various municipal services and engage in discussions with city officials. These Citizen Streets act as decentralized hubs, bringing government services closer to the neighbourhoods and facilitating direct interaction between residents and decision-makers.

Curitiba also implemented a participatory budgeting system, allowing residents to have a say in how public funds are allocated. Through this process, citizens can propose and prioritize projects that address their community's needs. This participatory budgeting system has empowered residents to actively shape the city's development priorities and ensure that resources are allocated in a manner that reflects their aspirations.

In addition to these participatory mechanisms, Curitiba has prioritized sustainable and inclusive urban development. The city is known for its efficient and well-integrated public transportation system, which includes dedicated bus lanes, express buses, and a high-capacity bus rapid transit (BRT) system. This transportation network was developed with extensive input from residents, ensuring that it meets their mobility needs and reduces congestion and pollution.

Curitiba's participatory urban planning approach has resulted in numerous benefits for the city. It has fostered a sense of ownership and pride among residents, as they actively contribute to the development of their neighborhoods. The participatory processes have also led to more informed and contextually appropriate decisions, addressing the specific needs and aspirations of the community.

Furthermore, Curitiba's participatory approach has contributed to the city's sustainability and resilience. By involving residents in decision-making, the city has been able to prioritize environmental conservation, promote green spaces, and implement innovative waste management systems. These efforts have made Curitiba a global leader in sustainable urban development.

In conclusion, Curitiba's participatory urban planning approach has been instrumental in transforming the city into a model of sustainable and inclusive development. By actively involving residents in decision-making processes, the city has empowered its citizens, improved the quality of life, and created a strong sense of community ownership. Curitiba's success serves as an inspiration for cities worldwide, highlighting the importance of participatory approaches in creating livable, sustainable, and inclusive urban environments.

5.3 Rasa Popov square in Blegrade, Serbia

The square was created as an intra-block open space area as part of the project for the surrounding buildings and Inex's business tower, which is, today's city administration building, according to the design (1967-1981) of the architect Uroš Martinović. This space is an open public space area and is owned by the city of Belgrade, therefore its maintenance is the responsibility of the city. Unfortunately, this space was never maintained because there were simply not enough funds for it, as well as many other spaces in the city that fell into disrepair over time. There were many reasons, firstly the financial crisis in Yugoslavia in the 80s, then the civil wars and the disintegration of the former SFRY, and finally the democratic changes and transition in the early 2000s. As the state and its institutions weakened, illegal activities intensified, and illegal construction flourished throughout the city and the country. During the 90s and the beginning of the 2000s, illegal buildings sprung up in the area of this square, mostly of kiosk character, which served the trade of various necessities from socks, clothes, and food to pet shops. As a result, this space looked completely different and acquired an opposite character in relation to what it initially had and was totally unusable. Instead of a public space within the block, it evolved over time into a kind of small open-air shopping centre. A few years ago, all the illegally built buildings on the area of this plateau were demolished, and this area remained devastated with the remains of construction materials as a witness of another time.

After the demolition of illegal buildings, this space remained unused and became a place to avoid, because there were no street lights at night and it was unsafe. The residents of surrounding buildings wanted to return this space to its original purpose. The desire was to bring this square back to its original purpose so that it could be used by tenants and children. The initiative was handed over to the city, and the city accepted the tenant's initiative the area was reconstructed. The project was developed in 2019. by the city architect's office under the leadership of the city's chief urban planner, Marko Stojčić.

The idea behind the current solution for the square is to bear the name of a famous writer and television journalist who made television shows for children, Raša Popov, who lived near this area. As he dedicated his whole life to children, this space is also designed in a polychromatic manner, and this diversity is associated with children. Grass areas were formed on the plateau and trees were placed in planters as well as benches, while the concrete surface was painted like pixels in shades of yellow, purple, and red. With this choice of colours, the newly formed space fits in well and ties in with the surrounding solitaires whose facade is made of brick.

The problem of this space is reflected in the quality of the works performed. Since a tender was announced for this space, the job was awarded to the best bidder, i.e. the one who offered the lowest price. In public works, it often happens that the one who offers the lowest price does not perform the works in the expected quality, and reconstructions of the reconstructed are becoming more frequent. After a few months of autumn rains, at the beginning of 2021, the paint on the plateau began to peel off and wash off, and reconstruction was carried out, i.e. the plateau was repainted. Today, the plateau is in relatively good condition, but in some places, the paint is peeling again.

It is interesting that although the initiative came from the tenants, they were not involved in the further planning of this area. That is, they were involved only to the extent that it was accepted that there was a problem with the given space, but not what their needs were as tenants. Participation traditionally represents the inclusion of the general public in decision-making processes, not only elites or experts. Participation is extremely important for urban design because this is how the improvement of the use of public spaces is achieved, better mapping of the needs of future users of the space is achieved, and through their participation, a better connection of users with the future space is achieved. Certainly, the given solution is not bad, it is better than the previously found situation. As the tenants started the initiative and had the desire to renovate this space, then through interaction with the tenants, surveys, and workshops, their needs would certainly be better mapped and maybe some different content (e.g. fountains, more green spaces, etc.) could be introduced and different regimes of using this space would be enabled.

6 Discussion

Participatory urban planning has become an essential aspect of contemporary urban development, aiming to create cities that are more inclusive, equitable, and responsive to the needs of their inhabitants. While it presents various advantages, such as enhancing community ownership, improving decision-making, increasing transparency and accountability, and promoting sustainable and equitable development, it also comes with its set of disadvantages, including time and resource intensiveness, power dynamics, conflicting interests, expertise and technical knowledge, limited scalability and generalizability, and potential impacts on decision-making efficiency.

The case studies of Curitiba, Brazil, and Barcelona, Spain, showcase the successful implementation of

participatory urban planning approaches in these cities. Curitiba's participatory approach empowers citizens to actively shape the city's development, leading to sustainable and inclusive urban development. By establishing neighbourhood associations, Citizen Streets, and a participatory budgeting system, residents have a say in how their city evolves. However, the case of Curitiba also highlights the challenges of sustaining such an approach, including potential financial constraints and the need for ongoing citizen engagement.

In Barcelona, the "Barcelona en Comú" movement and the Superblocks project exemplify the benefits of involving citizens in local decision-making. The initiatives have improved public spaces, promoted sustainable mobility, and implemented social housing projects. However, the challenges of scaling up these projects city-wide, such as resistance to change, limited resources, political and administrative hurdles, difficulties in community engagement, and the need for continuous evaluation and adaptation, demonstrate the complexities of broad participatory planning efforts in a large urban context.

The case of Rasa Popov Square in Belgrade, Serbia, offers a unique perspective on the application of participatory urban planning. While the square's reconstruction aimed to address the community's needs, it also highlighted the importance of quality control in public works. Furthermore, the lack of meaningful involvement of the tenants in the planning process raises questions about the extent to which citizens are engaged and their needs addressed. A more comprehensive and collaborative approach, involving tenants in surveys, workshops, and discussions, could lead to better-tailored solutions that meet the community's needs.

Participatory urban planning represents an evolving approach to urban development that holds great promise but also presents significant challenges. It is imperative to strike a balance between involving citizens and efficiently managing decision-making processes. While participatory planning can empower communities, promote equity, and enhance the liveability of cities, it requires careful consideration of the complexities involved in its implementation. Successful cases like Curitiba and Barcelona demonstrate that participatory approaches can lead to more inclusive and sustainable urban environments when thoughtfully executed, but the limitations and challenges also need to be recognized and addressed to ensure their long-term viability. In Belgrade, there is room for further development and improvement in the application of participatory urban planning to better serve the community and foster a sense of ownership and connection to the city's development.

7 Conclusion

The case studies of Barcelona, Curitiba, and Belgrade highlight the diverse challenges and opportunities of participatory urban planning. Barcelona's success in engaging citizens in local decision-making processes, such as the Superblocks project, illustrates the potential for innovative urban transformations. However, scaling up such initiatives city-wide faces complex hurdles related to resistance to change, resource limitations, political and administrative challenges, community engagement difficulties, and the need for continuous evaluation and adaptation.

On the other hand, Curitiba's participatory approach in Brazil demonstrates how a commitment to citizen involvement can lead to sustainable and inclusive urban development, marked by neighbourhood associations, Citizen Streets, and participatory budgeting. The city has shown that actively involving residents empowers communities, fosters transparency, and creates a strong sense of ownership.

In contrast, the case of Belgrade's Rasa Popov Square in Serbia reveals both the potential and limitations of participatory planning. The initial initiative from tenants to restore the square's original purpose is a promising start. Still, challenges arise due to issues in work quality, lack of tenant involvement in the planning process, and inadequate consideration of their needs. This case underscores the importance of meaningful participation and interaction with the local community, which can enhance the usability and quality of public spaces.

In summary, participatory urban planning holds great potential for creating inclusive, sustainable, and community-driven urban environments. However, its effectiveness depends on addressing common challenges, such as power dynamics, conflicting interests, resource limitations, and the need for continuous engagement and adaptation. Achieving successful participatory urban planning requires a balance between innovative ideas, meaningful citizen involvement, and responsive design.

References

1. Asaro, P. M. (2000). Transforming society by transforming technology: the science and politics of participatory design. Accounting, Management and Information Technologies, 10(4), 257-290.
2. Bannon, L., Bardzell, J., & Bødker, S. (2018). Reimagining participatory design. Interactions, 26(1), 26-32.
3. Healey, P. (2003). Collaborative Planning in Perspective. Planning Theory, 2(2), 101–123
4. Čolić, R. (2006). Participativno planiranje. Zadužbina Andrejević
5. Kensing, F., & Blomberg, J. (1998). Participatory design: Issues and concerns. Computer-supported cooperative work (CSCW), 7, 167-185.
6. Luck, R. (2018). What is it that makes participation in design participatory design?. Design studies, 59, 1-8.
7. Mendoza, Carmen & Vall-Casas, Pere. (2014). Urban Neighbourhood Regeneration and Community Participation: An Unresolved Issue in the Barcelona Experience.
8. Macedo, J. (2013). Planning a Sustainable City: The Making of Curitiba, Brazil. Journal of Planning History, 12(4), 334–353
9. https://www.politika.rs/sr/clanak/464766/Otvoren-Plato-Rase-Popova retrived on August 25, 2023
10. Mitlin, D., & Thompson, J. (1995). Participatory approaches in urban areas: strengthening civil society or reinforcing the status quo? Environment and Urbanization, 7(1), 231–250.
11. Judith E. Innes & David E. Booher (2004) Reframing public participation: strategies for the 21st century, Planning Theory & Practice, 5:4, 419-436
12. Forester, J. (1999). The deliberative practitioner: Encouraging participatory planning processes. MIT Press.
13. O'Hare, P. (2021). Planning and participation. Lund Humphries Publishers Limited
14. Robertson, T., & Simonsen, J. (2012). Challenges and opportunities in contemporary participatory design. Design Issues, 28(3), 3-9.
15. Spinuzzi, C. (2005). The methodology of participatory design. Technical communication, 52(2), 163-174.

II
TECHNOLOGY AND ARCHITECTURE

METAVERSE – a powerful new instrument for urban planning or yet another unfulfilled tech-promise?

Marina Nenković-Riznić
Institute of architecture and urban & spatial planning of Serbia, Belgrade, Serbia
m.nenkovic.riznic@gmail.com and marina@iaus.rs, ORCID https://orcid.org/0000-0003-4431-4151

Abstract: Pandemic and post-pandemic conditions left significant impacts not only on human life, but also in all of the aspects of human behavior, which consequently led to serious change in human communication. Often overlapping and interference of "real life", and virtual, contactless communication influenced accelerated adaptation of people to rapid and immediate change of perspectives. This affected regular interaction among people, but also had consequences in different performance of duties such as scientific development in different fields, or any other development-oriented activities.

From that new adaptation, METAVERSE was born, as immersive 3D environment in which people synchronously interact with others, and with representations of objects from the physical world. METAVERSE enables interactions with digital environments and physical objects located in different places and enables individuals to interact with other people in remote locations.

Within the realm of urban planning, the emergence of the METAVERSE has sparked both excitement and skepticism. Proponents argue that it possesses the transformative power to revolutionize the way cities are designed, managed, and experienced, while skeptics remain cautious, questioning its viability and potential to deliver tangible benefits.

This paper aims to critically examine the METAVERSE as a potent instrument for urban planning or yet another instance of unfulfilled technological promises. By analyzing the concept of the METAVERSE and its fundamental principles, this study seeks to uncover its potential applications in urban planning, especially in the field of participation. It explores the integration of virtual and augmented realities, immersive technologies, and advanced data analytics to create interactive and participatory urban design experiences.

Ethical concerns regarding privacy, accessibility, and digital equity are addressed, acknowledging the potential for exacerbating existing social disparities. Additionally, technical constraints, economic feasibility, and the need for robust infrastructure are examined to assess the practicality of widespread METAVERSE adoption in urban planning practices.

Through a comprehensive analysis, this paper aims to contribute to a deeper understanding of whether the METAVERSE represents a truly powerful and transformative tool or merely another fleeting technological mirage in the landscape of urban development.

Keywords: METAVERSE, urban planning, public participation, 3D environment

1 Introduction

The term "metaverse" in urban planning is relatively new and emerging, but it can be understood as a digital or virtual representation of a city or urban environment, where users can interact with a computer-generated environment and with each other, in real time. It has improved urban planning by providing immersive digital environments that enable dynamic simulations, stakeholder collaboration and participation and visualization of city projects and infrastructure (Dorostkar, Najarsadeghi ,2023) (Allam et al., 2022). Also, it refers to a complex and interconnected virtual world that mirrors elements of the real-world urban environment and offers various interactive experiences and services to users. It's important to note that the concept of the METAVERSE in urban planning is still evolving, and its practical implementation may vary widely from one city or region to another. Additionally, ethical and privacy considerations, as well as the equitable access to and governance of the METAVERSE, will be important factors to address as this technology develops further in the field of urban planning.

History of METAVERSE development is long with the first mentioning in 1938 by the French poet and playwright Antonin Artaud who used the term virtual reality in his collection of essays, The Theater and its Double (Artaud, 1938).

First time the term "metaverse" was used in the science-fiction novel by Neal Stephenson (Stephenson, 1992) as a virtual reality (VR) space that utilizes internet and augmented reality (AR) (Joshua, 2017), but it was adopted worldwide in the beginning of the 21st century with the development of the smart city concept in the virtual reality and augmented reality surroundings. Smart cities are urban areas that utilize digital technologies and cutting-edge solutions to provide better infrastructure, modernize government services, improve accessibility, accelerate economic growth, and improve sustainability (Yaqoob et al., 2023). These concepts were firstly tried and tested within the video games and multimedia platforms (Gent, 2022), (Ludlow and Wallace, 2007), and

lately they made their pioneer steps in the area of urban planning (Petkov, 2023). As a support for development of sustainable and resilient cities METAVERSE is using tools, such as augmented reality, geographic information systems, and machine learning algorithms.
As an opponent or extension of human reality, METAVERSE experiences blooming during the pandemic of COVID-19 in 2020 and 2021, mainly because it had potential to extend physical world using augmented and virtual reality technologies (Dwivedi et al, 2022). Also, it helped urban planners to enhance city services, administration and to give better overview of the pandemic circumstances in the cities worldwide.
Popularization of METAVERSE during pandemics also enhanced possibilities for public participation and direct communication between the experts (architects, planners, students and scholars) who were territorially separated due to the restrictions and curfews proposed by the local and national governments.
In the "safe space" like METAVERSE, safe communication was enabled and basically became only way of human interaction, and the possibility to enjoy actual spaces and objects, but within the virtual realm.
Virtual copies of the actual working places such as offices, universities, and even public spaces provided users the real experience of attendance and provided them secure and familiar surrounding which was of the utmost importance in the pandemic hysteria. Psychological disbalance caused by the COVID 19 of the world population (including students, experts, ordinary people) had a direct impact on the communication, interaction and participation in all of the activities, which was partially overcome by use of the METAVERSE as a parallel universe.

2 METAVERSE in urban planning

As all of the other activities, urban planning has also gone through the major changes in the last 10 years, mainly due to rapid technological improvements in all aspects of human life. Use of computer programming, GIS systems and AI an VI reality for planning became a common practice in which urban planners serves as a coordinator of different activities and not only a designers and creators of new spaces (Yaqoob et al., 2023).
Over the past decade, technological advancements have significantly reshaped the landscape of urban planning, entering the new era of innovation and efficiency. The integration of smart technologies, data analytics, and digital tools has empowered urban planners to make more informed decisions and address pressing urban challenges. One of the most notable impacts has been the emergence of smart cities, where sensors and interconnected devices provide real-time data on traffic flow, air quality, energy consumption, and more. This wealth of information enables cities to optimize transportation systems, reduce energy consumption, and enhance public safety. Additionally, the rise of Geographic Information Systems (GIS) has revolutionized the way planners analyze spatial data, enabling them to visualize and model urban environments with greater accuracy. Moreover, collaborative urban planning platforms and public engagement apps have fostered greater citizen participation, making city development more inclusive and transparent. In the coming years, as technology continues to evolve, the influence on urban planning is likely to grow, paving the way for even more sustainable, resilient, and people-centric cities.
The METAVERSE technology works through interconnected, interactive, and immersive 3D worlds where urban planners can interact with each other, attend events, hold lectures, and scientific conferences. These typically involve using VR and AR technologies to create immersive 3D environments that can be accessed through various devices, including VR headsets, smartphones, and computers (Zallio, Clarckson, 2022) (Kye et al., 2021).
With all of these technological improvements, METAVERSE came like a logical sequence of events unifying all of the functions of the new smart city within one virtual realm. Havin that in mind, there are several potential key aspects of the use of METAVERSE in the urban planning:

a) Digital Twin: The METAVERSE often involves the creation of a digital twin of a physical city or urban area. This digital twin is a highly detailed, 3D virtual replica that includes information about buildings, infrastructure, transportation networks, and other urban features (Lv et al., 2022).
b) Virtual Collaboration: Urban planners, architects, policymakers, and residents can collaborate within the METAVERSE to visualize and simulate different urban planning scenarios. This enables stakeholders to better understand the potential impacts of various development projects and policy changes.
c) Public Engagement: The METAVERSE can serve as a platform for engaging the public in the urban planning process. Citizens can explore virtual versions of their city, provide feedback, and participate in discussions about proposed changes and developments.
d) Data Analysis: The METAVERSE can integrate real-time data from sensors and other sources to provide insights into urban dynamics, such as traffic flow, air quality, energy consumption, and more. This data-driven approach can inform decision-making in urban planning.

e) Smart City Integration: As smart city technologies become more prevalent, the METAVERSE can serve as a central hub for managing and monitoring various urban systems, including transportation, energy, and public safety.
f) Augmented Reality (AR) and Virtual Reality (VR): AR and VR technologies can be integrated into the METAVERSE to provide immersive experiences for users. This can include virtual tours of proposed developments, interactive simulations, and augmented overlays on the real-world urban environment.
g) Accessibility and Inclusivity: The METAVERSE can potentially enhance accessibility and inclusivity in urban planning by allowing individuals with disabilities or those who cannot physically attend meetings to participate in the planning process.

On the other hand, in the current theory and practice some of the critical opinions and concerns can be found regarding the use of the METAVERSE in urban planning such as: (Greenfield, 2017) (Brooke, 2022) (Allam, et al. 2022)

1. **Inequality and Accessibility/ Digital Exclusivity**: The METAVERSE heavily relies on digital technology, which could deepen existing socio-economic disparities. Not everyone has equal access to the internet or the necessary devices to participate fully in the METAVERSE. This could lead to a situation where certain segments of the population are left behind or marginalized in urban planning processes.
2. **Digital Divide**: The METAVERSE could create a digital divide, where those who are tech-savvy and can navigate virtual spaces effectively have more influence over urban planning decisions. This might exclude the voices of older generations
3. **Loss of Human Connection**: The METAVERSE is inherently digital, potentially reducing the value of physical, face-to-face interactions that are crucial for fostering a sense of community and social cohesion in urban spaces.
4. **Privacy and Data Security**: The METAVERSE involves the collection and sharing of vast amounts of personal data. This raises concerns about privacy, data security, and the potential for misuse or breaches of sensitive information.
5. **Monopolization**: Large tech companies could dominate the METAVERSE, controlling access, data, and infrastructure. This concentration of power may limit competition, innovation, and diverse perspectives in urban planning processes.
6. **Digital Addiction**: An overreliance on the METAVERSE could contribute to digital addiction and a detachment from the physical world, potentially leading to mental health issues and reduced physical activity.
7. **Environmental Impact**: Building and maintaining the digital infrastructure for the METAVERSE consumes significant energy and resources, which could contradict sustainability goals in urban planning.
8. **Loss of Authenticity**: Urban planning traditionally involves physical, tangible spaces. The METAVERSE, being virtual, may lack the authenticity and tangible qualities that make real urban environments unique.
9. **Security Risks**: Virtual environments are susceptible to hacking and cyberattacks, potentially disrupting essential urban services and infrastructure.
10. **Cultural Homogenization**: The METAVERSE could encourage cultural and social homogenization, as digital platforms often prioritize certain types of content and interactions, potentially eroding the cultural diversity that defines urban areas.
11. **Accountability Challenges**: In virtual spaces, individuals and entities can often remain anonymous or pseudonymous, making it challenging to hold them accountable for their actions. This may lead to issues like harassment or malicious activities without clear means of addressing them.
12. **Real-World Disconnect**: Overemphasis on virtual planning may lead to a disconnect between the digital representations of urban areas in the METAVERSE and the real-world physical environment, potentially causing planning decisions to be out of touch with practical realities.
13. **Accessibility Concerns**: Virtual environments might not be accessible to individuals with disabilities, creating barriers to participation in urban planning for this demographic.

Incorporating the METAVERSE into urban planning holds potential benefits but should be approached cautiously, taking into account these criticisms and addressing them to ensure that planning processes remain inclusive, equitable, and responsive to the needs of diverse communities.

Studies also have identified significant areas of concern relating to ethics, data security, regulation, safety as well as the potential detrimental psychological impact for vulnerable members of society (Lee & L.-H, 2021).

The integration of the METAVERSE into urban planning presents a host of ethical dilemmas that demand careful consideration. One of the most pressing concerns is the potential for exacerbating existing inequalities within communities. As METAVERSE technologies offer novel ways to engage with urban spaces and infrastructure, there is a risk that these innovations may primarily benefit those with the means to access and navigate the digital realm. This could inadvertently exclude marginalized populations who lack the necessary resources or digital literacy to participate fully. In such a scenario, urban planners must grapple with the ethical quandary of whether to prioritize the interests of the digitally privileged or invest in strategies to bridge the digital divide, ensuring that the METAVERSE benefits all residents equitably.
Furthermore, the METAVERSE raises questions about privacy and surveillance in urban environments. As virtual and physical worlds become increasingly intertwined, the collection and utilization of vast amounts of personal data within the METAVERSE could raise significant privacy concerns (Yaqoob et al 2023).
Ethical dilemmas emerge regarding the balance between using data for urban planning and respecting individuals' right to privacy. Striking this balance requires careful deliberation to prevent the METAVERSE from becoming a surveillance tool that erodes personal freedoms. Urban planners face the challenge of implementing robust privacy safeguards and transparent data governance frameworks while harnessing the potential of the METAVERSE to enhance urban living. These ethical dilemmas underscore the critical importance of developing a METAVERSE that is not only technologically advanced but also ethically responsible and inclusive in its urban planning applications.

3 Social impact of METAVERSE in public participation

Ever since the first anti-utopian concept of the city has appeared (Stupple, 1974) (Eszeneyi, et al. 2023), the premises of the utopian city were demolished by dystopian ideas open, monitored cities which will have almost biological connection between residents and buildings.
METAVERSE concept enables all of that and goes even further in complete and accurate transformation of the actual cities in the virtual space, without giving a starting position to the residents to adapt and grow with the new born virtual city. The environment in which the 2020 COVID-19 pandemic developed only accelerated the adaptation processes and the residents were practically pushed to the new environment without knowing any advantages and disadvantages of such a system.
Some of the critics previously provided in the paper are giving an overview of potential problems of adaptation to the new METAVERSE cities, especially in terms of digital inequality generated by the lack of technical knowledge or access to the internet. Also, these circumstances could directly affect and public participation in the new born cities, which needs to be one of the basic postulates for its creation in VR (virtual reality) and AR (augmented reality).
One of the most important problems in the METAVERSE development in urban planning was lack of strategies and any guidance on the national/regional/local level which led to the rather confusion both in operational efficiency of the urban planners as well as in facilitation of communication in urban planning (Petkov 2023).
Also, public participation, as it was previously known went through serious transformation and new communication methods were starting to implement.
The practical use of METAVERSE in urban planning came in focus during the COVID-19 pandemic where new circumstances in the usual participative planning procedures demanded paradigm shift and new reconstruction of the participation process towards online spheres, instead of usual tete-a-tete cooperation. The basic principles for the adequate participation of all stakeholders in decision-making processes in pandemic conditions were the same, regardless of whether they are carried out live (offline) or on online platforms, and refer to the fact that the degree of harmonization of views is greatest if all interested parties are simultaneously engaged (Nenković-Riznić, Simonović Alfirević, 2022). Online engagements were initially met with many obstacles in the implementation, primarily related to the level of (un)familiarity with technology, psychological obstacles in active participation in decision-making in changed circumstances, as well as generalized problems arising from the impossibility of continuously holding the workshop due to technical obstacles (interruption of the Internet connection, image delay, etc.), enabling equality in time for expressing individual views, etc. All of this obstacles are the one noticed and acknowledged in the METAVERSE implementation- same problems were occured in the public participation processes organized in METAVERSE environment, but, due to the system complexity it was even more difficult and demanded all new set of behavioral patterns that must be learned for a long time, and not in a short period of time (which was the case in the COVID-19 surrounding).
The METAVERSE has helped maintain a semblance of normalcy during the pandemic and thus has become a powerful weapon for the continued collaboration of people of diverse backgrounds in urban planning.

On the other hand, METAVERSE technology had a strong social impact on the continuity of urban planning processes during the pandemics, having in mind that it is a fully immersive digital space that allows users to interact and feel the presence of a computer-generated space as if they were physically present. The users can create avatars to represent themselves and interact with other users and objects within the virtual world. (Biswas,2023)
The creation of an avatar is one of the most significant problems in interaction. Even highly educated experts (in this example, urban planners) cannot remain immune to the improvement and beautification of reality, thus creating their fictional character that should represent it worthily in the virtual space.
Beautifying reality has become a global trend that bypasses processes such as participation. In virtual circumstances, all actors become an idealized vision of themselves, and the objectivity of their views, as well as their timely response to questions that require a direct answer, can be questioned.
Due to all of the above, the question of participation in the METAVERSE environment partially loses its objectivity, which can be one of the most serious criticisms of this concept.

4 Application of METAVERSE in urban planning participation processes and learning - advantages or unfulfilled tech promise?

During the COVID-19 pandemics, METAVERSE has involved from yet another internet tool to really useful platform for exchange of ideas, knowledge and opinions in the hostile world environment.
Although the majority of users were completely ignorant in using the METAVERSE, on the other hand, it was necessary to quickly become technologically literate, because the METAVERSE offered an almost faithful alternative to real life. The sense of safety in familiar spaces, generated for users, gave much-needed hope that life could go on despite prohibitions and obvious health threats.
On the other hand, the generators and creators of those spaces were faced with a serious challenge to create faithful replicas of objects that exist in the real world in a short period of time.
This stage represents breaking point where urban planners enter the scene, who are expected to faithfully recreate real spaces and place them in virtual reality in cooperation with technological experts and the IT sector. As the final product of this work, a large number of METAVERSEs of different purposes were created that represent faithful replicas of the spaces that exist in the real world and as such enable communication most similar to one in the real world. In the METAVERSE, people can go into a virtual world and interact with their surroundings and other people (Morgan 2023). With the METAVERSE, users can access their virtual environments created for learning and participation in urban planning processes from anywhere with an internet connection, and have discussions and work together in real time. This can make it easier for people with disabilities or who live in remote areas to get an education and learn.
In the METAVERSE, users can work together on projects, participate in virtual events – meetings, conferences, learning activities, and connect with others in their field of study. This can help stakeholders feel like they are part of a group and give them the chance to meet new people and work with others.
One of the biggest challenges facing the METAVERSE is the technical infrastructure required to support the virtual world. This infrastructure must handle high levels of data transfer, support real-time interactions, and provide a stable and secure environment. There are also problems with privacy, data protection, and intellectual property rights that come with the METAVERSE. These problems need to be fixed so that the METAVERSE can be used for participation, learning and education in a safe and responsible way (Morgan 2023).
Having in mind disadvantages and advantages of METAVERSE it can be concluded that this type of interactive engagement of different groups has its potential especially in the pandemic conditions, and/or in circumstances where it is impossible to organize meetings in a short period of time, primarily due to territorial distance, but also due to other limiting factors (Picture 1)

Picture 1. Virtual meeting organized in METAVERSE

Source: https://diginomica.com/meta-brings-vr-business-meetings-enterprise-gateway-METAVERSE

5 Analysis of METAVERSE – impressions of the survivor

METAVERSE was widely spread as the most desirable way of communication (although it was not developed for that purpose) during 2020., 2021. and even 2022. after post-covid crises all around the world, since travelling to distant countries was banned due to different levels of restrictions.
New surroundings were born and developed, forming a parallel universe in which all activities were maintained according to earlier habits.
World universities organized lectures in faithful replicas of their rooms, amphitheaters and classrooms, easing the already too difficult situation for students, caused by COVID--19. In the new METAVERSE, in addition to lectures, universities also organized conferences on various topics. One of these conferences was the WASTE TO ENERGY workshop organized in November 2022 by Zheijang university in Hangzhou, China. The conference lasted for 2 weeks and with participation of more than 40 experts from the third world countries, mostly from Africa.
The conference and workshop were organized via zoom, with the main event organized in the METAVERSE environment.
None of the participants had previous experience in METAVERSE, although they were technologically fully educated and had adequate infrastructure that supported their attendance.
Before the main event, where all of the participants should attend the conference in METAVERSE and to present their work, an additional education was organized for the experts, where they learnt how to manage in the virtual space, learnt how to walk, talk, and how to operate their avatar. Each participant got his own avatar, whose facial expressions were operated by the person behind the camera. It gave new perspective to the virtual reality concept, since the avatar really got the personality of the person who operates them (Pictures 2a-c)

Picture 2. Avatars of the experts on the final conference of WASTE TO ENERGY WORKSHOP

a) b) c)

Source: Author

Participant-driven avatar had wide range of possibilities for communication with other participants through video calls, chat, gestures, exchange of the business cards etc.
The architecture of the university building was completely replicated with all the details of the object. Participants had to opportunity to visit virtual exhibition of the best works of the university students and also to have a very vivid experience in communication with the colleagues, almost like in the real world. Also, the mentioned method of communication enabled greater intimacy between the large number of participants who

also attended other social events, apart from the conference itself (awards awarding, celebration of the end-of-conference and awarding of diplomas, etc.)
Technical obstacles have sometimes made a minor problem, but all things considered – METAVERSE experience is not nearly as unpleasant as critics of this concept elaborate in their work.
Main obstacles observed in this experience are related to the difficulties in learning to perform basic operations in the METAVERSE (walking, sitting, navigation in space and surrounding), as well as problems caused by internet communication breakdowns that can greatly detract from a positive experience.

6 Conclusion

The concept of the METAVERSE holds tremendous promise for reshaping the way we participate in urban planning. As our cities continue to grow and evolve, the need for more inclusive, collaborative, and innovative approaches to urban planning becomes increasingly apparent. The METAVERSE, with its immersive and interconnected digital environments, offers a unique opportunity to bridge the gap between citizens, urban planners, architects, and policymakers.
By allowing individuals to engage in virtual representations of their cities, the METAVERSE can democratize the planning process, enabling a wider range of voices and perspectives to be heard. It has the potential to break down physical barriers, making participation more accessible to those who may have been marginalized in traditional urban planning processes.
Moreover, the METAVERSE can serve as a powerful tool for visualizing and simulating different urban design scenarios, helping stakeholders make more informed decisions. This technology can facilitate real-time feedback, fostering a sense of community ownership over the urban environment.
However, it's important to acknowledge that the successful integration of the METAVERSE into urban planning will require careful consideration of privacy, security, and equity concerns. As with any transformative technology, there are challenges and risks that must be addressed to ensure that the METAVERSE enhances rather than diminishes the quality of urban life.
On the other hand, initiatives for better technological knowledge are more than welcome to overcome initial ignorance that can slow down the process, as well as improvement of technical infrastructure.
In conclusion, the METAVERSE has the potential to revolutionize urban planning by promoting inclusivity, enhancing collaboration, and providing innovative tools for decision-making. Even though there's a possibility the METAVERSE may not succeed, it's safe to say that another technology will soon follow holding a different promise. Embracing this technology thoughtfully and responsibly can lead to more sustainable, vibrant, and livable cities in the future. It is essential for urban planners, policymakers, and citizens to work together to harness the full potential of the METAVERSE in shaping the cities of tomorrow.

Acknowledgements: The funds for the research presented in this paper were provided by the Ministry of Science, Technological Development, and Innovation of the Republic of Serbia, registration number: 451-03-68/2023-14/200006.

References

Allam Z., Sharifi A., Bibri S.E., Jones D.S, Krogstie J. (2022), The Metaverse as a Virtual Form of Smart Cities: Opportunities and Challenges for Environmental, Economic, and Social Sustainability in Urban Futures, Smart Cities 2022, 5(3), 771-801; https://doi.org/10.3390/smartcities5030040
Artaud A. (1938), , The Theater and its Double, Grove Weidenfeld, New York
Biswas S. (2023), Impact Of METAVERSE Technology: An Explanation And In-Depth Guide, https://elearningindustry.com/impact-of-METAVERSE-technology-an-explanation-and-in-depth-guide, accesed on 11th September 2023
Brooke S. (2022), The metaverse: city planner's dream or urban nightmare?, https://www.raconteur.net/technology/metaverse-planners-dream-urban-nightmare, accesed on 11th September 2023.
Dorostkar E., Najarsadeghi M. (2023), Sustainability and urban climate: How Metaverse can influence urban planning?, Environment and Planning B: Urban Analytics and City Science, OnlineFirst, https://doi.org/10.1177/23998083231181596
Dwivedi, Y. Hughes L., Baabdullah A., Ribeiro-Navarrete S., Giannakis M., Al Debei M., et al (2022), *METAVERSE beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy*, International Journal of Information Management, Vol 66, October 2022, 102542

Eszeneyi R., Bednarova-Gobiva K., Edina R., (2023) Artificial Intelligence, Machine Translation & Cyborg Translators: A Clash Of Utopian and Dystopian Visions, Orbis Linguarum, Vol 21, Issue 2, DOI: https://doi.org/10.37708/ezs.swu.bg.v21i2.13

Gent, E. (2022), *Lessons from a second life> before meta, philip rosedale created an online universe,* IEEE Spectrum, 59 (1) (2022), p. 19

Greenfield A. (2017), Radical technologies: The design of everyday life, Verso, ISBN-10 : 178478043X

Joshua J., (2017), *Information Bodies: Computational Anxiety in Neal Stephenson's Snow Crash*. Interdisciplinary Literary, Studies, 19 (1), pp. 17-47

Kye B., Han N., Kim E., Park Y., Jo S. (2021), Educational applications of metaverse: possibilities and limitations, J Educ Eval Health Prof 2021;18:32, DOI: https://doi.org/10.3352/jeehp.2021.18.32

Lee, T. Braud, P. Zhou, L. Wang, D. Xu, Z. Lin, …, P. Hui, All one needs to know about METAVERSE: A complete survey on technological singularity, virtual ecosystem, and research agenda, arXiv, 2110 (2021), p. 05352,

Ludlow P, Wallace M. (2007), *The second life herald: The virtual tabloid that witnessed the dawn of the METAVERSE*, MIT press

Lv Z., Xie S., Li Y., Hossain M.S., El Saddik A., (2022), Virtual Reality & Intelligent Hardware, Volume 4, Issue 6, December 2022, Pages 459-470, https://doi.org/10.1016/j.vrih.2022.06.005

Morgan R. (2023), How The METAVERSE Impacts The eLearning Industry, https://elearningindustry.com/how-the-METAVERSE-impacts-the-elearning-industry, accesed on 12th September 2023

Petkov M. (2023), *Exploring the potential of the METAVERSE in urban planning,* https://landvault.io/blog/METAVERSE-urban-planning, accesed on 3rd September 2023.

Stephenson, N. (1992), *Snowcrash,* New York, Bantam books

Stupple, J. (1974) Towards a definition of anti-utopian literature, CEA Critic, Vol. 37, No. 1, A CEA CHAP BOOK: Science Fiction: The Academic Awakening (November 1974), pp. 24-30

Yaqoob I., Salah K., Jayaraman R. Omar M. (2023), Metaverse applications in smart cities: Enabling technologies, opportunities, challenges, and future directions, Internet of things vol 23., https://doi.org/10.1016/j.iot.2023.100884

Zallio M., Clarkson P.J. (2022), Designing the metaverse: A study on inclusion, diversity, equity, accessibility and safety for digital immersive environments, Telematics and Informatics 75 101909

CLIP and the City: Addressing the Artificial Encoding of Cities in Multimodal Foundation Deep Learning Models

Dario Negueruela del Castillo, Iacopo Neri
Digital Visual Studies, University of Zurich
dario.negueruela del castillo@uzh.ch
iacopo.neri@uzh.ch

Abstract: In this project, we propose and explore a computational pipeline to examine urban cultural landscapes through the lens of artificial intelligence, and for questioning modes of embedding culture in machine learning models. By employing machine learning models that extract features and textual properties from images, we aim to uncover the connections between a city's history, architecture, and urban development. The city of Rome serves as a significant case study for this research.
To achieve this objective, we feed 360° panoramic images into large vision-language models (e.g. OpenCLIP), to question how mainstream culture is expressed in these models. In this machine-triggered urban experiment, we investigate overlaps between history and machinic interpretation and whether relevant temporal correlations can be captured through generic street images only. Finally, by spatially analysing the captured data, we identify clusters and discontinuities in the urban layout aiming at visually depicting the interplay of forces behind its development.
As in a forensic exercise, the paper seeks to uncover the complex social and historical dynamics of urban environments, exploiting only contemporary images of their settings and a generic embedding of culture. It explores potential cultural biases embedded in machine learning models by comparing Rome - culturally relevant for the western world - with other cities around the world; leveraging innovative computational pipelines and globally covering datasets to provide a novel research line for urban studies.

Keywords: AI, Urban Studies, Multimodality, Computational Mapping, CLIP

1 Introduction

Cities are crucial man-made environments. Sites of cultural and economic innovation, they are also dynamic and living iconic repositories of memory and identity. Moreover, cities populate our dreams of futures to either cherish or avoid.
On the other hand, cities have long exceeded human control or comprehension, operating according to their own complex rhythms and logics. As Henri Lefebvre observed, the urban constitutes an autonomous force that cannot be fully grasped through traditional categories like the political, economic or social (Lefebvre, 2003). Rather, as Read argues, cities emerge through infrastructures that gather and distribute heterogeneous elements, translating global virtualities into local actualities (Read, 2013).

Figure 1 Process image for multimodal urban studies

In this light, we propose a computational pipeline for investigating the cultural landscape of cities through machine vision (Figure 1). By feeding panoramic images into multimodal models based on CLIP (Contrastive Language-Image Pre-training), we explore alternative applications for such technology in the field of urban studies, simultaneously questioning the extension to which images alone can be representative of urbanity and revealing how these models embed cultural assumptions or biases. Questions of cultural identity, architectural history, urban economics are addressed among others to test the performance of the model in disparate fields and, consequently, to question its universal application. Beyond a mere theoretical exercise, this becomes

relevant in light of the operational image, as discussed by Farocki (2004). Serving as the knowledge base for an increasing number of Machine Learning models, CLIP architectures possess the potential to directly influence real-world contexts through its visual preferences, finally deserving extensive consideration. Crucially, this experiment views the city not as a bounded human artefact, but as a provisional point of articulation in flexible networks, continuously remade over time. The models extract visual features and textual properties, but miss the unseen continuities that pattern individual lives, as Read describes (2013). By spatially analysing the captured data, we seek to identify clusters and discontinuities expressing the interplay of forces behind the development of the city under study.
Our approach goes beyond surface appearances to probe the virtual centralities that precede and make visible place possible. It conceives the urban as a found world, appropriated and reworked, rather than a fixed social construct (Massey, 2005). As such, it promises novel perspectives on entrenched assumptions regarding culture, history and technology, opening and sketching a new direction for the study of cities.

2 Background

Cities are where we spend most of our lives and therefore our visual environment - the imagerial background if you wish - to our lives. So, what can we learn from looking at its appearance beyond questions of architectural style and urban form? Can the image of cities be a synthetic testimony to its underlying social and spatial processes and logics? This type of inquiry only emerged strongly in the second half of the XX century when key urban scholars witnessed and addressed rapidly changing urban landscapes. Their pioneering contributions still inspire contemporary studies, providing an evolving and adaptable source of knowledge and tactics, which deserves a concise summary.

2.1 Seeing the City

In postwar central Europe, members of the Internationale Situationiste, influenced by avant-garde movements like Dadaism, developed creative practices for critically engaging with urban space, including the *dérive* (drifting subversively through the city) and practices of detournement to subvert the spectacle of consumerist landscapes. Deeply compelling, their daring and visionary methods and interventions - despite limited in scale and continuity (Plant, 1992) - remain a source of inspiration for addressing how the atmosphere and the mental geography or psychogeography impact our behaviour and spur us on to the continued exploration of alternative approaches for studying the city.
It is however since Kevin Lynch's pioneering work in "The Image of the City" (1960) that urban scholars have increasingly turned to visual and sensory methods for studying the complex life of cities in a more scientific manner. Lynch examined how residents perceive urban environments through *mental maps* oriented around paths, edges, districts, nodes and landmarks. While providing insights into urban navigation and design, however, Lynch's approach has been critiqued for focusing excessively on physical forms over social processes behind the cityscape (Tonkiss, 2013).
Jane Jacobs expanded sensory approaches in "The Death and Life of Great American Cities" (1961), advocating first-hand observation of neighbourhoods as key resources for urban studies. She valued the messy vitality of the street and its complex intermingling of uses and users, not without receiving criticism. Her pioneering contribution, seen as romanticising urban diversity, has been questioned for ignoring exclusionary dimensions beneath surface-level mixing (Brenner et al., 2012).
Influenced by Marxist philosophy, Henri Lefebvre conceived of space as produced through recursive interactions between social relations, ideologies, and physical form. In "The Production of Space" (1991), Lefebvre highlighted how spatial practices and built environments shape everyday urban life. Lefebvre's social theorization of space inspired extensive scholarship specifically on key concepts of spatial justice and right to the city, though some argue it overemphasised abstract domination over human agency (Soja, 1996). A little later, in "The Practice of Everyday Life", Michel de Certeau (1984) examined how residents tactically reappropriate urban spaces through subversive pedestrian practices like walking, eluding visual capture by institutional strategies of control. However, critics argue de Certeau romanticises individualised resistance in the absence of larger structural change (Buchanan, 2000). Yet afterwards, Sharon Zukin vividly illuminated connections between culture and the urban political economy in "The Cultures of Cities" (1995), studying how public debates over architecture, gentrification and aesthetics shape urban identities. Her positions have been accused of overstating causal claims regarding the cultural impact of deindustrialization (Ley, 1996).
While varying in approach, these perspectives collectively demonstrate how cities take form and meaning not just through material structures but also through contested fields of vision, imagination, spectacle, strategy, and representation. The urban landscape condenses social histories and relations, requiring contextualised visual

analysis to unpack. However, limitations around structure versus agency, romanticization, scale, causation, and intersectionality ought to be addressed.

2.2 The Computational Eye

In parallel, a much more quantitative approach was paving the way for groundbreaking technologies and city scale disaster. Seminal works like the one of William H. Whyte, particularly in his 1980's book "The Social Life of Small Urban Spaces", laid the foundation for empirical urban studies through meticulous first-eye observations, and consolidated the relevance of data gathering to comprehend and effectively manage urban areas (Whyte, 1980). Despite providing an effective and replicable method to analyse human-space interaction, Whyte's approach required spending countless hours in public spaces, meticulously recording and annotating, and soon was no longer viable at scale (Batty, 2013).

As time marched on, the birth of data science and novel developments in computing technologies brought an ever increasing attention to data in all fields of application, and the urban realm was not an exception (Batty, 2013; Kitchin, 2014). Occasionally culminating in tantalising concepts like the one of *smart cities*, the promise of data in optimising complex urban environments has been driving economic interests in city planning for decades (Greenfield, 2013). Around the turn of the 21st century, cities all over the world seemed impelled to start implementing IoT technologies, from sensors to monitor air quality and traffic to CCTV cameras for security reasons, fostering a global digital-oriented transformation and literally becoming city-scale information systems (Batty, 2013). While proven insufficient in inherently leading to a conclusive understanding of urban life due to heavy reliance on corporate interests, and issues of data ethics and privacy, these experiments offered fertile ground for data analytics to thrive (Greenfield, 2013; Kitchin, 2014).

In the midst of growing scepticism towards the smart city concept, a glimmer of optimism emerged in the form of computer vision models. These state-of-the-art technologies held the potential to harness advanced algorithms and machine learning for facilitating visual observations (Zhu et al., 2017). In contrast to human observers, computer vision models operated without the constraints of time, rendering them a formidable instrument for scrutinising public spaces (Naik et al., 2014). Nevertheless, despite their considerable potential, these models had their own set of limitations. State of the Art vision models (e.g. YOLO[1]) excelled in tasks like object detection and enumeration (Redmon et al., 2016), yet they struggled to encapsulate the nuanced social, cultural, and contextual aspects that shape the tapestry of urban life (Gebru et al., 2021). Finally, urban studies stand at an intriguing crossroads, as qualitative and quantitative approaches have each unveiled relevant structuring facets of cities, yet both retain certain limitations (Brenner, 2013; Jacobs, 1961). However, the emergence of multimodal AI models signals a profound shift in analysing intricate urban complexity (Saxena et al., 2022). These models integrate the strengths of existing methods while mitigating singular limitations, as they offer a new promise for computationally deciphering cities through a fusion of data-driven precision and nuanced understanding (Young et al., 2022).

§The computational eye, with its quantitative computational urban analysis has significantly expanded the understanding of physical urban dynamics, from flows to formations (Batty, 2013). However, purely data-driven approaches often overlook nuanced cultural, social, political aspects that are constitutive and crucial to urban life (Jacobs, 1961). Conversely, influential qualitative perspectives from scholars like Jane Jacobs and Henri Lefebvre have timely illuminated experiential and sociological urban complexity, but they nevertheless encounter challenges of scale and discourse-dependent subjectivity (Brenner, 2013).

In the next chapter, we delve into this transformation as we introduce the advent of the multimodal CLIP neural network and conduct an inquiry into its capacities for understanding urban environments. The model's ability to process extensive datasets, coupled with its potential capacity to interpret some of the multifaceted nature of cities, positions it as a crucial candidate in the quest to unravel urban research.

2.3 The Emergence of Multimodal Foundation Models

From 2018, following the introduction of BERT[2], AI has been undergoing a paradigm shift with the rise of the so-called foundation models (Bommasani et al., 2021), trained on large, broad datasets, which enables them to be adapted for a wide variety of downstream tasks. The term *foundation model* underscores how these models have become a fundamental building block in the modular stack of many AI systems.

The development of these models is enabled by a method called *transfer learning*, which allows models pre-trained on broad data to transfer knowledge to specialised tasks. It is the scale of data and model size is what gives foundation models their powerful capabilities. The concept originated in natural language processing (NLP)

[1] See https://github.com/ultralytics/ultralytics

[2] See https://github.com/google-research/bert

with influential models like BERT and ChatGPT demonstrating the potential and stimulating the development of similar models such as SimCLR (Chen et al., 2020a), MoCo (He et al., 2020), BEiT (Bao et al., 2022), and MAE (He et al., 2022a). In recent years, the foundation model paradigm has gained traction, expanding beyond NLP to computer vision and other domains. As models are trained on ever-growing data at ever-larger scales, foundation models have become a centralised pillar of machine learning while still requiring further specialisation for more task-specific applications.

Multimodality, with its fusion of data-driven computational power and nuanced qualitative understanding, offers a tantalising prospect as "a new kind of telescope and microscope" for understanding multifaceted phenomena (Manovich, 2017, p. 332). Multimodal models aim at synthesising the dualism quantitative/qualitative, leveraging vast data analysis while inferring nuanced human contexts (Saxena et al., 2022)[3]. Their agnostic nature circumvents preconceived biases that can limit human analyses (DeVries et al., 2022). Specifically, the Contrastive Language-Image Pre-training (CLIP)[4] model developed by OpenAI in the early 2021, demonstrates unique potential to computationally decipher urban environments through integrating language and visual data (Radford et al., 2021). Moving beyond siloed inputs, CLIP's dual encoders unlock new capacities to process extensive heterogeneous urban data while interpreting complex cultural contexts (Gabriel et al., 2022).

3 Multimodal Urban Studies

To address the performance of CLIP models for urban studies, we set up an experiment potentially replicable for any context around the world. Leveraging globally covering street image datasets like Google Street View, we work under the premise that observational data captured in public spaces in the form of panoramic images can act as a proxy for deeper urban dynamics. By comparing several locations within a city against a series of labels or terms via OpenCLIP[5], we aim at a distant reading of the public space mediated only by its culturally biassed training dataset[6], therefore agnostic enough to be applicable for different research questions. Compared to other studies involving CLIP models, the innovation of the proposed methodology lies in the consequent spatialization of the inferred evaluations, which are read at a city scale and provide a novel perspective that possibly highlights recognizable concentrations in the form of clusters or patterns. As a consequence, the city is considered not as a constellation of punctual events but an intertwined patchwork of styles and layers.

In this regard, many are the aspects that are being questioned through this experiment - currently serving more as a replicable manifesto than a severe methodology, - from established knowledge on cities, to the machine learning model involved and their urban imaginaries. Embracing a reflective practice, in the best tradition of urban studies, the aim of this exercise is not to find an optimised answer, but, instead, to trigger better questions.

3.1 Encoding Process and Urban Imaginaries

The encoding process within CLIP is akin to many deep learning models that learn to recognize patterns, relationships, and correlations within data through a process known as feature extraction (LeCun et al., 2015). As the model processes the myriad images of urban landscapes and their accompanying textual descriptors, it engages in a complex multi-dimensional mapping. The data is mapped onto a high-dimensional latent space where proximity denotes similarity in features or characteristics (Goodfellow et al., 2016). The dimensions of this latent space could potentially capture a multitude of facets of urban life such as architectural styles, spatial configurations, or socio-cultural interactions. Over time, this encoding process distils the essence of urban imaginaries into a multi-dimensional construct, creating a rich, albeit abstracted, representation of urban spaces (Zeiler & Fergus, 2014).

The latent space within CLIP serves as a digital mirror, reflecting the collective urban imaginaries encapsulated in its training data. Mircea Eliade, posited that cities are physical manifestations of a society's cosmology (Eliade, 1957); and in a similar vein, the latent space of CLIP reflects the digital cosmology of urban spaces as captured in the training data. This, however, is not a mere replica but a filtered and distilled representation (Bengio et al., 2013). The diversity of architectural styles, the rhythm of urban layouts, and the dynamism of socio-cultural interactions find a machinic abstract representation within the latent space. The range of urban narratives, from

[3] Even if they are, in our opinion, currently far from the structured and articulated complexity required for in-depth qualitative analysis.

[4] See https://github.com/openai/CLIP

[5] Open source model based on OpanAi's CLIP. See https://laion.ai/blog/large-openCLIP/

[6] Which consists of unfiltered, highly varied, and highly noisy data, publicly available on the internet. See https://openai.com/research/CLIP. This set arguably originated in the Common Crawl. For reference the latest crawl dating June 2023, is 390 TiB. see https://commoncrawl.org/overview

the sprawling territorial urbanity to the dense metropolises, is encoded in a manner that can be navigated and explored algorithmically (Zheng et al., 2019). The abstracted representations within the latent space can be perceived as a form of computational phenomenology, where the essence of urban experiences is captured and encoded (McCormack et al., 2019)

3.2 The computational pipeline

Technically, for the assessment of CLIP models' multifaceted and debated urban comprehension, we present in the following a Python-based computational pipeline. Organised around two main sections: setup and assessment, the pipeline automates the collection of observational data for the urban context under study, and consequently runs visual assessments at street scale against given prompts to finally plot the results into a map (Figure 2).

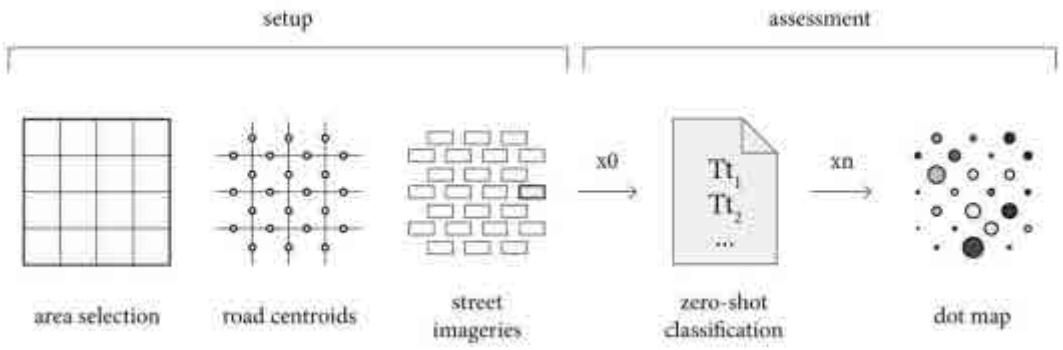


Figure 2 Diagram of the computational pipeline for multimodal urban studies

Point of the departure for any study, the setup phase is responsible for the creation of the imagerial dataset that becomes the primary synthetic representation of the analysed city. Aiming at maximising replicability, it permits comparison studies between contexts towards both inter-cities assessments as well as inter-cultural evaluation of OpenCLIP. In this regard, two main data sources are exploited to avoid issues of availability of local data:

- OpenStreetMap (OSM)[7]: to geocode a location via the Nomatim tool, and to retrieve a vectorial base layer of the road network
- Google Street View (GSV)[8]: to access street level panoramic images for the coordinates extracted via OSM

As roads become the preferred entry points from where to look at the city, the pipeline takes advantage of the OSMnx library[9] that not only dynamically accesses OSM data but also provides a flexible toolkit to clean and prepare street networks. An initial representation of the urban context is obtained via the *graph_from_place()* function subfiltered on the *primary, secondary, tertiary, residential,* and *pedestrian* categories. Consequently, using the GeoPandas[10] library for geospatial data manipulation, the network is reduced into a collection of representative locations lying at the centroid of each segment and waiting to be filled with panoramic images via the Google Street View Static API[11].

Once the setup is over and the imagerial database is created, the visual assessment with OpenCLIP can begin. The sole input here being a set of labels, properly processed into textual prompts, as the methodology leverages the application of CLIP models for zero-shot classification. Technically, this implies the ability of the model to classify unseen images into unseen categories by simply generalising from its prior learning, having embedded both the image and the prompt. By evaluating cosine similarity for each image against all prompts, the most relevant pairs are possibly inferred without need for fine-tuning. For the case study introduced in this paper, extensive label sets for "cities" or "architects" are iteratively introduced in prompts like "a panoramic street image of {city}" or "a panoramic photo of a street designed by {architect}" to investigate different scenarios.

Lastly once each image has been processed, the most pertinent labels alongside the model's similarity scores are geospatially mapped into their original coordinates. Resulting in a dot map where colours and radii are

[7] See https://www.openstreetmap.org

[8] See https://www.google.com/streetview/

[9] See https://osmnx.readthedocs.io/en/stable/

[10] See https://geopandas.org/en/stable/

[11] See https://developers.google.com/maps/documentation/streetview?hl=it

respectively representative of labels and scores, the final output provides an additional lens to read the model's evaluations that goes beyond the correctness of the single assessment, in favour of the collective pattern emerging from the underlying spatial distribution.

3.3 Rome seen through CLIP

How would then a multimodal foundation model, with its limitations as a general learner trained on the mainstream popular culture of the internet, see and characterise Rome? Avoiding the futility of asking for very precise or fine-grained questions, which also risk being irrelevant in the face of the large and multifaceted urban phenomenon, we choose to approach the inquiry through a set of questions that involve a more or less clear thematic polarity, as to explicitly reflect valorisation of urban appearance by the model. In this regard, we depart from a simple scoring approach to later evaluate classification tasks with standardised taxonomies. Finally, we conclude with two provocative experiments to support everlasting questions on the identity and culture of cities. Before we begin with the assessments, however, it is important to contextualise Rome within the framework mentioned above. Spanning over an area of 1.284 km^2, Rome offers an incredibly rich and varied context within its municipal boundaries where centuries of developments have endured. For the purposes of this paper, nonetheless, a case study is created in relation to its historical core area only, more precisely the Rioni on the eastern side of the Tevere river. Here, an initial street network is accessed in the form of 7.143 street segments and separated from 4.454 segments of *footways* and *trackways*, generally unequipped with GSV data. This is further reduced into 4.157 locations where proximity between centroids is less than 20 metres, to obtain a satisfying balance in the results between resolution and relevance. Thus, the panoramas collected represent a wide array of urban features, spanning from iconic architectures to less trafficked alleys, and collectively provide an image of a *real* Rome that goes beyond the solely tourist attractions.

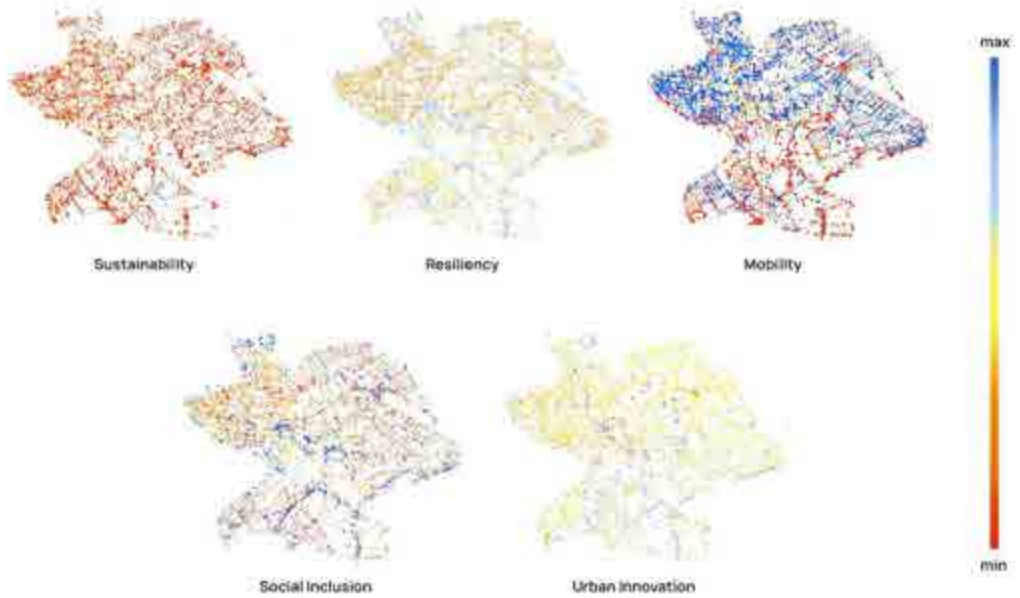


Figure 3 Dot maps resulting from the scoring evaluation for the topics of Sustainability, Resiliency, Mobility, Social Inclusion, Urban Innovation. Colours and radii are respectively showcasing the most pertinent performance labels and the similarity scores with which the model assessed them.

We begin our enquiry following a simple scoring logic aiming at assessing key performance indicators for sustainable urban development. Taking inspiration from international reports on innovative practices for city planning[12], five label sets ranging in five degrees from low to high performance are produced around the topics of: sustainability, resiliency, mobility, social inclusion and urban innovation. The results (Figure 3) reveal a remarkable diversity in the area under study, both within each indicator as well as in their cross-reading, and preliminarily prove the applicability of the approach. This becomes particularly relevant when considering the resulting spatial distribution, which clearly escapes pure randomness. In this regard and acknowledging decades of visual urban studies, Rome is undoubtedly best understood through the experiment as a multi-layered

[12] See the thematic tracks of the European Commission's Intelligent Cities Challenge (ICC), https://www.intelligentcitieschallenge.eu/

tapestry of urban features, rather than an arbitrary constellation of isolated events. On the other hand, it is important to ponder on the wide spectrum that the adopted terminologies embrace as they function like guidelines for policymakers to initiate decision-making processes, and not like specific, granular analysis. Thus, further experiments are warranted to confirm the validity of each chapter in the stance of supporting serious policy frameworks; more specifically in regard to the adopted labels and the process of prompting, which solely derived from the authors' understanding of the subject.

Precisely the latter issue becomes a matter of investigation for a following experiment where the label set is extracted from a standardised taxonomy. Exploiting the CORINE Urban Atlas Land Cover/Land Use[13] categories, we evaluate the capability of the model to infer the land use patterns, bridging ground-level observations with established terminologies used in environmental studies. Answering the call for a consistent and comprehensive dataset to map land across nations, the CORINE (Coordination of Information on the Environment) program provides a successful example of land monitoring service at the European level that has been producing large-scale and comparable land cover, biotope, and air quality maps since the early 1990s. Among the highest resolution outputs that have been developed, the Urban Atlas is a metropolitan scale dataset covering 788 cities[14] at the finest scale of 0.25 ha. Adopting the same taxonomy but exploiting street-level images instead of satellite ones, the study aims to provide an alternative lens to discuss these datasets toward the goal of ubiquitous replicability. Additionally, and in line with traditional land use maps, the results are aggregated into a coarser grid that leaves no void within the area under study and highlights the most recurrent labels among close locations. Once again, the main focus of the study is shifted from the single evaluation to its collective distribution as two clear polarities emerge between the southern and the northern sections of the area, respectively under the *other roads and associated land* and *continuous urban fabric* labels. Hinting at a diffused difference in the current facades, urban furnitures, and usages of the area, these results are tangentially aligned with the administrative subdivisions of Rome - the Rioni - and might be representative of deeper historical conditions. Amidst the remaining cells escaping the above-mentioned two labels, the area of Roma Termini's train station gets interestingly classified as a port area, triggering a promising quantitative point of departure for future studies on non-places (Augé, 1992).

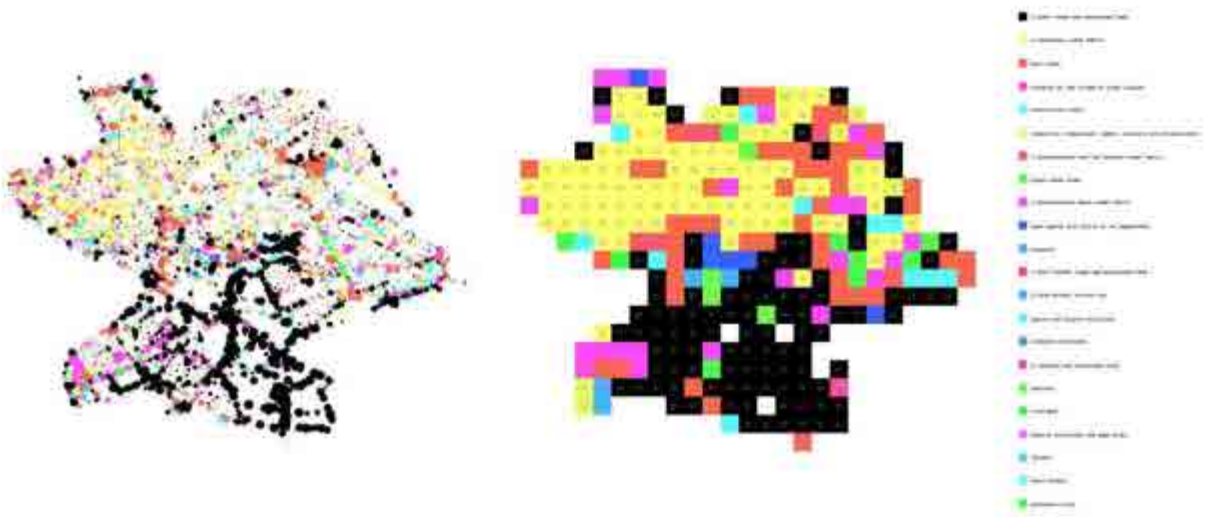


Figure 4 Results of the classification task using the Corine Land Cover taxonomy. The image illustrates the process of resampling with the values being aggregated into a coarser resolution. Similarity scores are not considered for the resampling, which only evaluates the occurrences of each label

[13] See https://doi.org/10.2909/fb4dffa1-6ceb-4cc0-8372-1ed354c285e6

[14] Precisely, the dataset refers to Functional Urban Areas as the urban area resulting from aggregation of a city and its commuting zone. Functional urban areas therefore consist of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city. See https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Functional_urban_area#:~:text=Short%20definition%3A%20a%20functional%20urban,city%20(OECD%2C%202012)

Contrary to the application-focus we have discussed until now, a more sophisticated question arises in the following section where architects and cities are evaluated against the synthetic representation of Rome to shed a light into OpenCLIP's cultural understanding. Serving as profound cultural proxies, we argue that architects and cities are ideal labels for the discussed methodology, as they encapsulate intricate relationships with the urban, simultaneously bearing an intimate connection to the aesthetics and visual characteristics depicted in the panoramic images.

Thus, we decided to query the model for confidence in associating the panoramas with a selection of 211 Italian architects[15]. Spanning centuries and from different regions of origin, the results show Mattia De Rossi (1637-1695, Rome), Aloisio the New (XVI century, probably Venetian or Lombardian but worked mostly in Crimea and Russia), and Florestano di Fausto (1890-1965, Rome, epitome of Italian colonial architecture), achieving the three highest scores overall (Figure 5). Agreeably, this assigns a baroque architect to majorly represent the core of Rome, yet surprisingly not the most notable one. Moreover, a puzzling behaviour emerges at a deeper look, as Mattia De Rossi - despite being the most recurrent choice - is also overall reported with very low similarity scores. We therefore believe the label Mattia De Rossi to be an entry point for the exploration of the Rome that lies in the backstage of its monumental and iconic architectures, as he seems to encapsulate the undefined complexity of fuzzy contexts, seamlessly unrelatable to other well-known architects[16].

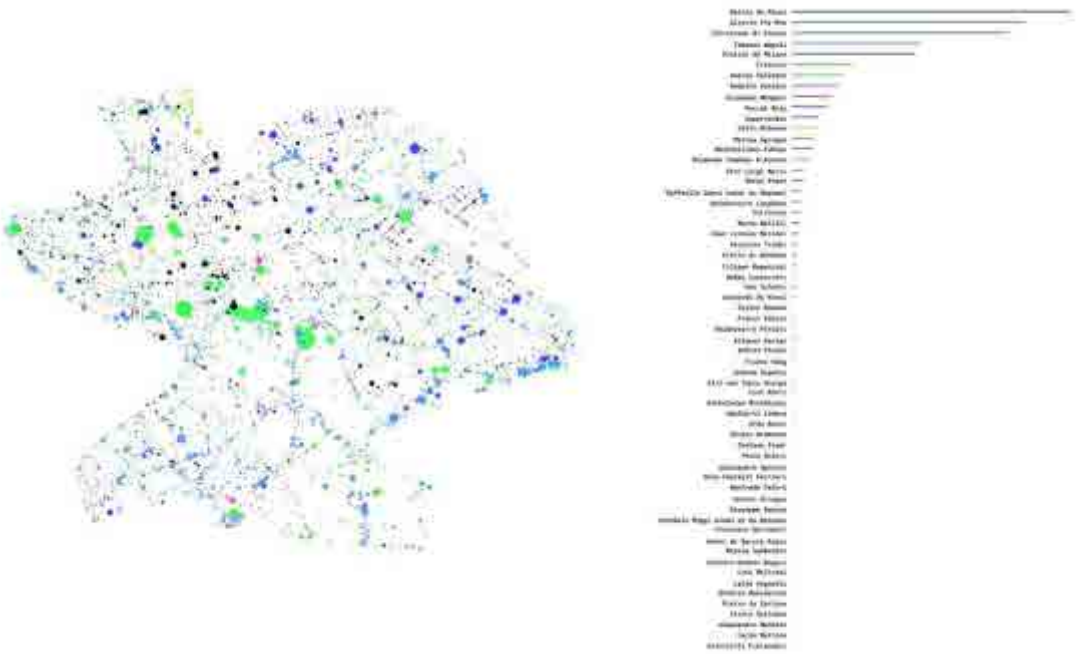


Figure 5 Dot map showcasing the distribution of the most identified Italian architects. Mattia de Rossi is the only entry reported in black while the radii are in function of the similarity score given by the model. On the right, a bar chart shows the values distribution.

Along the same line, a multiscalar study is carried out to position Rome in the global worldview of OpenCLIP. Beginning with a comparison of Rome to other Italian provinces, we gradually enlarged our focus to include European capitals and, ultimately, world capitals (Figure 6). The results show an indicative performance as the model struggles to correctly identify Rome in relation to the Italian provinces (achieving 18th place), to suddenly reach a consensus at the European scale (achieving 1st place) that is only maintained at the global scale if aggregated with the Vatican City label (their sum achieving 1st place). Interestingly, this offers a parallel with human perception as discerning Rome within the Italian context can be said to be a much more challenging task than compared with further distant contexts and permits cross-scale studies to precisely pinpoint views of Rome that can be arguably recognized as its mainstream image.

[15] For the sake of transparency and replicability we took the list of Italian architects that features in Wikipedia, in its version from March 2023.

[16] As if Mattai de Rossi would have become CLIP's proxy for 'generic Romeness'.

Figure 6 Results of the multiscalar evaluation of Rome compared to 109 Italian provinces (left), 44 European capitals (centre) and 241 world capitals (right). Rome and the Vatican City are the only results reported in black.

4 Discussion

Our spatialized application of a CLIP model to urban images provides several intriguing initial results that demonstrate the promise of this approach while raising critical questions for further inquiry. Thematic mapping of model outputs reveals distinct spatial patterns of perceived urban qualities, suggesting CLIP embeddings encode certain logic around geographical variations in cityscape character. However, we observe potential gaps between computational assessments of Rome by OpenCLIP and established qualitative knowledge. If this stems from training data biases toward more contemporary materials and aesthetics, it remains to be tested. This underscores the need to critically examine how such systems conceptualise notions like cultural heritage and character.

The computational eye we put in place discerns patterns at scale that elude the human gaze, unveiling the essence of ordinary urbanism encoded across countless fragments. Results seem to suggest that the city becomes legible, and most importantly, comprehensible in its complexity not through spectacular skylines or iconic monuments, but through the constant landscape of mundane streets and urban tissue. This attempt at penetrating this generic realm underscores AI's capacity to potentially decode cities in the aggregate rather than as constellations of landmarks.

This computational discernment of the urban generic represents a major divergence from past lenses that privileged the monumental over the mundane. It also contrasts with critics like Lewis Mumford who decried "formless masses of urban residues" of modern cities lacking intentional design (Mumford, 1961). The capacities of general learner foundation models like CLIP and OpenCLIP, however, provide renewed attention to the cumulative legibility and qualities of ordinary urban fabrics. Their data-driven apprehension of the generic city promises new perspectives on urban form and experience. Through intentional, and critical application, multimodal models like CLIP may reveal new insights into ordinary urbanism, provided their limits are acknowledged.

In any case, a critical lens and contextualised interpretation are vital to unpack the cultural logics and biases encoded in AI's worldviews. We therefore want to affirm approaching computational urbanism critically rather than reductively. Treating urban data as *transparent* risks a naive technocratic solutionist approach to complex phenomena that exceed computational capture. Critical perspectives are vital for examining what insights computational techniques provide, but also what they inevitably exclude. Multimodal Urban Studies offers an innovative and productive lens, but only one among many required. Urban research must retain pluralistic, contextualised approaches.

These types of models and their machinic view on our world, our cultures, and cities are pervasive and increasingly endowed with agency to shape our world. While we cannot emphasise enough the continued need for critical human interpretation, theorization and contextualization, we also advocate taking these technologies seriously, which not only add unprecedented synthetic analytical capacities but potentially subvert and expand the epistemological regimes of urban phenomena.

References:

Augé, M. (1995). Non-places: Introduction to an Anthropology of Supermodernity. Verso.
Batty, M. (2013). The new science of cities. MIT press.
Batty, M. (2013). Big data, smart cities and city planning. Dialogues in Human Geography, 3(3), 274-279
Bengio, Y., Courville, A., & Vincent, P. (2013). Representation Learning: A Review and New Perspectives. IEEE Transactions on Pattern Analysis and Machine Intelligence, 35(8), 1798-1828.
Brenner, N. (2013). Theses on urbanization. Public culture, 25(1 69), 85-114.
Buchanan, I. (2000). Michel de Certeau, Cultural Theorist. Sage
DeVries, T., Misra, I., Wang, C., & van Merriënboer, B. (2022). PsyNeuLink: A framework for neural and cognitive modeling using Python. Computational Brain & Behavior, 5(1), 1-10
Eliade, M. (1957). The Sacred and the Profane: The Nature of Religion. Harcourt Brace.
Farocki, H. (2004). Phantom images. Public, 29(29), 12-24.
Gebru, T., Morgenstern, J., Vecchione, B., Vaughan, J. W., Wallach, H., Iii, H. D., & Crawford, K. (2021). Datasheets for datasets. Communications of the ACM, 64(12), 86-92.
Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. (2016). Deep Learning (Vol. 1). MIT Press Cambridge.
Greenfield, A. (2013). Against the smart city (The city is here for you to use Book 1). Do Projects.
Jacobs, J. (1961). The death and life of great American cities. Vintage
Kitchin, R. (2014). The real-time city? Big data and smart urbanism. GeoJournal, 79(1), 1-14
LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. Nature, 521(7553), 436-444.
Lefebvre, H. (2003). The urban revolution. U of Minnesota Press.
Manovich, L. (2017). AI aesthetics. Moscow: Strelka Press.
Massey, D. B. (2005). For space. Sage.
McCormack, J., Gifford, T., & Manning, P. (2019). Autonomy, Authenticity, Authorship and Intention in Computer Generated Art. ICCC, 196-203.
Naik, N., Philipoom, J., Raskar, R., & Hidalgo, C. (2014). Streetscore-predicting the perceived safety of one million streetscapes. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops (pp. 793-799).
Radford, A., Kim, J. W., Hallacy, C., Ramesh, A., Goh, G., Agarwal, S., ... & Sutskever, I. (2021). Learning transferable visual models from natural language supervision. In International Conference on Machine Learning (pp. 8748-8763.
Redmon, J., Divvala, S., Girshick, R., & Farhadi, A. (2016). You only look once: Unified, real-time object detection. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 779-788).
Saxena, S., Tripathi, G., & Talukdar, P. P. (2022). Vokenization: Improving generalization of vision-and-language models via textual decomposition. arXiv preprint arXiv:2205.03750.
Tonkiss, F. (2013). Cities by Design: The Social Life of Urban Form. Cambridge: Polity Press.
Whyte, W. H. (1980). The social life of small urban spaces. Conservation Foundation.
Young, T., Hazarika, D., Poria, S., & Cambria, E. (2018). Recent trends in deep learning based natural language processing. IEEE Computational Intelligence Magazine, 13(3), 55-75.
Zeiler, M. D., & Fergus, R. (2014). Visualizing and understanding convolutional networks. In European conference on computer vision (pp. 818-833). Springer, Cham.
Zheng, Y. T., Capra, L., Wolfson, O., & Yang, H. (2019). Urban Computing: Concepts, Methodologies, and Applications. ACM Transactions on Intelligent Systems and Technology (TIST), 5(3), 1-55.
Zhu, Y., Jiang, Z., Zhao, F., Terzopoulos, D., & Zhu, S. C. (2017). Inferring forces and learning human utilities from videos. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (pp. 6234-6243).

The Science of Networks: Urban Movement Design, Analytics, and Navigation

Dragana Ćirić
Independent Scientific Associate/Research Assistant Professor, Architect and PI at unit [d], Belgrade, Serbia
dragana.ci@gmail.com, ORCID: https://orcid.org/0000-0001-5778-5599
unit.d.dciric@gmail.com

Abastract: The science of networks, a relatively young field of research that appeared in such a form and definition at the beginning of the 21st century (as a distinctive, officially approved and accepted scientific discipline (Barabási, 2016)), represents a very powerful area considering the range of subjects to which it contributes and is applied. This science is key for *complex systems analysis* or *analytics* (when referring to the *(big) data science* framework, which now mostly defines its methods and resources (Betty, 2019)) based on the claim that *networks encode the interactions between the system's components* (Barabási, 2016) and thus provide insights into the ways complex systems behave, or control the behaviour of the artificially created systems (emphasis added). The area represented here, through its analytical methods and forms (network graphs and related operations), is the urban transportation system — the Grand Paris rail system, including all the categories with their existing lines and extensions currently either in construction and planned, or under consideration in the long term. The network has been created as a background topological environment and geometry for various research operations and generative design tasks. Some of them, such as urban movement path generation or the network's incremental growth and reconfiguration as a system and the geometry of possible moves ("legal actions"), will be presented in more detail. The network can be considered both an abstract and real-world environment and situation, susceptible to the research of both gaming strategies for any constructed scenario and designed spatial situation (*academic gaming*, *operational gaming*, and *heuristic gaming*) and problem-solving strategies related to identified real-world design issues. Thus, the main question addresses the ways in which its presented graph can be operationalised and the methods through which this can be achieved, with special regard to AI.

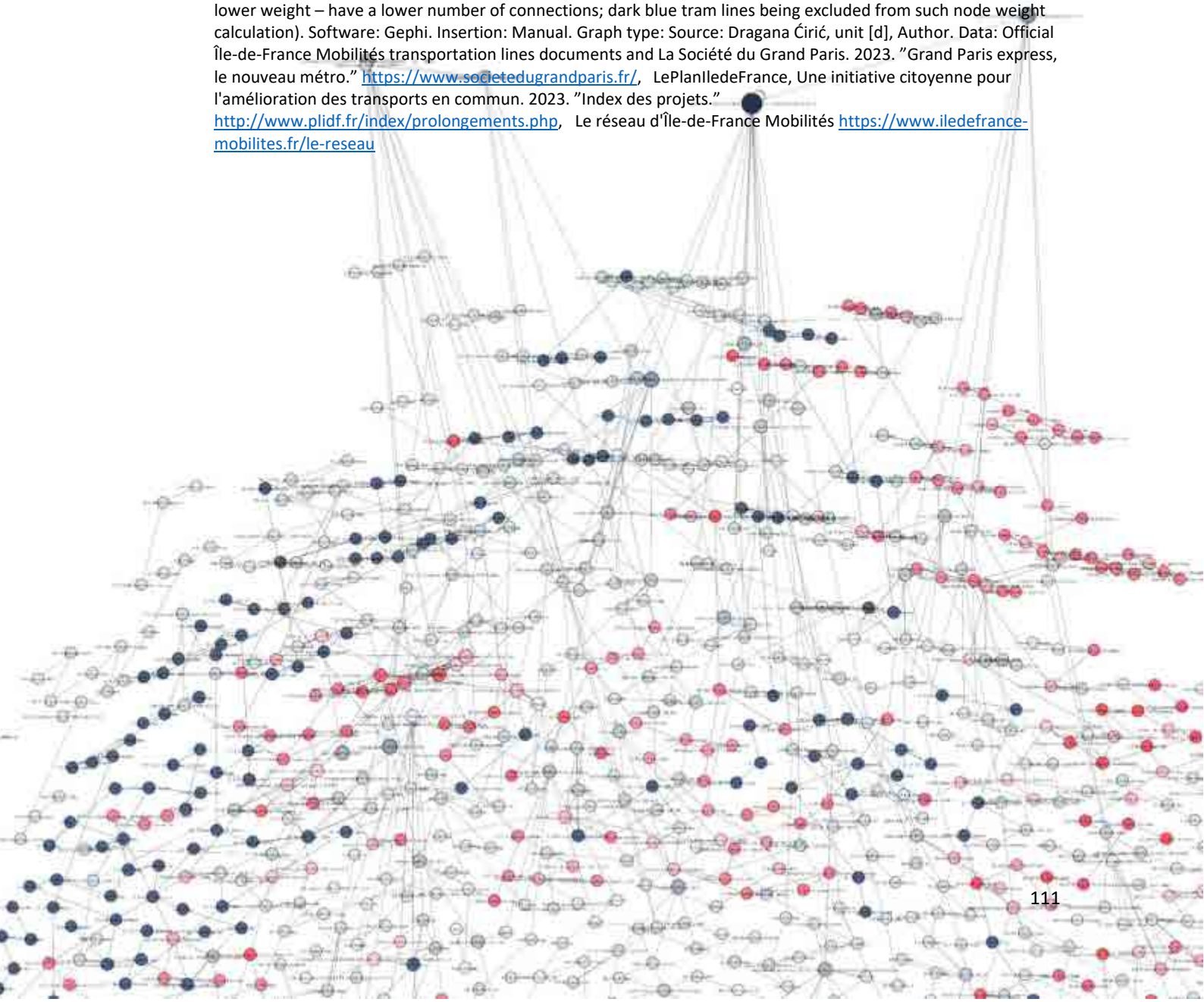
Keywords: network science, urban mobility, transportation systems, urban computing, generative design, AI, urban intelligence, urban informatics, intelligent cities, smart cities, spatial information systems

1 Introduction

The aim of this part of a larger research project on AI and architecture is to establish a relevant spatial framework that can be presented as an input structure, or investigative system and case study, to all further collaborations between architectural and urban designers, planners, and scientists and data and artificial intelligence scientists. The intention is to prepare the theoretical and practical material to support such interdisciplinary projects, reinforcing the perspective coming from the expert area of urban and architectural studies, sciences, and professions while keeping in mind the importance of the inclusion of artificial intelligence in architecture and urbanism. The latter stands at the center of the presented project, and will be reflected through investigated computational methods and research.

Relying on the material published elsewhere (Ćirić, 2023), this paper provides a complement to the explained collaborative framework and system for interdisciplinary research involving spatial, architectural, and urban designers, scientists, and researchers, and computer and data scientists, providing more details about the performed case study. In addition to presentation and the corresponding exhibition material, it gives priority to one of the aspects of the acknowledged exemplary generative design problem and its solution method – its network system, or a context for any kind of devised spatial operation. In that respect, the paper follows investigative phases and methods of design problem definition and solution while extracting observations of a more general significance and value in terms of application.

Figure 1. Grand Paris rail transportation system graph, containing 1523 nodes and 2054 edges. Clustering has been performed according to the included transportation types (Paris metro lines, RER lines, Transilien, Tgv, Ter, and tram). Colour coding has been performed to distinguish the existing stations and lines (shades of blue) and network extensions (shades of magenta red), while the shade indicates nodes' weights (the darkest ones are of a higher weight – have the highest number of connections, while those with a higher degree of lightness are of a lower weight – have a lower number of connections; dark blue tram lines being excluded from such node weight calculation). Software: Gephi. Insertion: Manual. Graph type: Source: Dragana Ćirić, unit [d], Author. Data: Official Île-de-France Mobilités transportation lines documents and La Société du Grand Paris. 2023. "Grand Paris express, le nouveau métro." https://www.societedugrandparis.fr/, LePlanIledeFrance, Une initiative citoyenne pour l'amélioration des transports en commun. 2023. "Index des projets." http://www.plidf.fr/index/prolongements.php, Le réseau d'Île-de-France Mobilités https://www.iledefrance-mobilites.fr/le-reseau



Considering the interdisciplinary character of the investigated topic and posed aims of the presented research project, the interdisciplinary collaboration which is going to cover issues related to data science and artificial intelligence has been acknowledged – while the research part presented here provides a learning background for researchers coming from the field of spatial studies and various engineering fields, the expertise related to authorities in the field of artificial intelligence has been referenced (Tristan Cazenave, Université Paris-Dauphine – LAMSADE, and Milo Roucairol, Université Paris-Dauphine - LAMSADE), representing a key value in parallel research phases for which architectural, urban, and broader interdisciplinary grounds have been posited.

Related to, or based on urban logistics and mobility within the existing system of transportation and free movement area, the decision-making paths and scenarios have been at the heart of the targeted analysis. With the aim of improving urban movement experience through new navigation mechanisms and designed utilities, presently available instruments for their planning had to be investigated along with the current domain of their application. In order to explain their operational scope and apply optimum software interoperability, the current state of affairs has undergone preliminary inquiries through one of the examples. The generative design problem and task have been created, and they served as an object to which all these features would be reflected, implying future development directions to be followed regarding the broader scopes of computational design application within the field of mobility and smart/intelligent cities.
As regards education, new interdisciplinary methodologies and programs should be considered, while in professional practice, advanced training and skills should be given way to and applied. It becomes important to analyse the relationship between advanced research and development sector related to practice and education system in terms of their robustness and priorities regarding the investigated topic, which sometimes suppress innovation. Science should trace new paths with its perspectives, new findings, and summaries of research results, entering the vision scope of decision-makers with the clarity of the importance it claims. The example hereby presented will demonstrate the complexity of one such interdisciplinary topic, along with the computational methodology used.

Referring to the paper's objectives and contribution, but most of all the skills one acquires by going through this and similar computing methods and investigation, the competence of designing and computing both spatial tasks and their solutions in a bespoke manner can be emphasised. Even though standalone applications providing similar services do exist, explained skills and urban computing knowledge enable one to steer one's own objectives regarding the posed spatial problem and task and design the experience brough by the particular decision-making within the created computing method. Such qualifications can bring benefits to the individual, as well as improvement of the currently available urban design, analytics, and planning software and applications. It brings value to knowledge sphere in general, as well as urban computing theory and methodology in particular, being a part of the area of education on one side, and practice or everyday urban activity on the other. It also assures a full understanding of computing processes and programmed actions that urban computing platforms and applications perform, enabling one to include new parameters and, relying on acquired computing literacy and thus transformative power, intervene in the platforms' and applications' operation, in their procedural and protocol part. Self-steering, as well as the inclusion of multiple factors into the formula along with various contextual representations, provides a comprehensive perspective on one's position and movement possibilities in targeted space/environment as aligned with precision and control of transportation systems and their operation.

2 Theoretical inputs and Literature Review

The main subject that guides this study is situated in several theoretical fields. They include mathematics and data sciences, urban computing and informatics, urban and spatial analysis/analytics, planning and design, architecture and urbanism, and finally artificial intelligence and network science as subareas of some of the mentioned fields, but also their most conspicuous integrative factors, or instruments and domains able to encircle and entwine them in creative, innovative or unexpected ways, as well as scientifically robust ones. The science of networks has been widely and in detail explained by Barabási (2016) in his pivotal work *Network Science* (preceded by *Linked: The New Science of Networks* (Barabási and Frangos, 2002)) written as a didactic volume containing a training programme manual and resource of designed student exercises. Well systematised and equipped with brief and clear definitions and examples, it also offers a valuable introduction explaining the historical development and positioning of networks and complex systems' investigations in a wider scientific context, eventually arriving at the status of a discipline and an autonomous scientific field. Even though resting upon mathematical problems and first scientific initiations (e.g. those related to issues on topology), some of which also have a long history (many kinds of descriptive diagrammatic modes of relational thinking,

representation, and networking can be included (Ciric, 2016, 2017, etc.)), it only came to be named "science" at the beginning of the 21st century, with a decade of preceding actions in that direction (Barabási, 2016:20-22). The network paradigm might have always existeded as stated by Barabási, and it can be confirmed through numerous examples, but the institutional status and recognition is what situates the latest Rayonnant phase of network thinking in the new millennium. Two reasons for such situation have emerged, both firmly anchored into the technological development. The first one recognises data sciences and the ability to digitally express, or compute information as driving forces of network sciences' progressive pace (image – analysis, Barabási, 2016:19), preceded by investigations of complex systems and networks. The other argument refers to institutionalisation of network science through main scientific and research bodies, which established it as a separate research field (Barabási, 2016:20) with its "own intellectual core" (Barabási, 2016:22). The science of complex systems and systemic thinking, likewise, influenced the development of networking activity, motivating the task of revealing the laws that shape systems' behaviour and their governing organising principles, or, in other words, the hidden structures and inner mechanisms behind the systems' appearance and operation.
Considering the theoretical scope, one would also investigate and consult key figures in the theory of urban computing, urban science, and modelling (Batty, 1990, 1997, 2001, 2005, 2008, 2009), urban movement (Batty, 2018), and urban informatics (Shi, Goodchild, Batty, Kwan and Zhang, 2021). Here, within the area of urban and architectural studies, Michael Batty's name certainly comes among the first ones. The long history of his dedication to urban and spatial science, planning, design, analysis, and analytics produced a firm and substantial resource base for continuous development of the field. Urban science, urban modelling, smart and intelligent cities, network science and network geography (Batty, 2003), dynamics of urban complex systems, agent-based modelling and modelling through cellular automata, present only some of the key topics that ensured Batty the highest commendations and rank in the named research field. To these contributions, one should add his work within the Center for Advanced Spatial Analysis, UCL (https://www.ucl.ac.uk/bartlett/casa/), and editorial work at E*nvironment and Planning B: Planning and Design, or Environment and Planning B: Urban Analytics and City Science* after his relatively recent intervention towards the move from *analysis* to *analytics* (Batty, 2019). Batty (1990) elucidates on the development of transportation planning, theories and models explaining flows, network thinking, network paradigm, and network concept used by organization theory, linking these methods to the concept of intelligent cities. His notions on the *computable city* (Batty, 1997) are used to establish a relationship between transportation modelling and monitoring on the one side and the overall concept of a *programmable or computable city* (computational methods make each problem computable, spanning the range from each element of the subsystem (e.g. urban mobility) to their integrative form (the city)). Considering the area of urban modelling and digital twins (Batty, 2008, 2009), specific methods, such as actions modelling, agent-based modelling for modelling the pedestrian movement, or cellular automata, have also been referred to (Batty, 2001, 2005, 2008, 2009; Batty and Longley, 2014). Adding Batty's answers to questions on visualization of the movement flows to this volume of references (Batty, 2018), his complete opus has been addressed to apply operational elements to movement path generation design task, or representation of network dynamics in case of the presented research.

Since this review will be the most succinct – selecting only few prominent names to mark the research area, while suggesting a deeper analysis of full literature and other authors – an introduction will be closed with the most recent publications on AI in urban planning and design (As, Basu & Talwar, 2022), alongside the expert area of data and computer sciences. The publication *Artificial Intelligence in Urban Planning and Design: Technologies, Implementation, and Impacts* gathers the most important researchers in the field (Burry; Leach; Sinthalapadi Srikanth, Chien, Bouffanais & Schroepfer; Kimm; Rhee; Newton; Rahimian, Iulo, and Pinto Duarte; Sari, Erbas, and As; Lima, Brown, and Pinto Duarte; Sollazzo; Balaban; Landes; Janssen, Bui, and Wang; Bielik, Koenig, and Schneider; Zhang, Ringo, Chou, Pachuca, Pietraszkiewicz, and Wilson), presenting their theoretical, critical perspectives and exemplary studies in the following research areas: 1) AI-based urban design and planning, 2) AI tools, techniques and methods, 3) AI in urban scale research, and 4) urban design and planning case studies. To this disciplinary-shaped application of artificial intelligence, the expert literature from data, information, and computer sciences has been added (Cazenave, 2016, 2022; Roucairol and Cazenave, 2022; Sironi, Cazenave, Winands. 2021; Darvariu, Hailes, and Musolesi, 2023), including examples of how transportation problems have been specifically treated, analysed and resolved (Guihaire and Hao, 2008). Creative and visual aspects of representation could be guided by the most recent investigations on AI in architecture (in Ćirić, 2022), as well as specific case studies that imply proper computation methodologies or specific problem-solving methods (e.g. Lopes, Paio and Sousa, 2014, etc.). Lastly, regarding the chosen case study (Grand Paris transportation system) in terms of the network's real-world situation, the main urban historical data were retrieved from publications such as *Cities, Railways, Modernities: London, Paris, and the Nineteenth Century* (López Galviz, 2019) and

Subterranean Cities: The World beneath Paris and London, 1800–1945 (Pike, 2005). A more recent history of the continuity of metropolitanisation of the *Île-de-France* region, or construction and further development of *Paris Métropole / Grand Paris urban paradigm and designed urban environment* has been described in the book *The Making of Grand Paris: Metropolitan Urbanism in the Twenty-first Century* (Enright, 2023 (2023)), being also a source of other supplementary historical data (e.g., Hazan).

3 Case-Study: Grand Paris

The following section will present one specific case study so as to manifest computing methodology (design and organisation of the set of computing methods that build a chain of actions between the design problem identification or definition and its solution) and practical results of such design and planning approach, largely based on created network graph and consecutive network operations. The study should demonstrate how network science can be applied in practice, theory, and education by utilising computing methods for urban movement design, analysis, analytics, engineering, and navigation.

3.1 Generative design problem and exemplary twin problem-solving method based on network graph theory and set theory operations

Considering the aims of this study, it has been necessary to recognize its main subject – an opted task within the field of urban mobility and dynamics – as a problem or an idea that is a generative process, and to model it as a generative design problem. As such, the problem could have been resolved through specifically written algorithms, or existing algorithmic functions of operable software, having some of them based on the most recent artificial intelligence search, recognition, and optimisation methods, applied also in generative pre-trained transformers (GPTs).

The generative design applies to many areas, encompassing branches of the research field of architecture and urbanism. The specificity of the research subject had to be determined to narrow the scope of algorithmic performance, while the planned design task had to be computable – defined in a way that enables computational procedures to be executed while providing targeted research and design results. Generative as an attribute implies rule-based iterative processes, or processes with an underlying computing logic, as main generators of the desired and planned outcomes. The procedure and its internal code of conduct are crucial for creative design acts and outputs – by controlling and shaping the procedure (design process based on precise design instructions and rules) among other parameters in a way that ensures unrepeatability and uniqueness of the generated imprint, the outcome obtains its main features and identity. The rule-based design such as generative design also enables a designer to explore the endless field of probable outcomes before deciding upon the one to be presented as the final output (if such aim is prioritised over the multiplicity of all possible results) or it enables dynamic behaviour. Architectural and urban concepts within the scopes of planning, design, and analysis, can be considered and expressed as generative rules (Frazer, 1998:43) and this has been the main aim of problem definition, including narrative, spatial objectives, parameters, and code script of computer instructions. A simulation of the subject's prototypical and variation-based forms should have been displayed and visualised accordingly, and prototypical forms evaluated based on their performance in a simulated environment (Frazer, 1998:43). Finally, one or more options within the area of probability distribution should have been chosen as a part of the agent's decision-making process and the manner of constructing movement experience. Visual programming software tools have helped in placing the architect and an urban planner or urbanist in a position to be capable of performing some of these tasks, or properly understanding the algorithm writing process, while the expert operations are left to professionals with additional skills - data scientists and artificial intelligence engineers and designers.

3.2 Urban transportation system

The defined design problem examines network operations, generative principles, and algorithmic thinking within the field of urban planning, analysis, analytics, design, and dynamic representation. The main topic is urban movement and experience, based on urban mobility systems – the rail and metro systems in particular. The traffic networks acted as background platforms (a field of operation) for both 1) upgrades in terms of network extensions and 2) path generation that follows narrative, thematic, technical, and experiential objectives and parameters (Fig. 9 and 10), as well as simple mathematical rules of proximity (Fig. 7, 9, 10).

The main subject of the design problem is spatial navigation and movement planning, with elements of scenario-based methodology and spatial thinking. Such narrative-based urban movement and experience have been expressed in a geometrically and topologically operable way – through network graphs and visual upgrades of thus provided information. In other words, network syntax and operations provided a foundation for desired design objectives in terms of urban movement and dynamics. In the chosen geographical context, the rail and

metro network has been taken as a field for the planned operations. As one of the urban movement and transportation subsystems, its network easily resolves the problem of longer distances in a city and conjoins them with short walkable distances of another character within the specific urban scenario and integrative movement plan. Except for such role and relative autonomy regarding the ground-level morphology and existing layouts (buildings and street matrix), one of the reasons for opting to operate within this network and trying to resolve some of the issues of this type of urban mobility experience has been a specific visual and physical isolation of this system from the usual above-ground spatial references, as well as relational logic that exists in the usage of this system. Largely differing from street-based urban navigation, the urban movement experience of this type of transportation transforms the perception of the real-world environment, along with the transformation of spatial and time-based perception. Metro system has the ability to compress the ground level *space-time* and physical environment, and, conducted mostly underground, it does so without direct visual support and references at all times. Therefore, the secondary aim has been to maintain the relationship with the ground-level situation through the proposed movement design representation. In concert with the first aim - the path generation – the idea acquired higher significance and innovative aspects, surpassing the basic demand for a simple superposition of different navigation systems in a visually distinctive and new way (the superposition of the geographically and geometrically accurate real-world representation and topological representation of urban movement). This refers likewise to path prediction with multiple options, and generation according to different experience modes (including gaming), different themes, movement aims, and other contextual conditions that govern movement decisions, or determine a decision-making process.

Regarding the application of the analysed instances in a professional realm, besides the possibility of spatial parameters analysis, and full awareness of their influence on movement within the aim of design implementation, which is important for architects, urbanists, urban planners, and policymakers, it is important to stress its design capacities that stretch across all engineering disciplines. In this case, architectural and urban design, traffic management and design, and mechanical, electronic, information, and software design and development are particularly converged, and the methodology should properly service all these disciplines. The study sets such aims within the long-term project objectives.

3.3 Abstract and real-world problem and environment–designing the operative field

Both options, in terms of the opposition between abstract and real-world environment and spatial determinants, have been taken into consideration, as well as their possible hybrid formats and representations within the specific aim of good visual communication. Behind all modes of representation, a possible real-world action is demonstrated through proposed exemplary scenarios for which the path generation design task has been posed, while the abstract gaming environment could have worked for developing playout strategies or testing performances that remain invariant regardless of network representation. At the core of this dilemma lies a difference between the morphological and topological representation, or a degree of likeness regarding reality and real-world elements retained for adequate orientation (*sufficient realism* (Taylor, 2009:80)). It is the question of the balance between cognitive soundness and computational operability of contained spatial data, and the expression needs to satisfy both. A degree of abstraction used in certain research phases can imply the field of application and main research objectives (e.g. algorithmic solutions for simple mathematical problems of spatial navigation, or analysis of topological properties relevant to the generative design problem). When completely traversing to solutions for real-world problems (e.g. optimisation of network increments and the entire performance) the exact data come to the fore as a main objective and requirement, while representation can still be subjected to various modes or styles (including mode in which all its elements might pertain to existing and planned morphology, as is the case within the opposite direction from complete abstraction). As can be seen, representation ranges from field-based representation and object-based representation (Fig. 3) to the street- and railway lines-based topological representation of the highest degree of abstraction (Fig. 4, 5; the layout transformation – Fig. 6). Regarding some last observations on representation, it has to be added that data formats and systems (metadata lists) used in the most recent and advanced spatial analysis (spatial analytics) require a good structure that ensures precise execution of instructions towards a desired design result; representation and variables used for generating basic geometrical and topological outcome are subject to separate design efforts. Literature on movement visualisation can also be consulted (Batty, 2018), while fictional cities and geometries, such as play boards or fields of operation, can be devised as well.

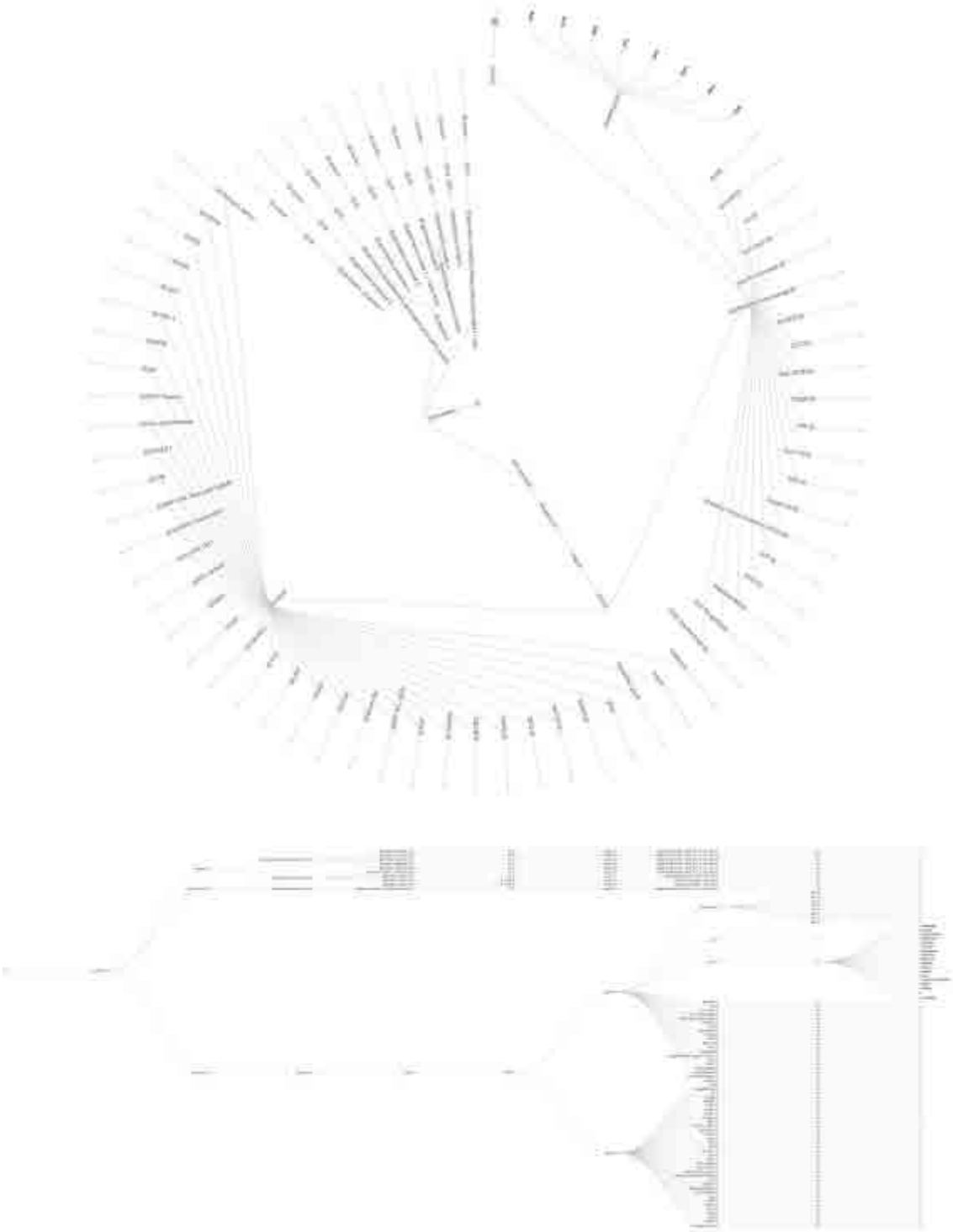
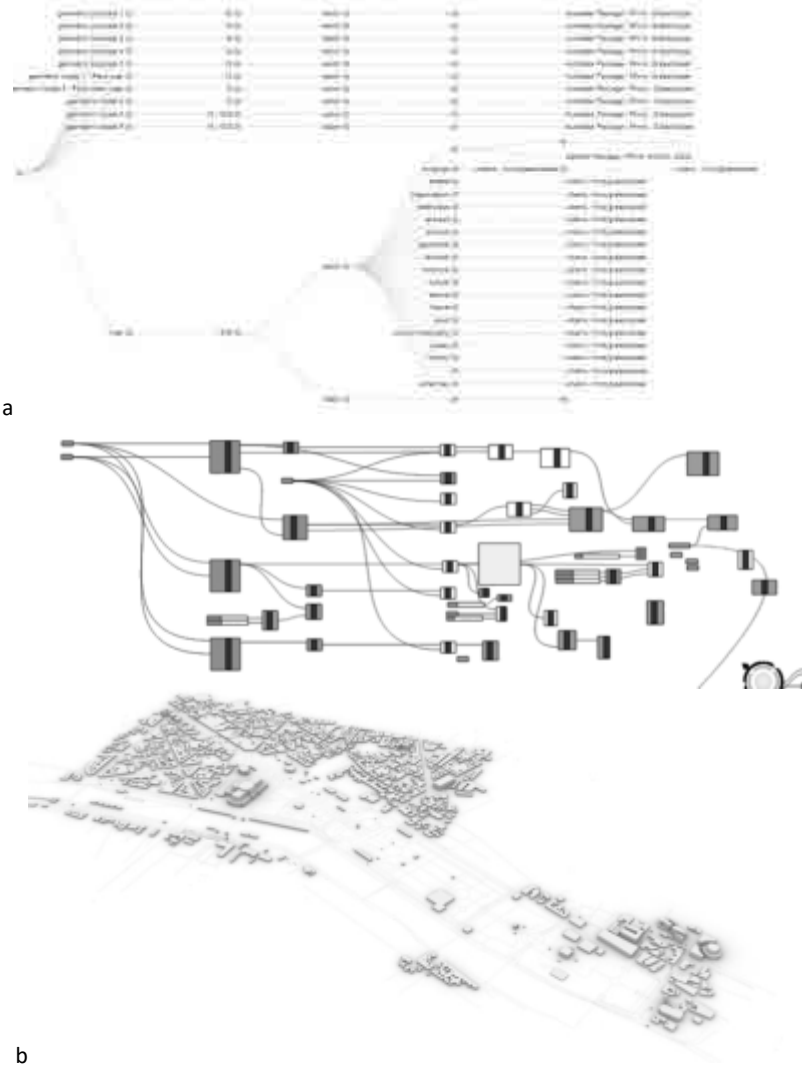


Figure 2. Spatial and simulation context definition, elements that defined them, and computational tools for design problem-solving in a defined context: design of either the real-world environment or abstract environment and decision-making algorithm layout. The radial and the linear dendrograms with a tree structure/layout start from the design problem, focusing on the environment for spatial operations: 1. real-world geometry and situation along one branch and 2. abstract geometry along the other. The continuing branches/categories contain elements necessary for a modelling process and explain models that are used further in the design process, information systems and data formats (major groups and subgroups with elements they include) used for its modelling, ending with plug-ins and software in which devised operations can be performed and stated data formats made operable. Source: © Dragana Ćirić, unit [d], 2023



a

b

Figure 3. a. The branch of the main context definition tree layout shown in Fig. 2, starting from categories of the abstract geometric spatial models along the first branch and the real-world maps and spatial models along the second, ending with the category of operable software and plug-ins for devised operations and with listed data formats to be used. b. Demonstration of computing actions along the branch for the real-world environment modelling - metadata extraction from .osm files (Source: OpenStreetMap) using Urbano Grasshopper plug-in and 3d representation of objects, streets, and transportation in Rhinoceros. Source: © Dragana Ćirić, unit [d], 2023.

3.4 Graph analysis method and use in urban studies

Before explaining the specific urban example, followed by research and analysis methods that have been tested, the network graph method will be addressed in terms of its use in urban and architectural studies. Graph modelling enters the field of architectural and urban representation due to its diagrammatic explanatory capacity in terms of existing visible and invisible spatial or procedural relations (Ćirić, 2016), its capacity to reveal certain parameters and measure their values, indicate relationships and connectivities, and also to make the subject of such representation computable, or translatable into algorithmic expressions. Graph lists (.xls and .csv formats) are algorithmically operable - they can be easily subjected to number of operations, including optimisation, variation, evolution and growth, reduction, etc.

The transportation network graph represents one of the network graph types determined by the subject, having several classes within this category that can be used (e.g. primal and dual graphs (Betty, 2004; Porta, Crucitt and Latora, 2006; Jiang and Liu, 2007)). The class that has been applied here relies on the model in which the intersections/junctions (stations) have been represented by nodes (vertices) and connection lines (rail lines) by edges (point-to-point relationship). All data (points and edges) have been manually inserted, carefully controlling the on-site and planned situation regarding connections that are in operation or construction. Formed in Gephi, an application that offers several representation topologies, the initial graphs could have been represented in various ways (Fig. 6). The first one is a dimensionally-free based on the relational topology that puts upfront parameters such as centrality and in-betweenness, or node degrees (weights), including calculations relevant to

defined point classes. This is the abstract network environment whose geometric characteristics do not have to correspond to real-world situations or reflect their morphological state. Another option – Geo Layout mode – has also been enabled by inserting longitudes and latitudes for each node. This has given a more accurate geometry and nodes' arrangement. The complete accuracy in terms of the exact morphological properties, however, hasn't been completely achieved due to the fact that longitudes and latitudes that were extracted from the available open source for the first experiment and proof of concept - OpenStreetMap – vary regarding the real-world situation, while *network straight-lines representation* does not render linear connections between the marked nodes by following their real-world morphology, curvature, and design. Available maps also offer multiple geographic marks for some of the vertices, while the fact that they are always defined by larger areas, not single points as is the case in network graphs that are useful only at larger scales, discards geographic positioning through only one point, clearly distinguishing it as irrelevant on a smaller scale. Edges are also simplified implying only topological properties and connections – they do not provide exact distances, but their approximations if true values are not separately inserted. Apart from such assessment, the available information has been taken for planned tests assuming that in the moment of real-world application, correct data would be acquired from the official sources and institutions and as such processed through the adopted formula. For the first research phase, it has been satisfiable to establish the proper procedural framework and course of actions, create and adopt algorithmic methods, and test algorithmic performance/operations.

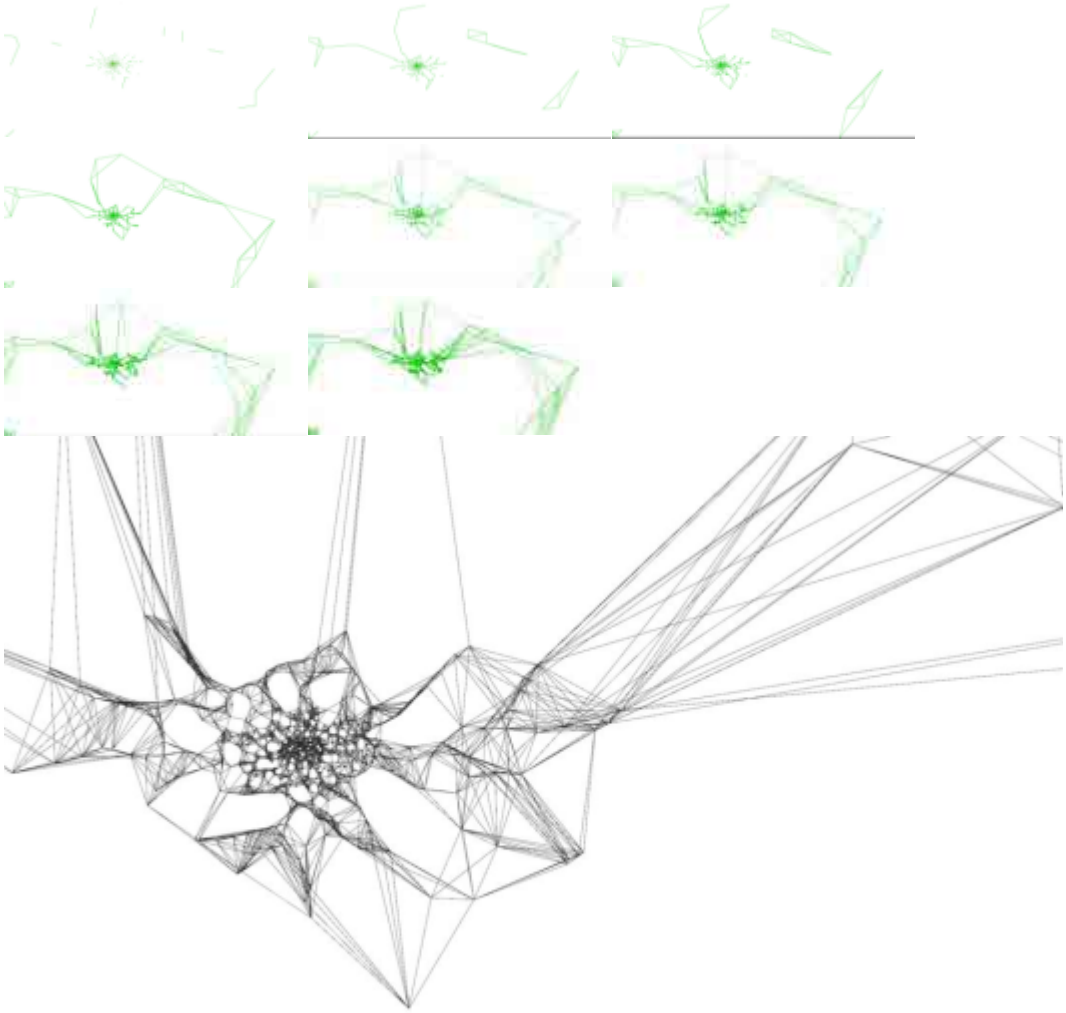


Figure 4. Proximity function within the defined network – the number of closest points increases eventually, forming the complete net of direct connections. Grand Paris graph – 1523 nodes and 2054 edges. Software: Grasshopper. Source: © Dragana Ćirić, unit [d], 2023.

The analysis applicable to network graphs – topological analysis – represents, following Jiang's and Liu's claims, *a new paradigm for geospatial analysis and modelling, with a focus on spatial interaction and relationships* (Jiang and Liu, 2007:1120), the basis for the new science of networks. In their words, it renders a specific diagrammatic representation of relations between locations and geographic places, while it can be used in predicting traffic flows given several topological and geometric characteristics of traffic channels. Based on topology which *in*

contrast to geometry, refers to a description of the relationship between geographic objects or locations. (Jiang and Liu, 2007:1119-1120), network graph of the chosen urban traffic systems (the rail lines) could have been subjected to the investigative method of topological analysis, relying on the ability of the *science of networks* to support the study of real-world networks of a large size, including their evolution and incremental growth, being parts of the defined design problem. Taking into consideration the fact that the defined environment (chosen transportation system within which agents operate and which constitutes the field of designed activity) is not static and that the network growth and rearrangement, including temporary changes, should also be subjected to analysis, design, and optimisation, a specific branch of a generative design problem has been dedicated to it. This branch should have resolved the dynamics and transformation of the main design problem's operational field (urban system network). Given specific attention, the complex behaviour of this real-world system and its constituents could have been posited from a topological perspective and represented dynamically, while data that the system contains is made operable for other objectives of the generative design problem. As it can be concluded, the aim of this study has not primarily been to analyse and explain, or classify the phenomena observed through the method of the topological analysis, but to apply it to design methodology – within the design problem definition – as well as to model the operative environment (also information model) to be used for later problem-solving phases.

3.5 *Grand Paris* network map/graph

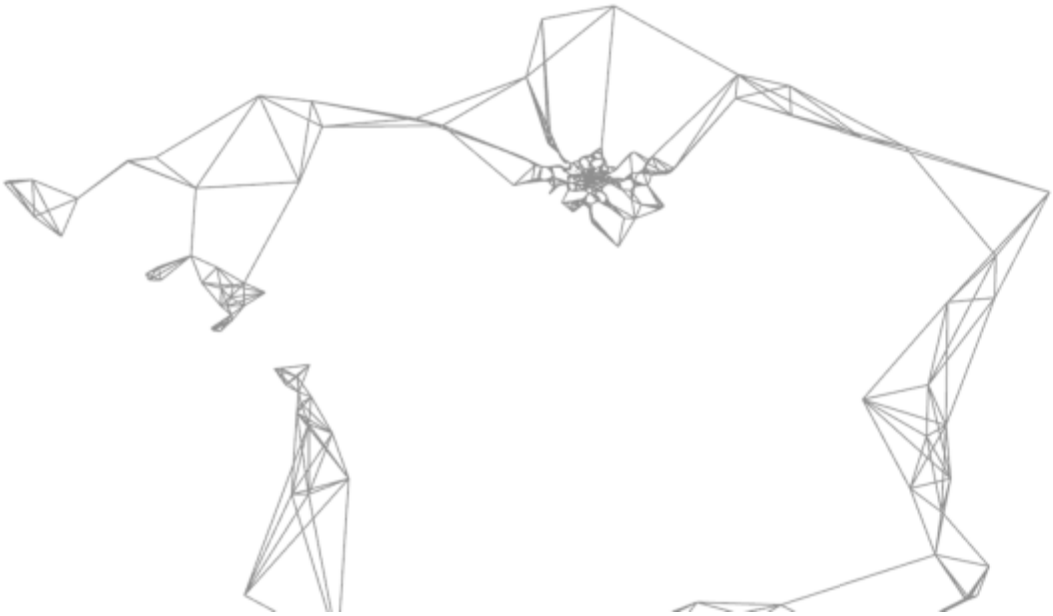


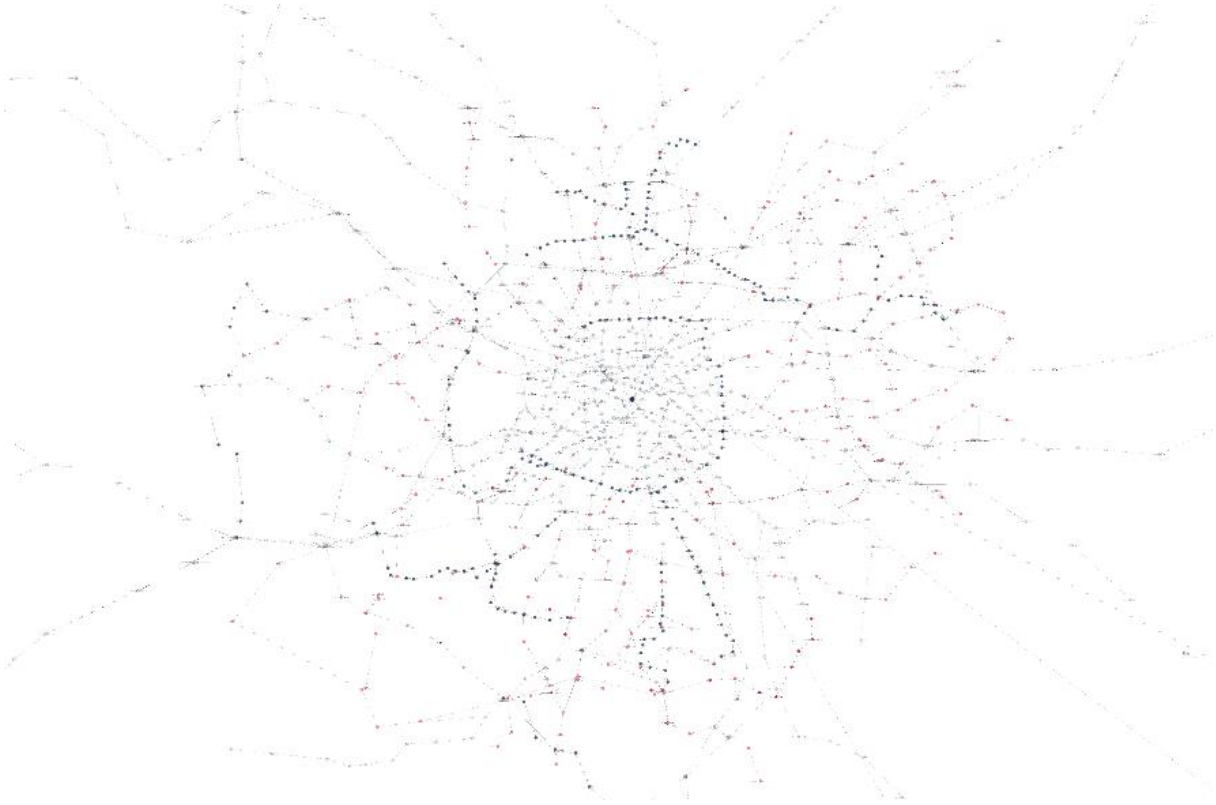
Figure 5. Proximity network Greater Paris, or Paris metropolitan area (city-region) - *Île-de-France*. Source: © Dragana Ćirić, unit [d], 2023

Since Île-de-France region represented the area chosen for the experiment, the graph of the *Grand Paris* rail lines network has been created. For this purpose, the author has tested several software options. Firstly, the possibilities and requirements of the *Urbano* plug-in for Grasshopper/Rhinoceros have been analysed. The application extracts data from the .osm map format and makes them operable for further actions in Grasshopper. The format is available either from the *OpenStreetMap* source, but only for smaller regions, or from databases containing the regional maps of a larger size. For smaller areas, the plug-in worked smoothly (Fig. 3), but in case of the digital map of the whole Île-de-France region, the file size produced certain difficulties and was ineoperable (the amount of data was too large for processing on a standard computer). Due to such circumstances, the option of working with .osm maps has been eliminated, since patching the smaller areas for which data extraction and morphological transposition worked perfectly, has been assessed as time-consuming and thus costly. The second software that has been tested is Cytoscape, used in biotechnology for representing chemical bonds between atoms and molecules. Cytoscape functions and representational environment could have formed well-understandable graphs, but there was a question of its later operability due to the manner in which the edges have been defined – they have implied chemical bonds that might require additional corrections later on and prolong the process. Finally, Gephi proved itself viable. It had options of either typing each node and establishing connections manually or importing pre-prepared tables; however, due to its programming language, all the

nodes have been manually entered due to precaution, including parameters that define them – id, name, transportation type, line, longitude, latitude, and status regarding the criterion of being a network node that already exists or the node within the planned network extensions. Since one of the generative design tasks comprised investigation of the network's incremental growth and optimisation of internal re-branching and possible new branching regarding extensions still not fixed, the last mentioned feature has been fully mapped, adding to the existing network the positions of all stations that are currently under construction and still under consideration.

The network contains the following transportation types: metro, RER, speed train, and tram lines. Data for the existing stations have been acquired from *Île-de-France Mobilités* open documents, while those related to the extensions from 1) *Grand Paris Express* resources (referring to already adopted lines and lines currently under construction), and 2) *LePlanIledeFrance* webpage, whose data have been analysed and triangulated with other sources, and paid specific attention to, due to inclusion of lines and points whose justifiability and acceptance will be considered in the long term (the workability of these locations hasn't been confirmed or approved yet and, in terms of this project, they have been considered as nodes that could have been tested in terms of network optimisation and feasibility, or proper positioning regarding the existing built environment, communities' demands, population parameters, opinion of the parties in a participatory process of decision-making, ground properties, etc.). As a result, the network containing 1523 nodes and 2054 connection lines has been created. It provided a database for all other operations - a population of points, connections, sets, and lists were defined as the main input data. The integrative graph made in Gephi, along with the separate lists of transportation lines for focused analysis, were planned for network optimisation tests, both in Grasshopper where they could have been operationalised for planned generative design scenarios, and by AI optimisation methods with specialised algorithms (Cazenave, Roucairol). The posed aim included the expression of urban movement user experiences, actions, decision-making, and their qualitative aspects (thematic and narrative categories) in terms of, or in relation to geometric and quantifiable spatial properties.

a



b

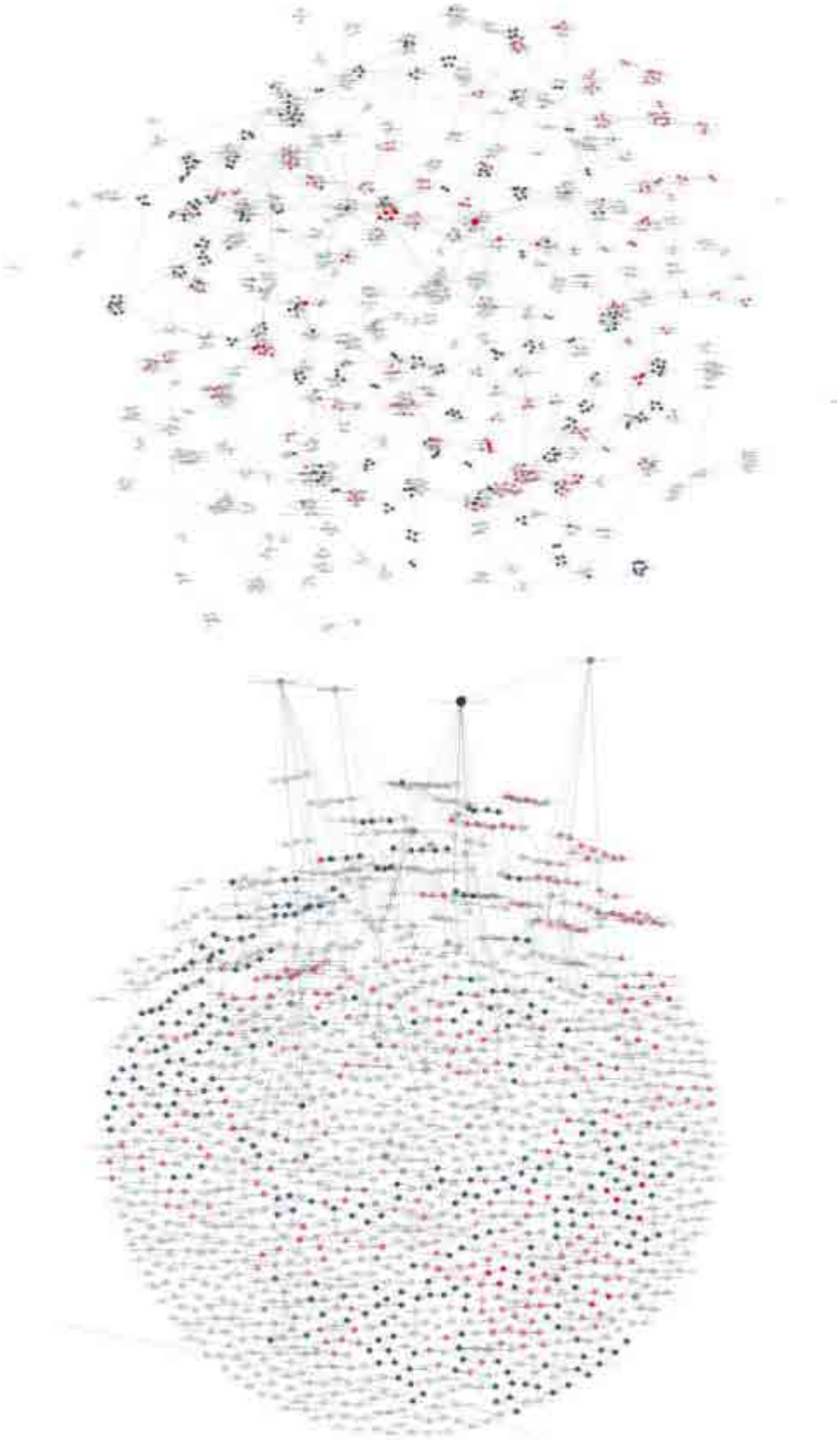


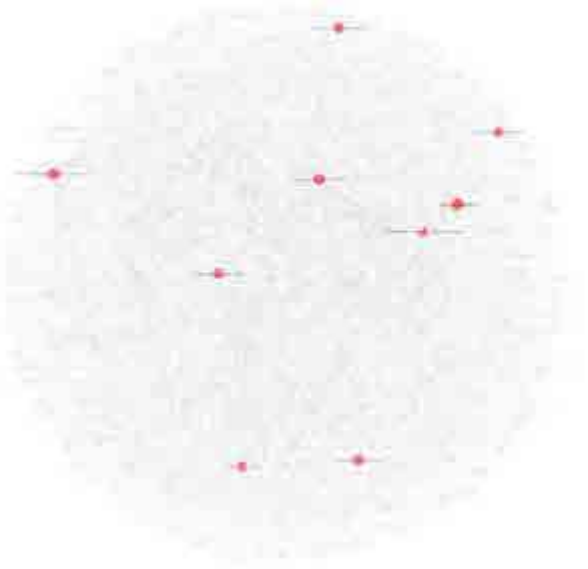
Figure 6: a. Paris railway transportation system graph; type: undirected graph, Geo Layout, created in Gephi. Each node has been assigned its geographic coordinates – longitude and latitude. b. Paris railway transportation system graph; type: undirected graph, OpenOrd Layout and Fruchterman-Reingold Layout. Source: © Dragana Ćirić, unit [d], 2023

3.6 Generative design problem definition – urban movement path construction

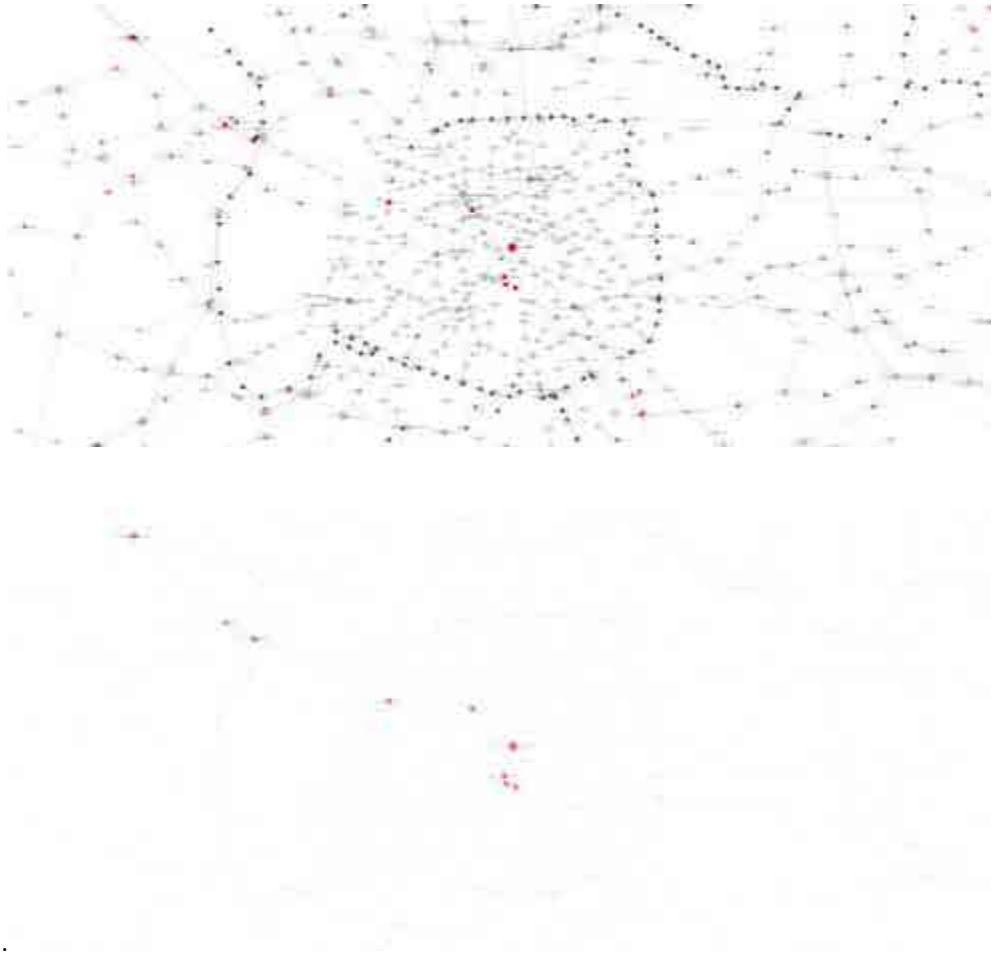
The problem chosen for testing has been defined as follows: Generate an urban movement path of an agent along the lines of the city rail transportation system while being guided by relations between the states/points within its network (distance, proximity, thematic character, passenger frequency, etc.) and separate landmark class of destinations (Fig. 8, 9). Define parameters for path character, movement objectives, constraints, policies, and movement agendas. Suggest path increment options in each state and continue the process after the decision has been made including feedback propagation to be included in statistic analysis and improve new playouts.

The path character can slide from a roaming adaptive pattern, containing dynamic and real-time-changeable elements and character, at the extreme with no predetermined and exact destinations or their fixed number (it has been presumed they can be formed in a course of action - during the movement and decisions made accordingly, adapting the current situation and transformation of parameter values and objectives), to the most rigid simple ones based on the definition of only one and exact point of reference (Fig. 7). Between these poles, we can distnguish a number of nuances based on criteria derived from the question whether the path should be 1) the shortest and the quickest possible one regarding a single destination, or 2) defined as one containing several destination points that should be organised in a best possible and parametrically guided way, while their number can change and be adapted depending on the various criteria (including nearness, thematic labeling, external conditions, etc.). Such design task requires a decomposition of its design process and careful analysis of each stage (states and actions), as in the *state machine* pattern or state-oriented system, taking a particular look at the part of the process that is going to be subjected to optimisation or generative design search processes and algorithms (tree search, or other heuristics methods (Cazenave, 2022; Roucairol and Cazenave, 2022, 2023; Darvariu, Hailes and Musolesi, 2023). Path-finding or generation according to the defined objectives, constraints (legal moves), path features, and external parameters, can be represented through the model of playout strategies (policies) based on decision-making processes, comprising adaptation (Cazenave, 2016; Sironi, Cazenave, and Winands, 2021). Before being finally executed through the chosen method relying on the concatenation of selected decomposed operations/algorithms, each state and action has been planned to be defined and tested separately, all through visual programming graphs and diagrams.

The constructed graph represents a virtual world in which the events (paths/movement and destinations) are visualised and simulated as generative processes. This can be done through abstract representation, but also through representations based on a larger number of real-world elements and their renderings accordingly. In all forms, the created environment represents an operable background and database that provides necessary tools for 1) play and analysis in an abstract space, 2) real-world problem-solving and prediction, or 3) education if the environment and operations are to be used for the didactic digital training as experimental instruments or research environments (Ćirić, 2020) – *structured exercises with a simulated environment* (Taylor, 2009:15). If used in a gaming context, where *simulation procedure or learning sequence is built up in such a way that it resembles the form of a game*, no matter the choice between the prescribed real world or defined hypothetical system and geometry that will work as a field of operation or gaming environment, several forms can be distinguished - *academic gaming*, *operational gaming*, and *heuristic gaming* (Taylor, 2009:15). Performance objectives in a network graph environment have to be set against them, as well. Since one of the branches of a design problem has been dedicated to environment construction, especially to its presumed dynamics (incremental local and global growth, or internal rearrangements), alongside the primary dynamic goal that the path generation (function) receives feedback and improves performance based on the quality of accumulated decisions and results of a decision-making chain and process, the goal that the state of the simulated environment can be continuously altered in response to network extensions (external increments) and internal rearrangements and increments, has also been set as one of the important design concerns. A specific example relevant to this study is certainly the METRO programme (Duke 1966 in Taylor, 2009:19) which combines real-world and abstract gaming environments by simulating the growth patterns which might occur. Certain instructions and experimental examples for gaming simulations have been provided in the literature (Von Borries, Walz, Böttger, Davidson, Kelley and Kücklich, 2007; Taylor, 2009), and, in that respect, this section will be closed with one of the notions on gaming-simulations (part of the umbrella phrase *instructional simulation system* (Taylor, 2009:20)) as *abstractions or simplifications which in this context are designed to advance appropriate learning in relation to the urban development process* (Taylor, 2009:19) to imply such use of the presented method and results, too.



a.



.

b

Figure 7. The shortest path between the chosen pair of points ("origin-destination") in a network graph (Houilles Carrières sur Seine-Maubert Mutualité): a) topological representation (relational diagram and abstract geometry) b) geographic representation and mapped points (real distances and real-world geometry). The path is automatically generated in Gephi, the software environment in which the network (Paris railway and metro system graph) has been created. Source: © Dragana Ćirić, unit [d], 2023

The path generation algorithm should be based on search operations with probabilistic formulas regarding possible states, characters, and outcomes/events, modelling movement paths within the simulated world (spatial context, or digital 3d environment and 2d area). It should include *decision-making scenarios analysis* and summarize all possibilities in regard to defined states (all inserted points) and parameters, thus visualise performance, suggestions, and final outcome (examples - https://dciricnetworks.tumblr.com/).

At the core of this generative design problem definition is specific user behaviour and its construction within the existing urban mobility system, which implies possible ways of its use (legal moves). This includes construction of the urban movement experience, especially in relation to certain elements of navigation that can be designed as a part of the interface. Each agent behaviour includes a specific scenario and parameters (e.g. in Feriolo, 2022), ranging from those fixed and nontransformable to those more flexible and changeable in real-time (adaptive). Certain scenarios previously created by the author within the plan for specific real-world situations, have been adopted for planned testings, supported additionally by the capacity to maintain a defined schedule within all time constraints and to adapt it to unexpected circumstances. Scenarios have been considered a starting point for either real-world action or an urban gaming setting.

The key difference of this framework to all existing movement path generators (e.g. moovit), as well as the innovation it might bring, rests in a specific display and computability of the design problem scenario, constructed design problem-solving methodology, and an overall design methodology, consisting of a specific structure and selection of objects of interest (destinations, or points along the generated path), their relational state, and distinctive character of paths to be generated that will be parametrised. According to the inserted aims, the path generator will indicate the nearby targets, suggesting possible decisions regarding destination choices and their addition to the path. Paths can be thus generated in real-time, based on instantaneous decisions (they are based on adaptive policy), while probable choices will also be visualised (aside from being only computed), predicting and displaying several possible moves in advance, such as in the multiple-choice games.

The first tests of the problem proposal – the exemplary method of the simulation environment design – have been made in Grasshopper/Rhinoceros, probing the use of metadata from external sources (OpenStreetMap), demonstrating a simple mathematical problem behind the goals of the explained generative design problem (Fig. 9, 10) and modelling decomposed problem's tasks. The first probe had as the outcome a method of environment and movement geometry construction – real-world (Gephi network graph) and abstract geometry as another option, rendering thereby the relationship between the current position (*state S*) in space and transportation system to the closest landmark(s) and other points along the traffic system lines (all possible destination points - points of interest) including transitory/transitional points (closest stations on transfer traffic lines visited as part of the *pass-through move* of the agent). The set that contains all states in a specific node can be marked as a set of possible states of the specific node $(S_1, S_2, ... S_n)$.

In conclusion to this section, the design goal can also be defined as follows: Develop semi-automated computer processes to pre-visualize mobility paths as part of the urban transportation system, while having as major design and decision criteria the following: 1) the nearest destination objects from within the list (magnets), 2) path character (between the a) free-roaming, temporally- and by length-unconstrained path and b) fast temporally-constrained shortest path), 3) the number of destinations (between one and multiple destinations), 4) clustering, comprising a) thematic destination clustering, b) district (area-constrained) destination clustering, and c) random clustering, and 5) multiple options and playout policy adaptability/resilience. After vectors to possible destinations have been programmed and displayed (Fig. 9), and the decision has been made, retain the chosen path segment between two nodes of the transition action. Repeat the process in each subsequent state. Make the path generation suggestions according to the chosen set of parameters, and defined number. The number of subsequent state suggestions can also be controlled (increased or diminished) by giving a specific proximity range or planning several moves in advance by taking into consideration the in-betweenness and position of each state in the probable final configuration of all states that the path should include, usually bounded by the area indicators or other controllers (for instance, thematic clustering label and filtering).

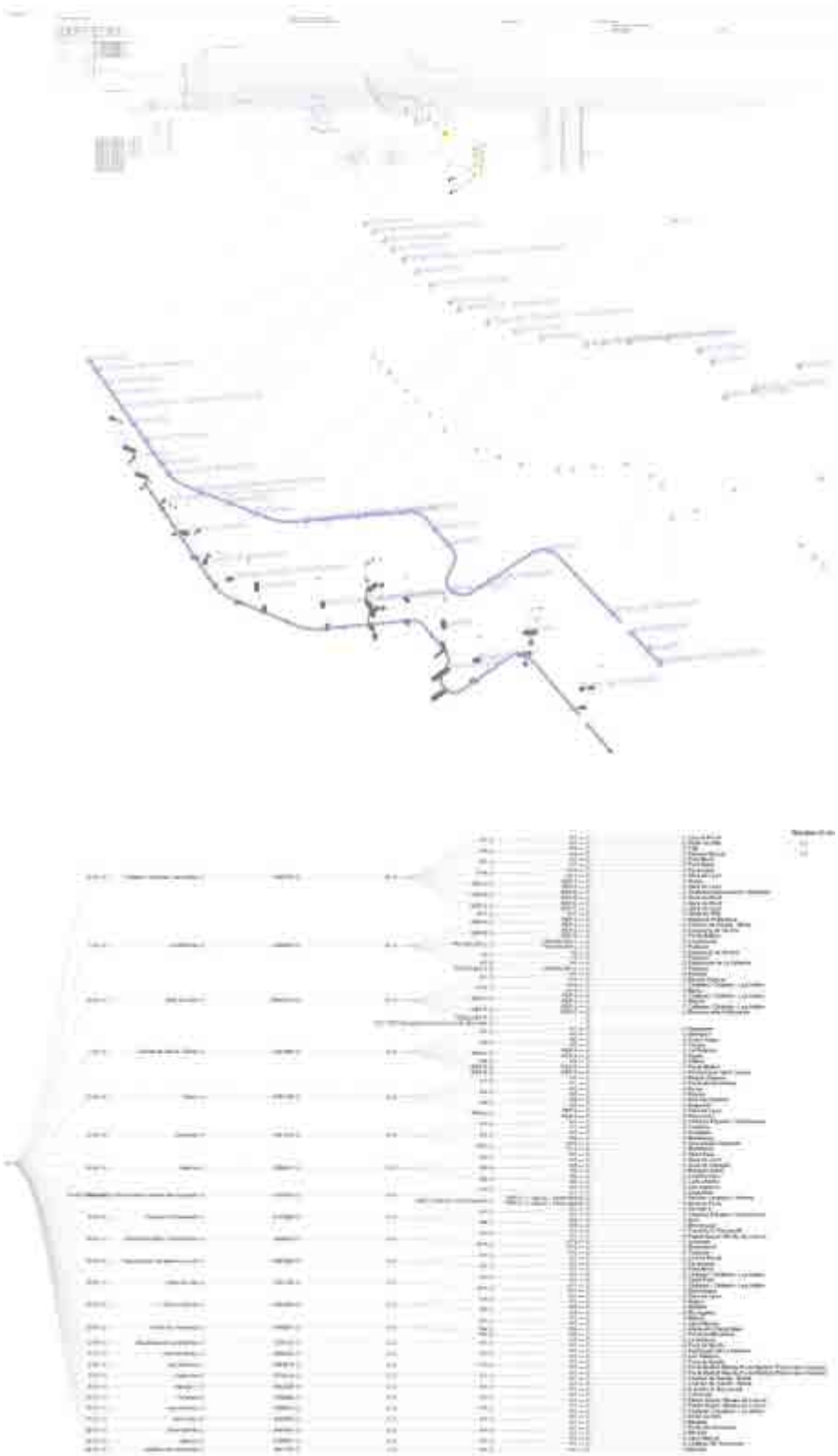


Figure 8. Map of actions: 1) selection of the exemplary metro line, 2) extraction of elements from the Paris metro map (selected line and stations) and its geometrical representation, 3) generation of the graph of the line from the list of stations in Grasshopper (operations with lists) – topological representation, 4) creation of the vector transition lines from morphological to topological representation, 5) adding data to each node – frequencies, number of commuters daily, 6) generating tree graph for the analysed line containing stations, frequencies, and connection lines with weights (number of connection in a node). Source: © Dragana Ćirić, unit [d], 2023

The method comprises computational design strategies, data-driven design, design through visual programming and parametric modelling, and generative design method, and it is supported by the use of digital tools for path generation construction, analysis, evaluation, and optimisation based on search algorithms and artificial intelligence. An additional platform that could be suggested by the paper is ArcGIS or ArcGIS Pro which will add a new class for comparison in the future.

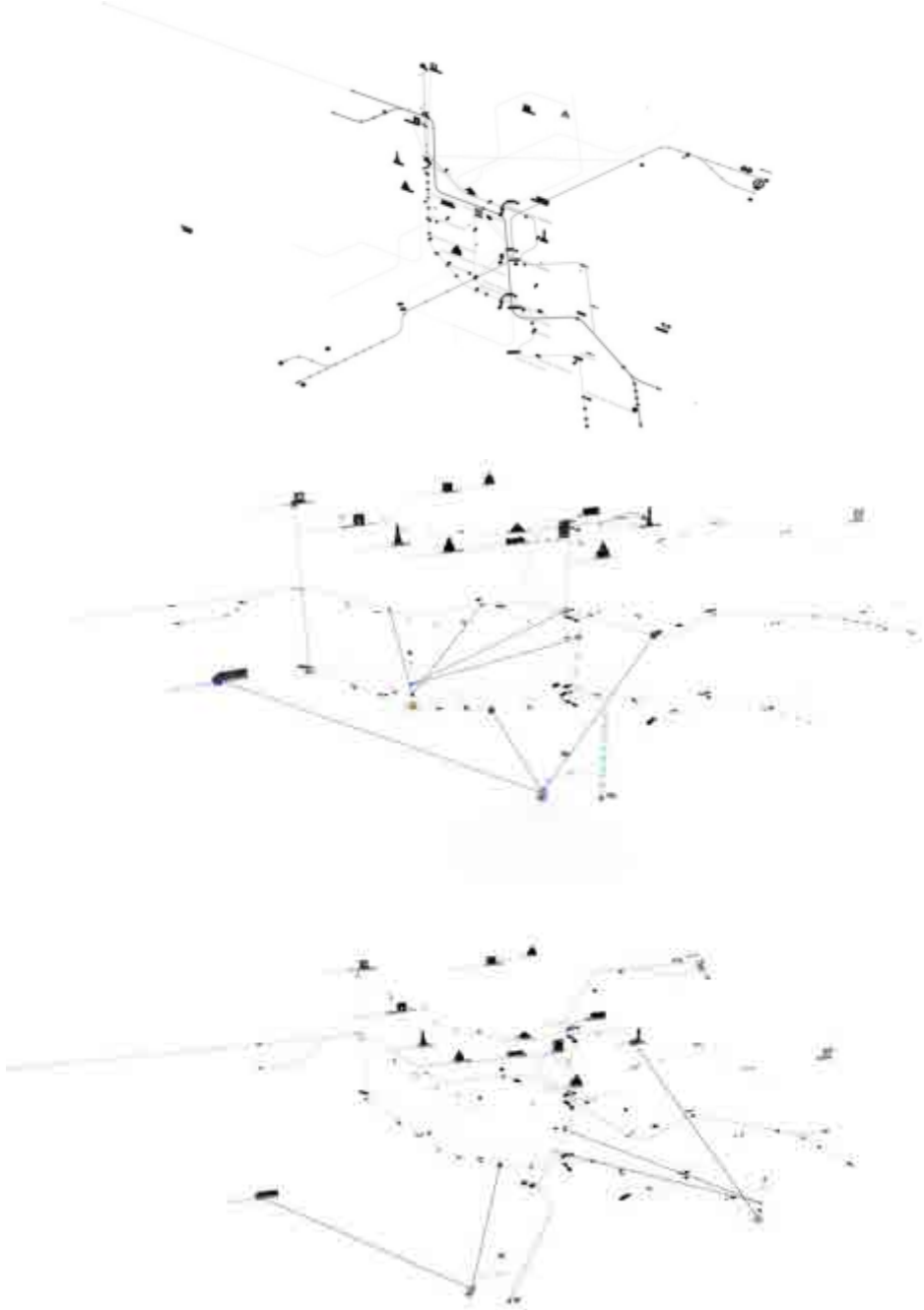


Figure 9. Simulation of the dynamic movement along the metro line, while the two closest points on the intersecting or marked metro line and the closest landmark destination are displayed through lines (possible actions) as subsequent points (states) to be occupied. Chosen stills of an animation render simultaneous movement along two lines (two agents) – displaying a variety of presumably the closest landmark and one or two closest transit stations, or only the closest stations along the other rail line of interest. Source: © Dragana Ćirić, unit [d], 2023, https://dciricnetworks.tumblr.com/, https://64.media.tumblr.com/036b9b81066623f82155223ecc171a50/a1edba9043f32fba-da/s1280x1920/f0e5572a01d8dd2d6fbd18de72adb1c98de3da8a.gifv, https://64.media.tumblr.com/704220f63d4a09c895c58eef54c9ebf7/da42d815e8d6c12a-a1/s1280x1920/e49a34a05b923244e5e8004b6bed3aa4b9d5f66d.gifv

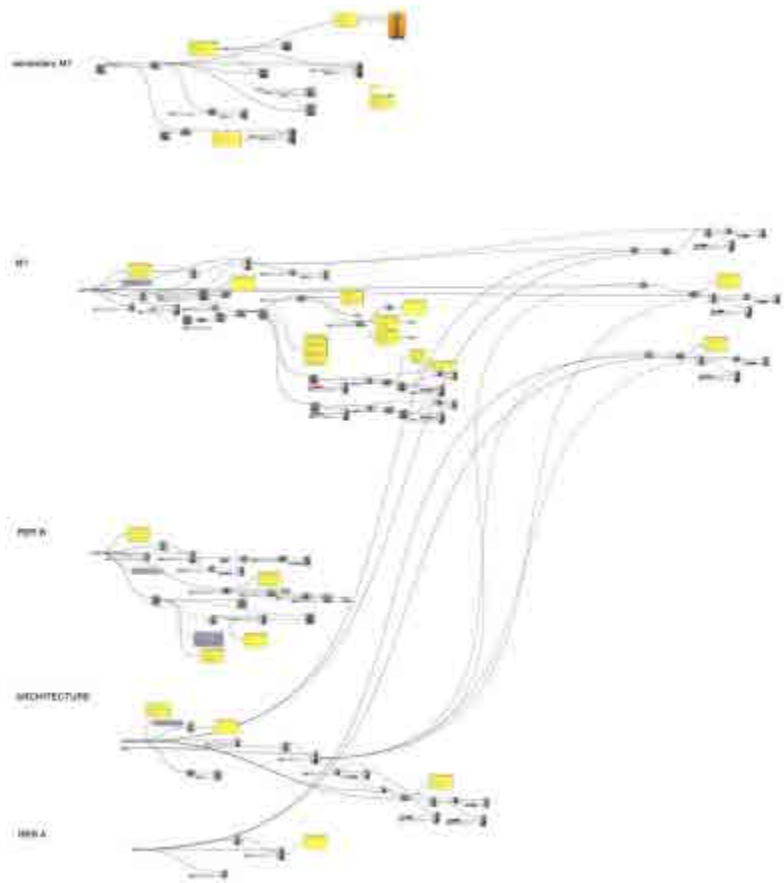


Figure 10. Grasshopper method for generating objects and simulation in Figure 9. Source: © Dragana Ćirić, unit [d], 2023

4. Conclusion

The presented paper and lecture aimed to demonstrate how the science of networks and its tools (network graphs) can be operationalised for abstract and real-world spatial problem-solving, analysis or analytics, planning, design, and representation. Targeting spatial design methodology, it addressed this new scientific area and tested several computational strategies tailored to resolve defined generative design problems as complex and decomposable sets of actions and instructions. Within such methodological framework and specific thematic area of urban computing, mobility, dynamics, and transportation systems, guided by the construction of targeted urban experience, generative design problem addressed methods and tools for its solution.

The contribution of the paper comprises the following:
1) theory of network science and its connection to urban systems;
2) literature review and selection for a defined interdisciplinary convergence;
3) network graphs construction, their complexity at the scale of the city-region, and operability; graph operations in a selected software;
4) urban communication, mobility/transportation, and navigation systems twins' construction, analysis, optimisation, and design through computational and data-driven methods and techniques;
5) computability of dynamic spatial problems;
7) generative design problem definition and solution methodology;
8) AI application in urban and architectural studies.
9) explanatory graphic and diagrammatic material supportive of the main arguments;

The plans for further development include finalisation of the remaining research project development phases (e.g. new path generation and design computational methods https://va.media.tumblr.com/tumblr_s1fik2uIPa1a96rc8_720.mp4?fbclid=IwAR3NDG3SVKp_MPzz1ru02eZIXT3Pv38uA6oZEU8WwiL5zxwXDzBNVUNlZWM, Source: © Dragana Ćirić. Software: Grasshopper), results of which will be updated at the following link https://dciricnetworks.tumblr.com/(© Dragana Ćirić, 2023).

References

AEC Generative Design Team at Autodesk. (2020). *Generative Design Primer*. Autodesk. https://www.generativedesign.org/

Albert, R. and Barabási, A-L. (2002). Statistical Mechanics of Complex Networks. *Reviews of Modern Physics* 74(1), 47-97. https://doi.org/10.1103/RevModPhys.74.47

As, I. and Basu, P. (2021). *The Routledge Companion to Artificialscale Intelligence in Architecture*. London and New York: Routledge.

Barabási, A-L. and Albert, R. (1999). Emergence of scaling in random networks. *Science*, 286(5439), 509-512. https://doi.org/10.1126/science.286.5439.509

Barabási, A-L. and Frangos, J. (2002). *Linked: The New Science of Networks*. Cambridge, Mass.: Perseus Books Group.

Barabási, A-L. (2009). Scale-Free Networks: A Decade and Beyond. *Science*, 325(5939), 412-413. https://doi.org/10.1126/science.1173299

Barabási, A-L. (with Márton Pósfai). (2018). *Network science*. Cambridge, UK: Cambridge University Press.

Batty, M. (1990). Intelligent cities: using information networks to gain competitive advantage. *Environment and Planning B: Planning and Design*, 17(3), 247-256. https://doi.org/10.1068/b170247

Batty, M. (1997). The computable city. *International Planning Studies*, 2(2), 155-173. https://doi.org/10.1080/13563479708721676

Batty, M. 2001. Editorial: Agent-based pedestrian modelling. *Environment and Planning B: Planning and Design*, 28(3), 321-326. https://doi.org/10.1068/b2803ed

Batty, M. (2003). Network Geography: Relations, Interactions, Scaling and Spatial Processes in GIS. *Centre for Advanced Spatial Analysis University College London Working Paper Series,* 63, 1-23. https://www.ucl.ac.uk/bartlett/casa/sites/bartlett/files/migrated-files/paper63_0.pdf

Batty, M. (2005). *Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals*. Cambridge, MA: The MIT Press.

Batty, M. (2008). Fifty years of urban modelling: macro statics to micro dynamics. In Albeverio, S., Andrey, D., Giordano, P. and Vancheri, A. (Eds.). *The dynamics of complex urban systems: an interdisciplinary approach*. Heidelberg: Physica-Verlag, pp. 1–20. https://doi.org/10.1007/978-3-7908-1937-3_1

Batty, M. (2009). Urban Modelling. In Thrift, N. and Kitchin, R. (Eds.). *International Encyclopedia of Human Geography*. Oxford, UK: Elsevier, pp. 51-58. http://dx.doi.org/10.1016/B978-008044910-4.01092-0

Batty, M. (2018). Visualizing aggregate movement in cities. *Philosophical Transactions of the Royal Society B*. 373(1753), 20170236. https://doi.org/10.1098/rstb.2017.0236

Batty, M. and Longley, P. A. (2014). Modelling Spatial Morphologies: Fractal Patterns from Cellular Automata. In Abrahart, R. J. and See, L. (Eds.). *Geocomputation*. London: CRC Press, pp. 23-48.

Cazenave, T. (2016). Playout policy adaptation with move features. *Theoretical Computer Science* 644, 43-52. https://doi.org/10.1016/j.tcs.2016.06.024

Cazenave, T. (2022). Nested Search versus Limited Discrepancy Search. arXiv:2210.00216 [cs.AI]. https://doi.org/10.48550/arXiv.2210.00216

Ćirić, D. (2016). Relational Logics and Diagrams: No-Scale Conditions. *SAJ*. 8(3), 388-426. https://doi.org/10.5937/SAJ1603388Q

Ćirić, D. (2017). *Scripts and Codes of Architectural Design Process: Disciplinary Borders and Transfers*. Doctoral Thesis defended on 13 July 2017. Belgrade: Belgrade University – Faculty of Architecture. https://www.researchgate.net/publication/319122883_Scripts_and_Codes_of_Architectural_Design_Process_Disciplinary_Borders_and_Transfers

Ćirić, D. (2020). System Architect: Digital Literacy and Construction of the Digital and Object-like Environments for Research Operations. *In* Bogdanović, R. (Ed.). *Eight International Conference On Architecture "Learning Architecture" Proceeding*, Belgrade: STRAND, pp. 49-63.

Ćirić, D. (2022). Generative design principles and algorithmic thinking in architectural plan variations: human to machine approach. In Soddu, C. and Colabella, E. (Eds.). *XXV Generative Art 2022: proceedings of the XXV GA conference*. Rome: Domus Argenia Publisher, pp. 144-156.

Ćirić, D. (2023). Generative and AI Methods for Transportation Systems and Urban Mobility Design, Planning, Operation, and Analysis: Contribution to Theory and Methodology of Urban Computing. In Đukić, A., Krstić-Furundžić, A., Vaništa Lazarević, E. and Vukmirović, M. (Eds.). *Keeping up with Technologies to Imagine and BuildTogether Sustainable, Inclusive, and Beautiful Cities, 8th International Academic Conference on Places and Technologies Proceedings*, (through the communication with the author, pp. to be announced), Belgrade: Belgrade University - Faculty of Architecture.

Darvariu, V-A., Hailes, S. and Musolesi, M. (2023). Planning spatial networks with Monte Carlo tree search. *Proceedings of the Royal Society A*, 479(2269), 20220383. https://doi.org/10.1098/rspa.2022.0383

Enright, T. (2023 (2016)). *The Making of Grand Paris: Metropolitan Urbanism in the Twenty-first Century*. Cambridge Mass.: The MIT Press.

Ferraiolo, A. (2022). Zebra: Threat and Response in a Dynamical Artwork. In Soddu, C. and Colabella, E. (Eds.). *XXV Generative Art Conference. GA2022*. Rome: Domus Argenia Publisher, pp. 46-48.

Galviz López, C. (2019). *Cities, Railways, Modernities: London, Paris, and the Nineteenth Century*. New York and London: Routledge.

Guihaire, V. and Hao, J-K. (2008). Transit network design and scheduling: A global review. *Transportation Research Part A*, *42*(10), 1251–1273. https://doi.org/10.1016/j.tra.2008.03.011

Jiang, B. and Liu, C. (2009). Street-based Topological Representations and Analyses for Predicting Traffic Flow in GIS. *International Journal of Geographical Information Science*, 23(9), 1119-1137. https://doi.org/10.1080/13658810701690448

Lopes, J. V., Paio, A. and Sousa, J. P. (2014). Parametric Urban Models Based on Frei Otto's Generative Form-Finding Processes. In Gu, N., Watanabe, S., Erhan, H., Haeusler, H., Huang, W. and Sosa, R. (Eds.). *Rethinking Comprehensive Design: Speculative Counterculture, Proceedings of the 19th International Conference on Computer-Aided Architectural Design Research in Asia (CAADRIA 2014)*, pp. 595–604. https://doi.org/10.52842/conf.caadria.2014.595

Pike, D. L. (2005). *Subterranean Cities: The World beneath Paris and London, 1800–1945*. Ithaka and London: Cornell University Press.

Porta, S., Crucitti, P. and Latora, V. (2006). The Network Analysis of Urban Streets: A Dual Approach. *Physica A: Statistical Mechanics and its Applications*, 369(2), 853-866. https://doi.org/10.1016/j.physa.2005.12.063

Roucairol, M. and Cazenave, T. (2022). Refutation of Spectral Graph Theory Conjectures with Monte Carlo Search. In Zhang, Y., Miao, D. and Möhring, R. (Eds.). *Computing and Combinatorics, 28th International Conference, COCOON 2022, Shenzhen, China, October 22–24, 2022, Proceedings*, pp. 162-176. https://doi.org/10.1007/978-3-031-22105-7_15

Serra, M., Gil, J. and Pinho, P. (2016). Towards an understanding of morphogenesis in metropolitan street-networks. *Environment and Planning B: Urban Analytics and City Science*, 44(2), 1–22. https://doi.org/10.1177/0265813516684136

Sironi, C. F., Cazenave, T. and Winands, M. H. M. (2021). Enhancing Playout Policy Adaptation for General Game Playing. In Cazenave, T., Teytaud, O. and Winands, M. H. M. (Eds.). *Monte Carlo Search. MCS 2020. Communications in Computer and Information Science, vol 1379*. Cham: Springer. https://doi.org/10.1007/978-3-030-89453-5_9

Shi, W., Goodchild, M. F., Batty, M., Kwan, M-P. and Zhang, A. (Eds.). 2021. *Urban Informatics* [Online]. Springer, The International Society for Urban Informatics. https://doi.org/10.1007/978-981-15-8983-6

Taylor, J. L. (2009 (First published in 1971)). *Instructional planning systems: A gaming-simulation approach to urban problems*. Cambridge: Cambridge University Press.

Von Borries, F., Waltz, S. P., Böttger, M., Davidson, D., Kelley, H. and Kücklich, J. (2007). *Space Time Play. Computer Games, Architecture and Urbanism: The Next Level*. Basel, Boston, Berlin: Birkhäuser.

Internet sources

Île-de-France Mobilités, https://www.iledefrance-mobilites.fr/

Le réseau d'Île-de-France Mobilités https://www.iledefrance-mobilites.fr/le-reseau

La Société du Grand Paris. 2023. "Grand Paris Express, le nouveau métro." https://www.societedugrandparis.fr/

LePlanIledeFrance, Une initiative citoyenne pour l'amélioration des transports en commun. 2023. "Index des projets." http://www.plidf.fr/index/prolongements.php

RATP, https://www.ratp.fr/plans

Metanarrative and Transnational in the Concept of Soft Power Architecture

Ivan Filipović
University of Belgrade, Faculty of Architecture, Serbia
ivan.filipovic@arh.bg.ac.rs, ORCID: https://orcid.org/0000-0002-6973-6142

Abstract: Soft power is defined as the capability to attract and persuade without coercion and payments. Consequently, soft power architecture is viewed as its spatial manifestation. Soft power architecture is seen as an amalgamation of processes and outcomes that must be examined and explained as an indissoluble structure rooted in various narratives.
This paper explores theoretical understanding, mapping, and classifying the (re)production processes for spaces aimed at communicating the officially sanctioned images/messages of identity(-ies). Such displaced typologies share declarative values analogous to core messages and their delivery. The findings of this paper suggest a shared metanarrative that is universally applicable and will be decoded through rigorous observation of place-making strategies for displaced typologies and their impact on the built environment where they are placed.
The conclusion indicates that these processes will be instilled by a specific set of values. However, since they operate within a complex network of various stakeholders, the question remains regarding the surrounding processes that promote a specific value(s) as a dominant trait. The "finished product" (displaced spatial manifestation) will not always accurately reflect the prevailing (meta)narrative due to the intricacy of these processes, but it will have significant spatial consequences on the urban matrices as well as provide further insight into the spatial tug-of-war between nations.

Keywords: soft power, architecture, metanarrative, transnational, spatial displacement

1 Introduction

Soft power, a concept rooted in the ability to attract and persuade without resorting to coercion or financial incentives, has a tangible expression defined within the scope of a novel concept soft power architecture (see e.g. Filipović, & Vasiljević-Tomić, 2019, Filipović, 2021). This architectural phenomenon represents a fusion of multifaceted processes and outcomes that demand meticulous examination, forming an inseparable structure interwoven with diverse narratives.
This paper embarks on a multilayered exploration, encompassing theoretical comprehension, process delineation, and categorization pertaining to the creation and reproduction of spaces expressly designed to convey officially sanctioned images and messages of identity(-ies). These spatial constructs, often termed *displaced typologies*, share inherent declarative values that align with core messages and the methods used to convey them.
The key findings of this research work postulate the existence of a universal metanarrative, a common thread transcending borders and cultures, awaiting decipherment through in-depth scrutiny of place-making strategies employed in shaping displaced typologies and their resultant impact on the surrounding built environment.
However, within the intricate web of interconnected stakeholders, questions arise concerning the mechanisms that elevate specific values into dominant traits. This complexity stems from the fact that these processes operate within a convoluted network of diverse actors, each with their own motivations and objectives.
Consequently, the ultimate "finished product" – the tangible spatial manifestation resulting from these endeavors – may not always be an accurate reflection of the prevailing (meta)narrative. This discrepancy underscores the intricate nature of these processes, where competing interests and perspectives may distort the intended message. Nevertheless, it is imperative to recognize that these spatial manifestations exert a significant influence on urban landscapes and matrices, shaping the very fabric of cities and yielding insights into the ongoing spatial power dynamics between nations.
This text is utilized to explore complex ideas within the intersection of the concepts of transnationality, meta narrative and soft power architecture, by creating a hypothetical framework within these concepts are studied and analyzed within the broader theoretical context and its implications. As such, it will remain within the boundaries of theoretical investigation, without the presumption these concepts have a physical manifestation that would be suitable to be utilized as an exploratory model, Furthermore, any examples that are identified with specific aspects of this investigation in previous research are deemed as insufficiently illustrative to showcase and highlight the complexities of the presented theoretical investigation and as such will be omitted from this text, to be explored in future academic publications.

2 Soft Power

'*Despite its growing importance around the world, a universal definition of soft power is yet to be found, except that it is a form of national power based on ideational and cultural attractiveness which is intentionally or unintentionally utilized by actors in international relations to achieve strategic imperatives'* (Lee, 2011: 2)

This segment will revise the scholarly works systematizing the concept of soft power, more precisely, the works of Nye (2004) and Lee (2011), with the former introducing the concept of soft power and the latter giving a concise overview of its historical development and implications, which will be utilized as the necessary outline in this paper.

Soft power, a term coined by Joseph Nye in the late 1980s, is the ability to attract and convince others without oppression and payments. Although military force and economic prosperity typically serve as the backbone of national power, such hard power does not always mirror its influence. For instance, the U.S, world's superpower has spent a defense budget larger than that of other nations and it is the world's largest economic body. However, U. S's image and its influence dwindling, mainly due to its failure in seeking a global consensus on how best to pursue counterterrorism approaches and to address potential global challenges such as climate change. There have been many calls both within and outside the United States to restore its leadership through "smart" blending of hard and soft power (Lee, 2011: 1).

Other countries also increasingly recognize the importance of soft power tools, such as diplomacy, foreign (economic) assistance and communication in the processes of rousing support and enhancing one's national image. Western European countries have a longer tradition and spend more time on their respective public diplomacy approaches, useful as a supplementary strategy of soft power, exhibited in actions such as peacekeeping and humanitarian mission, international cultural relations and immigration policies. Japan, for example, has embraced the concept of soft power as an instrument of its foreign affairs and security policy under its constraints on the use of hard military power. Most countries in general tend to attempt increasing their capacity to "strengthen soft power and integrate it with hard power and economic strength" (Lee, 2011: 1-2).

Lee (2011) gives clear theoretical perspectives on soft power starting with the concept of power itself, defined as the ability to influence others to produce the outcomes one desires. According to Dahl (1957), A has power over B to the extent that he can get B to do something B would not otherwise do. Traditionally, a nation's power has been determined by the capabilities to influence the behavior of other states through coercion and economic incentives. The sizes of population, territory, military force, national resources and economic strength have therefore been key factors in assessing national power. Countries have tended to heavily rely on "the use of hard power that rests on force and inducements (sticks and carrots metaphor), because it was the most direct and tangible way of enforcing dominance in international relations" (Lee, 2011: 3).

While acknowledging the importance of military and economic power, Nye (1991) added a third concept pertinent in the global arena of international relations, *soft power*. Soft power is the ability to attract and convince, not just command and coerce. It enables a nation to appeal to others' values, interests and preferences rather than being dependent on utilizing force and inducements. Nye (1991) argues that:

[…] '*if a state can make its power legitimate in the eyes of others, it will encounter less resistance to its wishes. If its culture and ideology are attractive, others will more willingly follow'* […] '*In short, the universalism of a country's culture and its ability to establish a set of favorable rules and institutions that govern areas of international activity are critical.'* (Nye, 1991: 33)

In summary, compatibility with other nations' set of values and interests is as important as the exercise of hard power to obtain the desired goal (Lee, 2011). According to Nye (2004), in the global information age, all three sources of power – military, economic and soft – remain relevant, although in different degrees in different relationships. However, Nye argues that the importance of soft power is ever-increasing and gaining traction as countries engage in competitive policies of attraction, legitimacy and credibility. Nye suggests there are three major resources of a nation's soft power: culture which attracts others, political values, when it lives up to those values, both internally and externally, and its foreign policies when others appreciate them as legitimate and moral (Lee, 2011).

Lee (2011) makes an observation that Nye's conceptualization is not the only or the definitive explanation of power. To illustrate, prior to the works of Nye, Boulding (1990) utilized the terms "threat", "exchange" and "integrative" power for similar purposes, highlighting that, while the realists focus on the threat power of coercion, "the evidence is very strong that integrative power is the most important of the three." From this perspective, threat power is coercive and destructive and exchange power is based on the dynamics of trade, mutual contracts and reciprocal cooperation, while integrative power has a more emotional and organic base, where human relationships extend beyond respect into friendship and even love (Lee, 2011).

Similarly, Griswald and Carr (1941) discussed the importance of "power over opinion" and its close connection with the military and economic power of the nation. Similarly, one of Morgenthau's (1972) ways of exercising

national power lies in the politics of prestige, offering a hint for understanding the implications of soft power in the world of anarchy. Power, in itself, is not the end of the nation-state, but a means to achieve prosperity and guarantee survival. The state not only implements its will towards others by taking measures that follow the drive of resources on foreign soil, but also by relying on an international reputation that has sufficient intention and ability to use its power. Morgenthau (1972) stated that '*in the struggle for existence and power, what others think of us [the image in the mirror of the minds of others] is as important as what we actually are*' (Morgenthau,1972: 73)

3 Quantifying Soft Power

Inquiries of successful deployment of soft power and the follow-up processes, noting its results presents a challenge for scholars and policymakers alike. The main question remains: can soft power be effectively quantified? This segment will provide a brief overview of an approach from a think tank Soft Power 30, in partnership with the University of Southern California's Center on Public Diplomacy, endeavoring to deliver practical insights on soft power, public engagement and digital diplomacy. USC's Center on Public Diplomacy brings academic rigor to the discipline of public diplomacy, and translates cutting-edge research into actionable insights for diplomats, policymakers and academics alike (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 12).

An important note is to be made at this juncture: the presented data on the Soft Power 30's attempt to codify and quantify a country's soft power potential does not extend into the spatial realm. Architecture, for example has not been addressed as one of the factors, only widely interpreted as one of the facets of the sub-index "culture". The purpose of providing the theoretical concepts of soft power quantification in this segment is to illustrate the attempt to measure a concept that cannot be easily placed within the realm of definitively quantifiable data.

Countries most adept in using soft power facilitating positive collaboration will be better equipped to deal with the current uncertainty and geopolitical instability and ultimately shape global events. Referencing Nye's (2011) model of conversion of soft power into a desired outcome comprises of five steps (see: Figure 1). As depicted, the process must start with a clear account of available resources and an understanding of where they will be effective. It is at this first hurdle – measurement – that most governments stumble. This, however, is understandable as the difficulty of measuring soft power is well documented (Trverton, 2005).

Nye (2004) has previously pointed to three primary sources of soft power: culture, political values and foreign policy. The Soft Power 30 framework builds on Nye's three pillars, capturing a broad range of factors that contribute to a nation's soft power. The given index assesses the soft power resources of countries by combining both objective and subjective data (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 30).

The objective data is drawn from a range of different sources and structured into six categories, with each category functioning as a sub-index with an individual score (see: Figure 2). The six sub-indices are: Government, Culture, Global Engagement, Education, Digital, and Enterprise. The framework of categories was built on a survey of existing academic literature on soft power (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 30).

Figure 1 (left) Soft Power Conversion Process
Figure 1 (right) The Sub-Indices of Soft Power

For the *Government* sub-index, the Soft Power 30 Report (Soft Power 30, A Global Ranking of Soft Power 2017 Report, p. 30) uses the postulations of Haass (2013), assessing a state's political values, public institutions and major public policy outcomes. Together with measures such as individual freedom, human development, violence in society, and government effectiveness, the Government sub-index measures the extent to which a country has an attractive model of governance and whether it can deliver broadly positive outcomes for its citizens.

Similarly, Nye (2004) argues that, when discussing a country's culture, if it promotes universal values that other nations can identify with, it makes said countries naturally attractive to others. The reach and volume of cultural output is important in building soft power, but mass production does not necessarily lead to mass influence. As a result, the Soft Power 30 index includes measures of culture that serve to capture both the quality and the international penetration of a country's cultural production. The *Culture* sub-index includes measures like the annual number of visiting international tourists, the global success of a country's music industry, and even a nation's international sporting prowess (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 30).

Another sub-index, the *Global Engagement* is utilized to measure a country's diplomatic resources, global footprint and contribution to the international community. It captures the state's ability to engage with international audiences, initiate collaboration and ultimately shape global outcomes. This sub-index includes metrics such as the number of foreign missions abroad, membership in multilateral organizations and overseas development aid (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 30).

For the next sub-index *Education*, the Report (Soft Power 30, A Global Ranking of Soft Power 2017 Report, pp. 30-31) argues that the ability of a country to attract foreign students, or facilitate exchanges, is a powerful tool of public diplomacy, even between countries with a history of animosity. Similarly, Atkinson (2010) while presenting research on educational exchanges gives empirical evidence on accumulation of reputational gains for a host country when foreign student returns to their country of origin. Moreover, Olberding J. and Olberding D. (2010) discuss how foreign student exchanges have been shown to have positive indirect 'ripple effects' when returning students advocate on behalf of their host country of study. Metrics in the Global Ranking of Soft Power 2017 Report (p. 31) for this sub-index include the number of international students in a country, the relative quality of its universities, and the academic output of higher education institutions.

Enterprise sub-index is noted as, not a measure of economic power or output, but rather, aiming to capture the relative attractiveness of a country's economic model in terms of its competitiveness, capacity for innovation, and ability to foster enterprise and commerce (Soft Power 30, A Global Ranking of Soft Power 2017 Report). The Report section dealing with this sub-index that economic might is more often associated with hard power, but economic factors can contribute to soft power as well.

Lastly, the *Digital* sub-index is hailed as brining an important new component to the measure of soft power. As technology has massively impacted our daily lives and ways of interaction, the same can be said for foreign policies, practices of public diplomacy and soft power. This sub-index aims to capture the level of countries implementing technology, its connectedness to the digital world and their usage of digital diplomacy through social media platforms (Soft Power 30, A Global Ranking of Soft Power 2017 Report).

Soft Power 30 group's Global Ranking of Soft Power 2017 Report (p. 31) particularly addresses the difficulties of interpreting the *subjective data* for soft power; one of the biggest challenges is its inherently subjective nature. Rather than attempt to design against subjectivity, The Soft Power 30 index embraces such approach. Its inaugural report, launched in 2015, was the first to combine objective data and international polling. The following year (2016), adhering to the previously set framework, specially commissioned polling across 25 countries was utilized to analyze the subjective data for this index.

Drawing from the existing pool of academic literature of soft power, a series of short questions was developed, providing data on international perceptions based on the most common 'touch point' through which people interface with foreign countries. International polling for the index ran across a range of the world's major regions. In 2016 the polling was expanded to 25 countries, up from 20, and taking our sample size from 7,200 to 10,500. In 2017, the Soft Power 30 group ran polling of the general public in the same 25 countries. (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 31-32).

The following factors were covered in the polling (each rated on a 0-10 scale, where 0 represented a very negative opinion, and 10 represented a very positive opinion):

- Favorability towards foreign countries;
- Perceptions of cuisine of foreign countries;
- Perceptions of how welcoming foreign countries are to tourists;
- Perceptions of technology products of foreign countries;

- Perceptions of luxury goods produced by foreign countries;
- Trust in foreign countries' approach to global affairs;
- Desire to visit foreign countries to live, work, or study;
- Perceptions of foreign countries' contributions to global culture.

These eight metrics were used to develop a regression model, where "favorability towards foreign countries" was the dependent variable, and the remaining questions were independent variables. This measured the extent to which the remaining perceptions predict favorability towards a country in the dataset (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 34).
Soft Power 30 group acknowledges that the presented composite index, as it is expected for any index of this nature, the presented data comparably has its limitations and shortcomings. Moreover, the subjective nature of soft power is highlighted, making comparison across all countries difficult. Moreover, the total complexity of the dynamics of inter-state relations – where soft power is brought to bear – cannot be fully rendered by a comparative global index (Soft Power 30, A Global Ranking of Soft Power 2017 Report: 36).

4 Soft Power Architecture

The concept of soft power architecture is an examination of its potential and effectiveness in influencing bilateral relations, offering concrete indicators of its underlying dynamics. Drawing from Joseph S. Nye's (2004) concept of "soft power," this framework introduces an additional element, positing architecture as a negotiating tool employed by various actors. Nye's definition of "soft power" is fundamentally rooted in the capacity to attract, with this appeal often resulting in compliance. It is achieved through the deployment of "soft" initiatives, such as cultural and intellectual exchanges, in contrast to "hard" power, which encompasses a nation's military or political influence on the global stage (Nye, 2004).
With soft power architecture, however, this can change, as interpretative stratagems can act and evolve differently within the diverse context and produce dissimilar consequences and meanings, not necessarily in synchronization with original intentions, as it happens with the export of architecture/ideology. One must underline that these "mutation" effects are applicable for any projected type of exported architecture, the ones communicating power and supremacy of the sending state and soft power architecture, representing the willingness for (an outward) display of deepening mutual understanding between countries. For the purposes of this research, the focus will be on the exported architecture that, in its conception, implementation and spatial consequences stages had the latter case of conceptualization, as the mechanisms that govern these processes are deemed to be more complex, when compared to the former.
Furthermore, implementation, monitoring and follow-up processes, if handled with care, either separately or as a set, can produce and/or sustain effects that are in line or differ from the original intentions. Again, the underlying value of management processes through inception, implementation and management cannot be stressed enough.
One must note, however, that soft power architecture alone cannot be used to fully examine and define ideologies and stratagems of the sending country, as its manifestations abroad are shaped both by internal processes and factors native to that environment and in many cases, ideological images and spatial manifestation must be amended to facilitate the requirements of foreign environments (even with the privileges awarded by the VCDR). Architecture is a system of construction of circumstances that do not exist independently from the contextual occurrences. Architecture, in fact, does not capture the entirety of, but rather constructs and legitimizes every societal reality and ideology (Ignjatović, 2007). Thusly, soft power architecture should be viewed as a snapshot (Czarniawska, 2002) of the conceptualization and implementation processes and policies of every actor involved, as well as its produced spatial effects.
Architecture that will be examined and that is defined as the architecture of soft power will be the one forged with the original intention to facilitate and enhance the sender country's interests abroad, with or without ulterior motives. The architecture of intimidation, showpieces of supremacy and might, is removed from this research, and a clear set of indicators will be put in place to separate and classify these typologies.

5 Meta-narrative

The term "metanarrative," also referred to as a grand narrative or master narrative, was introduced by Jean-François Lyotard (1979) to denote a theoretical framework that seeks to provide a comprehensive and all-encompassing account of various historical events, experiences, and social and cultural phenomena. These narratives are constructed on the basis of appealing to universal truths or universal values.
In this context, a metanarrative serves the function of legitimizing power structures, authority, and societal norms. It aspires to explain diverse historical events and imbue them with meaning by establishing connections

between disparate events and phenomena through the application of universal knowledge or a structured schema. The concept of grand narratives encompasses a broad spectrum of ideologies and worldviews, including Marxism, religious doctrines, the belief in progress, universal reason, and others.
However, Jean-François Lyotard critiqued the concept of metanarratives in his influential work, "The Postmodern Condition: A Report on Knowledge" (1979). In this text, Lyotard introduced the idea of the "postmodern condition," characterized by a growing skepticism towards the totalizing nature of metanarratives or grand narratives.
As described by Stephens and McCallum (1998), a metanarrative is a global or all-encompassing cultural narrative schema that organizes and explains knowledge and human experiences. The prefix "meta" signifies "beyond" or "about," while "narrative" refers to a story. Consequently, a metanarrative can be understood as a story about a story, encompassing and elucidating other "smaller stories" within a comprehensive framework.
Lyotard's "The Postmodern Condition" marked the emergence of the term "postmodernism" in philosophy and introduced the idea of incredulity towards metanarratives. He argued that technological advancements, particularly in communication, mass media, and computer science, had rendered traditional metanarratives untenable. Techniques such as artificial intelligence and machine translation highlighted the shift towards linguistic and symbolic production as central elements of the postindustrial economy and the associated postmodern culture. This led to a proliferation of language-games, without any overarching structure, challenging the foundations of modern science and its metanarratives.
Lyotard advocated for embracing the plurality of small narratives that compete with one another, replacing the dominance of grand narratives. This perspective has often been interpreted as endorsing relativism, a characteristic feature of postmodern thought.
It's worth noting that "The Postmodern Condition" was originally commissioned as a report on the influence of technology on knowledge in the exact sciences by the Québec government. Lyotard later admitted to limited knowledge in this domain and even humorously referred to the text as a "parody." Despite his reservations, the work has become highly influential in the field of postmodern philosophy, shaping discussions on the role of metanarratives and the postmodern condition.

6 Discussion

A narrative, any narrative has an end in view, it is a program how something (in this case soft power architecture) is to be achieved. Particularly when architecture and urban planning are combined with soft power that is conceptually rooted in the future/future goals. The challenges with soft power architecture and consequently, with the claim of a meta-narrative, is that the framework that will clearly define its end goals to be achieved is yet to be defined, even in the broadest of strokes, as it is, by nature, in a state of constant flux.
The presumed points of a meta-narrative for soft power architecture share inherent declarative values that align with core messages and the methods used to convey them, most notably through previously established international relation approaches. However, these values will ostensibly shift to suit particular contextual demands, which will translate into the spatial realm. Moreover, additional shift will occur after implementation within the built environment context, correcting the previously presented meta-narrative. The observable values can then be extricated, either through comparative analysis or focusing on particular major modifications in the (meta) narrative for a particular context.
As per the poststructuralist approach, when a narrative is constructed, something is left out, when an end is defined, other ends are rejected, without necessarily knowing the alternative ends are. Researchers must keep asking, what is left out, can we know what is left out, we must know the limits of narratives, rather than establish them for the future, for the establishment of soft power architecture.
In the instance when observing narrative shifts, there is great potential to observe and codify the changes, as it is presumed, they will be circular (space vs. narrative), constantly corrected, although it is presumed that the narrative will have to work around the already built environment, as any further modifications in said environment are more difficult than in a virtual one.
Researching meta-narratives of soft power architecture and its subsequent shifts (corrections) must have a long-term strategic approach. The end goal would be to codify the usage of spatial manifestations and urban governance to achieve particular goals within a global arena of various stakeholders and constant geopolitical turmoil, claiming their inherent transnational traits. It is doubtful that such an undertaking is likely to be finalized, with clear-cut findings, but nonetheless serves as an important overview on how architecture and other disciplines are involved in building philosophical, as well as spatial narratives and outcomes.

7 Conclusion

In conclusion, this paper delves into the multifaceted concept of soft power architecture, which represents a novel approach to understanding how nations shape their bilateral relations through the built environment. It emphasizes the importance of scrutinizing the theoretical underpinnings, processes, and categorizations associated with the creation and reproduction of spaces designed to convey sanctioned identities and messages. The research posits the existence of a universal metanarrative within the realm of soft power architecture, transcending borders and cultures. This metanarrative is proposed to be discerned through a meticulous examination of place-making strategies and their impact on the built environment. However, the complexity of this endeavor is evident, given the intricate network of stakeholders, each driven by their own motivations and objectives.

The paper underscores that the tangible spatial manifestations resulting from these efforts may not always align with the intended (meta) narrative due to competing interests and perspectives. Nevertheless, it acknowledges the profound influence of these spatial manifestations on urban landscapes and the power dynamics between nations.

The discussion also introduces the concept of soft power, emphasizing its significance in contemporary international relations. Soft power, as defined by Joseph S. Nye, revolves around the ability to attract and persuade without resorting to coercion or financial incentives. It contrasts with hard power, which relies on military or economic dominance. The paper highlights the increasing recognition of soft power tools by nations worldwide, emphasizing the importance of diplomacy, cultural exchange, and communication.

Additionally, the paper explores the quantification of soft power, recognizing the challenges in measuring such a concept. It introduces the Soft Power 30 framework, which combines objective and subjective data to assess a nation's soft power resources. The framework includes categories such as Government, Culture, Global Engagement, Education, Digital, and Enterprise. However, it notes that this framework does not encompass the spatial realm, which is a crucial aspect of soft power architecture.

Lastly, the discussion delves into the concept of metanarratives, as introduced by Jean-François Lyotard. These grand narratives are theoretical frameworks that seek to provide comprehensive explanations of historical events and cultural phenomena based on universal truths. Lyotard's work, "The Postmodern Condition," critiqued the dominance of metanarratives in shaping worldviews and highlighted the growing skepticism towards their totalizing nature in the postmodern era.

In summary, this paper embarks on a comprehensive exploration of the intricate interplay between soft power, architecture, and metanarratives. It underscores the need for a long-term strategic approach to understand how nations employ spatial manifestations and narratives to achieve their goals in an ever-evolving global landscape. While challenges abound, this research provides valuable insights into the complex dynamics of contemporary international relations and the role of architecture within this framework.

Acknowledgement: This research was kindly supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, with grant defined by the Contract on realization and financing of scientific research work of NIO (registration number: 451-03-68/2022-14/200090) with the Faculty of Architecture, University of Belgrade, Serbia, awarding the author of this paper the status of *Researcher – Returnee*.

References

Atkinson, C. (2010) ‘Does soft power matter? A comparative analysis of student exchange programs 1980-2006’, *Foreign Policy Analysis*, *6*(1), pp. 1–22. doi:10.1111/j.1743-8594.2009.00099.x.

Boulding, K.E. (1989) *Three faces of power*. http://ci.nii.ac.jp/ncid/BA11107699.

Griswold, A.W. and Carr, E.H. (1941) 'The Twenty Years’ Crisis, 1919-1939: An introduction to the study of international relations,' *The American Historical Review*, 46(2), p. 374. https://doi.org/10.2307/1838960.

Czarniawska, B. (2002) A tale of three cities: Or the Glocalization of City Management. Oxford University Press, USA.

Dahl, R.A. (2007) 'The concept of power,' *Systems Research and Behavioral Science*, 2(3), pp. 201–215. https://doi.org/10.1002/bs.3830020303.

Haass, R.N. (2013) *Foreign policy begins at home: The Case for Putting America’s House in Order*. Basic Books.

Ignjatović, A. (2007). *Jugoslovenstvo u arhitekturi 1904-1941* [Yugoslav in Architecture 1904-1941]. Građevinska knjiga

Filipović, I. (2021). *Soft Power Architecture: Mechanisms, Manifestations and Spatial Consequences of Embassy Buildings and Exported Ideologies* [PhD dissertation, Keio University]. https://doi.org/10.13140/RG.2.2.32368.17925

Filipović, I. and Vasiljević-Tomić, D. (2019). Soft power architecture: (Un)intentional and incidental in culture relations policies. *Arhitektura i urbanizam*, [online] (49), pp.18–31. Available at: https://scindeks-clanci.ceon.rs/data/pdf/0354-6055/2019/0354-60551949018F.pdf
Lee, S.-W. (2011) 'The Theory and Reality of Soft Power: Practical approaches in East Asia,' in *Palgrave Macmillan US eBooks*, pp. 11–32. https://doi.org/10.1057/9780230118447_2.
Lyotard J.-F. (1979) *La condition postmoderne : rapport sur le savoir*. http://ci.nii.ac.jp/ncid/BA03247761.
Morgenthau, H.J. (1972) *Politics among nations: The struggle for power and peace*. http://ci.nii.ac.jp/ncid/BA74403062.
Nye, J. (1991). *Bound To Lead: The Changing Nature Of American Power* (Revised ed.). Basic Books.
Nye, J.S. (2004). *Soft power : the means to success in world politics*. New York: PublicAffairs.
Olberding, J.C. and Olberding, D.J. (2010) '"Ripple Effects" in Youth Peacebuilding and exchange Programs: Measuring impacts beyond direct participants,' *International Studies Perspectives*, 11(1), pp. 75–91. https://doi.org/10.1111/j.1528-3585.2009.00394.x.
Soft Power 30. (2017). *Soft Power 30, A Global Ranking of Soft Power 2017 Report*. PORTLAND PR LIMITED. https://softpower30.com/wp-content/uploads/2018/07/The_Soft_Power_30_Report_2017-1.pdf
Stephens, J. and McCallum, R. (1998). *Retelling stories, framing culture: Traditional Story and Metanarratives in Children's Literature*. Psychology Press.
Trverton, G. F. (2005). *Measuring National Power (Conference Proceedings)*. RAND Corporation. www.rand.org/content/dam/rand/pubs/conf_proceedings/2005/RAND_CF215.pdf

III

REWORKING ARCHITECTURE/ CITY

How to maintain the roots of history and culture and yet be contemporary
Case study: Minimalism in Architecture

Dragana Vasilski
University Union Nikola Tesla, FCM - Architecture and Urban Planning, Belgrade, Serbia
dvasilski@unionnikolatesla.edu.rs, ORCID: https://orcid.org/0000-0001-5068-1500

Abstract: Architecture is one of the most important quality and characteristics of each nation and every historical period that indicate the environment of human's lives at any time. Urban development is an ongoing process even in historical parts of cities. This process had been happening in history and is still happening. Contemporary interventions in the historical urban space should not be the imitation of historical styles but they have to be authentically new and carry the creative stamp of the time they were created in. Every new architecture should be viewed as the heritage of the future. This is certainly a great challenge. New architecture as a very complex and sensitive task establishes an optimal balance in the relationship between conservation and development in the urban historical environment. Through the case study, the potential of minimalism (in architecture) is analyzed as contemporary creative activities enabled for a qualitative contribution to the whole of the historical space without compromising the preservation of spatial characteristics, historical character and identity of the city. Minimalism in architecture is seen as a possibility for realization of another one layer in the history of urban spaces that carries the creative seal of the time it was created in. As a reconciliation of styles from the past and a feature of the present.

Key words: Architecture, Minimalism, history, culture, heritage, development

1 Introduction

The elegance and grace of the building consists in placing everything in its place, as well as leaving out everything that should not be there.
Germain Bofrand (Livre d'Architecture, 1745 in Bojanić and Đokić 2012)

Architecture is one of the most important quality and characteristics of each nation and every historical period that indicate the environment of human's lives at any time. Urban development is an ongoing process even in historical parts of cities. This process had been happening in history and is still happening, framing the new building volume at the rear and creating a dialogue with the period houses and the heritage structures of the surrounding neighbourhood (Brolin 1985).

Contemporary interventions in the historical urban space should not be the imitation of historical styles but rather authentically new and carry the creative stamp of the time they were created in. Every new architecture should be viewed as the heritage of the future. This is certainly a great challenge. The relationship between *new forms* and *ancient forms*, between design and restoration interventions, leads us to find some contact points between past and present time; it leads us to find, throughout the historical processes and within the bodies of architectures, some invariant elements able to hold the significance of the places, the *meaning of the buildings*. For this reason, the principal problem assumed by the restoration project is the research of the meaningful and fundamental parts of architecture and their mutual and variable relationships. In this way, through this paper, it is possible to translate the original sense of architecture, which is recognizable within the fragmentary depth of history since it is nestled in the structural relationships inside the form, into a renewed sense, which can reinterpret those relationships and give them new life in the unstable vitality of our present time.

2 Architecture as a way of thinking

Logical thought is thought expressed in parts that are moderate to the outside, like a conversation. Analogous thought is sensory, figurative and absent. Not a conversation, but a search for images from the past, a kind of inner monologue. Logical thought is thought with words. Analogous thought is related to memory, it is subconscious, unexpressed and practically unspeakable in words.
From Jung's letter to Freud

Contemporary architectural statement is determined by the entire society and all the sciences that deal with it. Either at the level of the individual (psychology), at the level of society (sociology), or at the level of development (anthropology).

In his theory of comparable place, which served as the foundation for his entire body of work, Aldo Rossi discusses the notion that architecture emerges from the concrete, from architectural history, from the notion that architecture develops from itself, and from the materials of its past. Aldo Rossi's perspective is understandable given that he lived within the modernity era. As its major forebears, eclecticism and modernism

both strongly invoke the validity of the doctrine. By imitating the past, eclecticism was dependent on it. Modernism broke with the past while relying on it. It gave the same, undermining her significance.
In his special discussion of postmodern architecture, Derrida contends that the genre cannot be confined to the role of idea representation. Architecture may certainly be reduced to something like that less than any other art form if we simply consider it in relation to other arts, regardless of when it was created. He doesn't discuss it, though. He discusses the idea of architecture as a means of thought. Thinks about architecture. The method. The path. The letter. *Finding the way is a letter. A letter is like a labyrinth, it has neither beginning nor end. Man is always on the move. The juxtaposition of time and space, the time of speech and the space of a temple or house no longer makes any sense. Man lives in letters. Writing is a way of life* (Derrida 1986, p.17). At the macro level, it means that the task of architecture is no longer just interaction with its users and the nature in which it is implemented. The interaction of architecture now occurs on a higher plane. In the dimension of space, time, and language. Within the realm where it coexists and interacts with other sciences.
Let's go back to thinking about architecture, using thought as a path and constant forward motion. One of the main elements of architecture is place and development in space. Here, Derrida references Heidegger's theory of language as a path to self-discovery. How difficult was it to come up with this whole architectural theory? Not at all, when we take into account the intellectual tradition that utilized architecture as a symbol for a specific mode of thought. Aristotle, Descartes, and Leibniz had laid enough groundwork for Descartes and Heidegger to concur that architecture is a *mode of thought*.

3 Transformation as challenge in space and time

Man is forever in search of an object outside himself,although the desire for the object is within itself. Georges Bataille (Vesnić 2020)

The literal meaning of the word transformation is *passing from one form to another*. In architectural field this changeover consists in translating an *ancient* form (whose sense refers to ancestral needs and desires) in a *modern* form (whose sense refers to our ways of life in contemporary world). It consists in recognizing, within the fragmentary depth of history, the original sense of ancient architectures (or also of ancient human settlements), which is nestled in the structural relationships inside architectural forms. Thence, it consists in translating this original sense into a renewed sense, which should be able to reinterpret those relationships and to give them new life into the unstable vitality of our time; finally, it consists in researching the compliant forms to represent this sense in new manners, in new ways that are suitable to our current *culture of living*.
New architecture as a very complex and sensitive task establishes an optimal balance in the relationship between conservation and development in the urban historical environment. The concept of superstructure of the identity and spirit of the place in a clear primary form corresponds to the establishment of a cultural and spiritual dialogue between the existing and the newly built structure. Thus, architecture is understood as an instrument that builds and strengthens a place, and not simply as an instrument that builds on a place (Duncan, Ley 1993).
The relationship between *new* and *ancient* forms helps us identify some points of contact between the past and the present. It also helps us identify some fundamental elements that, both within the bodies of architectural works and throughout historical processes, are able to retain the significance of the locations. Because of this, every architectural heritage transformation process, whether it involves a single building or a complex of buildings, compels us to learn more about the essential components of architecture, known as invariant elements, and the ways in which they relate to one another and to one another in different ways.
By identifying correspondences, or the presence of some comparable principles, between architectures constructed in various locations and periods, analogy enables us to engage in a dialogue with history in which time is not rectilinear and diachronic.
Working on the project means developing a deep knowledge of the *meaning of the buildings.* This is possible if the analytical moment is intended as an interpretive moment. Through abstraction it is possible to build an *image* of the structural relationships that underlie architectural forms. The new proposed buildings have been designed thinking at the analogy with this *structural image*, and so with the specific traditional formal typologies of the site (such as the bastion, the wall, the courtyard, the loggia).
A design challenge is a practical task to assess how well an author approach design problems by applying their own design skills to a real-world scenario. The goal of this exercise is not to focus solely on the end solution, but also to understand what a design process is and evaluate where its own strengths and opportunities lie. *In design abduction, the starting point is that we only know about the nature of the outcome and the desired value we want to achieve. So, the challenge is to figure out "what" to create, while there is no known or chosen "how," that we can trust to lead to the desired outcome. Thus, we must create or choose both a "what," and a "how"— as these are quite dependent on one another, they should be developed in parallel. This double creative leap*

requires designers to devise proposals for both the "what" and the "how," and test them in conjunction (Kees 2011: 521).

4 Creating place in space

The real voyage of discovery consists not in seeking new lands but seeing with new eyes. Marcel Proust

Architecture is usually understood, and learned about, through the notion of space. The fundamental starting point of architecture is to identify a *place*, from the formation of the hearth, through Aristotle who understood space as the *total sum of all places* to Heidegger, who states that *gathering gives meaning to a space and makes it a place* (Hubbard (ed), Kitchin (ed), 2010). The *place* provides a matrix for different mixes between the past and the present and opens new meaning for the future. One must beware of *confining memory to the recovery of the past in the form of remembrance* (Heidegger 1968, pp. 140-141). Another branch of resistance against modern space may be called as *place* theories which are mostly based on Martin Heidegger and became popular in architecture between 1970s and 1990s.

We need to take some definitional care. The question of architecture is in fact that of the place, of the taking place in space (Leach 1997 p. 302). Place is used in a variety of way, but its meaning can be specified more clearly in terms of the three dimensions that tend to reoccur across the various theoretical positions, and which can be examined empirically (Agnew 1987). The first dimension is place as *location* or a site in space where an activity or object is located, and which relates to other sites or locations because of interaction, movement and diffusion between them. Second is the view of place as a series of *locales* or settings where everyday life activities take place. Here the location is not just the mere address but the place of social life and environmental transformation. The third dimension is place as *sense of place* or identification with a place as a unique community, landscape, and moral order. In this construction, every place is particular and, thus, singular.

Using this definition, we will modify it and interpret as a crucial essence of the place: *location*, *landscape*, *time* and, of course, some *personal involvement*.

Location - The first step for someone trying to define a place will be to describe the location of the entire *place.* Most of the places are indeed located, but the location is far from enough in defining the entire place, its meaning and experiencing.

Landscape is, somehow, a physical and visual form of the *space*, some kind of a boundary that makes it a *place*. At the same time the word *landscape* has various meanings. At this very moment we shall consider landscape to be everything that is surrounding some particular place, natural and urban landscape.

Time - When changing characters of the places through the time, we always have in mind the changes of the buildings and landscapes. We must be aware that the time for *insiders* is different from the time for *outsiders.* The persistence of some place through the time is related to our experience of change.

5 The relationship between tradition and innovation

Tradition is a challenge to innovation. Alvaro Siza

Today, various architecture professionals face the challenge of deciding how to intervene, or not, in these buildings to meet the needs of their inhabitants and improve their habitability conditions through innovative solutions that engage in a dialogue with existing structures and combine various materials, technologies, and more. The subject of many research includes design principles for interaction and the best possible communication between the old and the new building. The various methodologies, tools, and technical and construction strategies are often employed (Alfirević, Alfirević Simonović, 2015, pp. 24-39; Šekarić, 2011, pp.17-35).

5.1 Architectural form in the context

Architecture is in constant relationship with context, by identify its own differences and leverage them. There is no possibility to work out of the context, so with context, there is always present *space* somewhere. The designer's task is to emphasize refinement within the aesthetic limits of a given formal or visual environment, be it contemporary or traditional, on the point of human meaning. Context types can be historical, social, political, economic, functional etc. The specific environment is certainly a valuable, if not essential, source of design inspiration.

Placing the object in its context implies making connections, respecting the circumstances, in order to form a network, through which unity is established and belonging to the whole is emphasized, without division. Character in context is determined by cultural and sociological influences (regionalism or internationalism), which conditions that the design problem is not fixed before the search begins for a satisfactory solution concept.

Expert design is more a matter of developing and refining both the formulation of a problem and ideas for a solution in concert, in a process called "co-evolution." (Dorst and Cross 2001, p. 425).

5.2 Form in the ethical aspect of awareness and contribution

For understanding the ideas and forms of architecture, the question of the relationship between the topic, content and methods of working on the work is important. Awareness and contribution determine the direction of the project, and this determines the work procedures and methodological conditions. In this sequence, we can easily recognize historical periods and in them special phenomena, directions or traditions - they carry information about the time, understandings, knowledge, mentality, abilities of the environment and the builders. Innovative processes permanently act on traditions with a kind of biological lawfulness about their constant birth, maturation and extinction on the historical stage. Jenks recorded six traditions of the modern movement, for the fifty years of the last century, Frampton and Curtis delimit this list. Therefore, despite the constant innovative processes of ideas and forms of art, especially in architecture, they look for support and easy-to-understand stable meanings through tradition. Certain uses of buildings require clean codes, unambiguous information. Architecture, as a part of the public space, bears a part of the responsibility towards others, that is, it is an ethical act, it bears the obligation of contribution on its own active and wider cultural plan. Architecture that become inactive within the historical texture of cities can be rehabilitated through related projects and new designs that encourage people to use them more actively. Such spaces are especially important for urban memory, yet they risk losing their integrity over time due to uncontrolled development. Therefore, making them available for urban use is important for socio-cultural and economic development (Panić, Dinulović 2009).

6 Case Study

Minimalism is not defined by what is not there but by the rightness of what is and the richness with which this is experienced. John Pawson

Through the case study, the potential of minimalism (in architecture) is analyzed as contemporary creative activities enabled for a qualitative contribution to the whole of the historical space without compromising the preservation of spatial characteristics, historical character and identity of the city. Values such as authenticity, integrity, and reversibility have been observed both at the project level and during the works, therefore the choice has been to benefit the inherent character of existing, looking for an adequate articulation between new and existing. This is an admittedly contemporary architectural intervention, which, simultaneously, preserves the authenticity and the *spirit of the place*.

For some, a brand-new building with a modern design is the preferred solution. While the costs of an expansion on a historic home can go up quickly and ultimately seem more expensive than new construction, the emotional attachment for these structures, as mentioned earlier, often outweighs the desire to build anew. The precise work of integration and the mixing of designs is what makes these projects so unique and authentic. By giving back life to these old country ruins, a century-old house needing an extension or a small rural house whose appearance we would like to enhance, architects see themselves developing a kind of hybrid architecture that mixes perfectly with its surroundings.

6.1 Case Study: Entry into Louvre, I.M. Pei

Achitectural traditions of the past. It is a work of our time. I.M. Pei

Pei's design for the Louvre expansion has a massive pyramid made of steel and glass, encircled by three smaller triangles that provide light into the area beneath Cour Napoleon. For Pei, the primary entry was emphasized by the glass pyramid, which offered a symbolic entry with historical and figurative significance (Figure 1-3).

Figure 1-3. *Entry into Louvre*, I.M. Pei

Because it is made of steel and glass, it is also one of the most structurally stable designs, ensuring its transparency and signifying a break with the traditional. The museum's historical significance is maintained

by the striking contrast between its contemporary architecture and the French Renaissance style, rather than by the size of the massive pyramid, which is modeled after the well-known Pyramid of Giza.

6.2 Case study: Punta Della Dogana Museum, Tadao Ando

When the external factors of the urban environment require the wall to be without openings, the interior must be particularly fulfilling and satisfying. T. Ando

Punta Della Dogana is a triangle tract located in Venice, where the Grand Canal and the Giudecca Canal converge. The location features a long, low-graded 17th-century building with a Chucan tower atop it, capped by ornate gold and green weathervanes that symbolize riches. Tadao Ando was given the responsibility of converting this ancient customs house in Venice, Dogana da Mar, into an art museum after François Pinault bought it in 2007.

Figure 4-6. *Punta Della Dogana Museum*, Tadao Ando

Although it may not have seemed apparent to choose a Japanese architect to work with Italy's historic architecture, Ando's approach blended his signature stark minimalism with complete respect for the existing structure (Figure 4-6). The building has been substantially restored to its original structure, which dates back centuries. A concrete volume that organizes the areas surrounding it lies at the center of the building's deep design, hinting at the architects of the restoration.

7 Conclusion

You reduce, you simplify … and then as you go on reducing, attenuating and compressing, you come to a point which you go through a barrier and pass through into a kind of mirror world, in which you see, look at it with enough clarity, not emptiness, but a sense of richness. Powson (1996, p. 13)

Any future in architecture has a connection to the past. But the past does not cast its shadow on the creator's imagination. Hence these memories do not shut out the future, they bring about changes, revolutions and variations that win our hearts, and when we give them a new meaning, we discover the possibilities of our own existence. Due to the complex and conflicting nature of architecture, the tendency in architectural practice is towards an increasing dominance of intellectualism. Minimalism in architecture is seen as a possibility for realization of another one layer in the history of architecture that carries the creative seal of the time it was created in. As a reconciliation of styles from the past and a feature of the present, as a sign of own time.

After all, all people are equal, the same, as a species - genus, but everyone is an individual for himself, he has his own soul and his own identity. Translated into architecture, every architectural object is an artifact created according to the same laws, but each one has its own individual, unrepeatable something, the *archi* (from *archi+tecture*) that is its soul. Or should have. That's why we use to say: *not every built object is architecture*.

References

Agnew, J. (1987). *Place and Politics: The Geographical Mediation of State and Society*, Allen & Unwin.

Alfirević, Đ., Alfirević Simonović, S. (2015) INFILL ARCHITECTURE: DESIGN APPROACHES FOR IN-BETWEEN BUILDINGS AND „BOND" AS INTEGRATIVE ELEMENT*, Arhitektura i urbanizam,* no. 41, pp. 24-39.

Bojanić, P. and Đokić, V. (2012). *Arhitektura kao gest: mali i veliki arhitektonski potezi,* Beograd: Univerzitet u Beogradu: Arhitektonski fakultet. (*Architecture as a gesture: small and large architectural moves*; University in Belgrade, Belgrade: The University of Belgrade, the Faculty of Architecture).

Brolin, B. (1982). *Architecture in Context,* Van Nostrand Reinhold Inc.,U.S

Dorst, K. (2011). The Core of 'Design Thinking' and its Application, *Design Studies* 32, no. 6.

Dorst, K. and Cross, N. (2001). Creativity in the Design Process: Co-Evolution of Problem–Solution, *Design Studies* 22, no. 5

Duncan, J. & Ley, D. (eds). (1993). *Place/Culture/Representation.* London: Routledge.

Heidegger, M. (1968). *What is Called Thinking?*, New York: Harper and Row.

Hubbard, P. (ed.), Kitchin, R. (ed.): (2010). *Key Thinkers on Space and Place*, SAGE Publications Ltd.
Leach, N. (1997). *Rethinkong Architecture*, London and New York: Routledge.
Panić, P., Dinulović, R. (2009). Odnos nove i stare arhitekture: Projektovanje novih objekata u istorijskom okruženju, *Zbornik radova Fakulteta Tehničkih nauka*, No.5, str. 1731-1734 (The relationship between new and old architecture: Designing new buildings in a historical environment, *Proceedings of the Faculty of Technical Sciences*, no. 5, p. 1731-1734)
Powson, J. (1996). *Minimum*, London: Phaidon.
Šekarić, B. (2011). Savremene intervencije u istorijskim urbanim prostorima*, Zbornik radova Šeste regionalne konferencije o integrativnoj zaštiti: Integracija staro-novo u zaštiti, restauraciji I revitalizaciji,* str. 19-35. (Contemporary interventions in historic urban spaces, *Proceedings of the Sixth Regional Conference on Integrative Protection: Integration of Old and New in Protection*, *Restoration and Revitalization*, pp. 19-35.)
Vesnić, S. (2020). *Arhitektonski koncept – objekt stvarnosti i subjekt iluzije*, Novi Sad: Akademska knjiga. (*Architectural concept - object of reality and subject of illusion*, Novi Sad: Academic book).

The New Architecture of the Palace of Justice in Belgrade: Remodeling the Serbian Built Environment Towards the Spaces of Inclusivity

Milica Mađanović, Davor Ereš
Institute for Philosophy and Social Theory, University of Belgrade, Serbia
milica.madjanovic@ifdt.bg.ac.rs ORCID https://orcid.org/0000%200002%201514%20124X
davor.eres@ifdt.bg.ac.rs ORCID 0009-0004-9819-2246

Abstract
For decades, the issue of accessibility of the built environment remains one of the key topics in the societies focused on creation of equitable spaces, appropriate for use of all their citizens. The Serbian Planning and Construction Law recognizes the necessity of accessibility standards, issuing the set of accessibility norms and defining them as mandatory technical measures, standards and conditions of design, planning and construction that ensure unhindered movement and access for people with disabilities, children and the elderly.
In response to the Reworking architecture/ city thematic stream, this paper aims to explore how can the remodeling of built environment, more specifically, public buildings, enhance their functionality for the people for mobility impairments. To do so, it will analyze the case study the reconstruction (arch. Z. Abadić) of the Palace of Justice in Serbia, a masterpiece originally constructed in 1973 (architects Z. Žunković, M. Živadinović). The largest judicial facility in Serbia, housing The High Court in Belgrade, the Chief Public Prosecutor's Office, the criminal department of the Second Court in Belgrade and the Second Prosecutor's Office, the Palace of Justice was fully renovated in 2019.
This paper will focus on a specific aspect of the building's remodeling approach which was least discussed in terms of architectural contemporaneity – its accessibility. The research discusses the design strategies employed to make the building accessible to the citizens with mobility impairments. The paper will answer the following questions – what was successful about the particular design decisions regarding the Palace of Justice's accessibility, what could have been done differently – and why. Ultimately, the paper implores the necessity of reworking Serbian architecture – and public spaces – to transform them into inclusive environment that could be equally enjoyed by all its citizens.

Keywords: accessibility, Palace of Justice in Belgrade, remodeling, inclusive spaces design, movement equality

1 Introduction

Built environment has been considered an expression of dominant societal values for centuries, and simultaneously, defined as an active constituent in the process of betterment of a society. As the paradigm of equal rights and justice entered the global discourse of social politics, marginal groups advocates argued for buildings and public spaces that could be used equally by all members of a society. Gaining traction since the second half of the 20th century, social tendencies towards inclusivity and equality left a mark on the built environment professions. This influence is the most evident in legislation regulating the accessibility standards across the world. However, since the 1970s socially aware designers advocated the idea that creating accessible built environment simply to meet the law enforced standards is not enough, suggesting that the needs of the widest possible range of users should be placed at the core of architectural thinking. Though supported by the various UN and EU policies and initiatives, the practice of placing the notion of inclusivity at the very inception of design thinking is penetrating built environment professions at a slower pace. Most commonly, built environment professionals integrate accessibility solutions in later stages of design development, simply to meet the legislation standards. The challenge is even greater when it comes to the interventions to the existing built environment.
This paper opens the discussion of the accessibility design strategies in Serbia through the case study of the Palace of Justice reconstruction in Belgrade. The example of reconstruction was selected because over fifty percent of Serbian built environment is more than half a century old. Therefore, adapting the existing built environment to meet the contemporary accessibility standards stands for a pressing matter in Serbia. The paper opens with a condensed overview of history of design practices which put the needs of all members of a society at the center of design process in the international context, showing the corresponding policies adopted by the international community. The second part of the paper discusses the example of the Palace of Justice in Belgrade. The paper shows that though the reconstruction successfully brought the building up to the contemporary accessibility standards, the ideas about inclusivity were not of particular importance when formulating the reconstruction design. This finding confirms the claim that building professionals are slower than policy makers in adopting the inclusivity strategies as a core component of their practice.

2 Design Approaches as Strategies for Inclusion

2.1 Built Environment as Means of Social Equality: A Historical Overview

In their informative title about inclusive design, a team of researchers recently offered a well condensed history of generational aspirations to create inclusive built environment that would be suitable for a broadest range of users – and truly expressive of the social equality tendencies which gained traction since the second half of the 20th century (Maisel *et al.*, 2018). They traced the origins of this type of design thinking to the 1950s 'barrier-free' designers in the United States and Europe, who began the early work of removing obstacles in the built environment for people with physical disabilities, addressing the immediate needs of severely injured World War II veterans. The following decade saw the rise of various social movements (such as feminism or civil rights), bringing new attention to the questions of equal rights and social justice (Klatch, 1999; Mackenbach, Hu and Looman, 2013). In that climate, marginal groups, including persons with disabilities, advocated for a change, influencing designers and policy makers. In the United Kingdom, architect Selwyn Goldsmith wrote the groundbreaking *Designing for the Disabled* (1963), which remained a leading architectural access guide for built environment professionals globally for decades.

The disability rights movement spread throughout Europe and North America during the 1970s (Rembis, Kudilck, and Nielsen, 2018). Since this period, advocates began to argue against the medical model of disability toward the social model, in which disability is defined by the relationships between people and their built and social environments. They warned that discrimination can be a direct result of inadequate built environment. Demanding 'accessible design,' which moved away from adaptive solutions added to existing objects and toward the integrative ideas which should be present at design inception, activists made design choices part of the social equality equation (Lifchez, 1987). During the 1980s the concepts of 'barrier-free' and 'accessible' design evolved further. In 1983, architect Ron Mace proposed the concept of 'universal design', proposing that design that works for those who are disabled also works better for the entire population (Preisr and Smith, 2011).

The 1990s witnessed a global spread of the universal design concept, directly related to the concurrent legislation. In the United States, the 1990 Americans with Disabilities Act outlawed discrimination based on mental and/or physical disabilities and prodded accessibility requirements for public buildings. The 1995 Disability Discrimination Act in the United Kingdom prohibited discrimination against people with disabilities in relation to employment, the provision of goods and services, education, and transportation. In Continental Europe, two major centers were established – Design for All Europe (1993) and the Helen Hamlyn Centre for Design (1999), where director Roger Coleman used the term 'inclusive design.' At the turn of millennium, in 2001, the World Health Organization (WHO) redefined disability through the International Classification of Functioning, Disability and Health and emphasized functional status over diagnoses. The WHO described disability as a contextual variable, intersecting with social and economic status. Inclusive design was cited as a strategy for enhancing people's daily experiences and lifelong attainment. In addition, in 2006, the United Nations General Assembly adopted the Convention on the Rights of People with Disabilities. Most recently, in 2015 the United Nations adopted the UN Sustainable Development Goals, setting ambitious global targets to be achieved by 2030 in the sectors of health, education, water, sanitation, energy, and nutrition – underpinning all areas is an emphasis on equality and inclusivity.

The recent popularity of inclusive and equitable design strategies has also been driven by the reality of the aging of the world population. Over the next twenty years, the older population will increase by more than 50% in many developed countries. Moreover, in a 2023 article, the WHO estimates that 1.3 billion people experience significant disability. This represents 16% of the world's population, or 1 in 6 persons (WHO, 2023). It has also been estimated that more than a quarter of Europeans experience difficulties in movement throughout their lifetime (Gačić, 2013). Therefore, having that most people at some point of their lives can come into a state of reduced mobility – young / old age, pregnancy, temporary injuries, carrying heavy burdens, etc. – the accessible environment is a necessity to a large group of people, not just for persons with disabilities.

2.2 'Person-Centered' Design vs. Accessibility as an Afterthought

As shown previously, in response to the new 20th- and 21st- century societal expectations and demands, generations of designers developed various approaches to create built environment that can be used independently by the greatest possible number of users: universal design, inclusive design, design for all, etc. (Mosca, *et al.* 2019). Differing in methods, they are all gathered round the idea of an 'human-centered' design. The statement included in the technical manual of the European Concept for Accessibility (ECA) explains that 'fundamental basis of a European philosophy for accessibility is the recognition, acceptance and fostering - at all levels in society - of the rights of all human beings, including people with activity limitations… to an ensured context of high human health, safety, comfort and environmental protection. Accessibility is an essential

attribute of a "person-centered", sustainable built environment' (ECA, 2003). The manual postulates that the principles of design for all and the concept of universal design make the cornerstone of a fully inclusive society (ECA, 2003: 8).

The manual heavily criticizes the fact that the built environment is predominantly constructed on assumption of 'there being an 'average person'. In the past, the problem of accessibility was considered a direct result of the individual's deviation from 'the norm'. The person was 'the exception', hence 'the problem' (ECA, 2003: 43). Sara Hendren asks the same question, challenging the readership to take a step back and consider 'who is the world designed for' (2020)?' Who, and what physical and cognitive abilities of the human body, do architects typically have in mind when they design a project? To aid the architect's work there are nationally described space standards and accessibility requirements for buildings. However, in the words of Jos Boys: 'improving the design of built space is not just about "adding" disabled people to existing environments to better meet their "needs." It is about exposing and challenging underlying attitudes, assumptions and practices that frame disabled people in particular and limited ways, both in everyday life and through the education and practice of architectural and urban design (2015, 36).' Similarly, the ECA technical manual describes as problematic the most common response to accessibility demands – adding special facilities to an existing building, such as ramps or wider doors. According to the manual this response reinforces the idea that certain individuals are 'exceptions to the rule' and stigmatizes them by obliging them to use, for example, separate entrances, often at the rear of the building. Furthermore, most of those modifications are add-ons, following some afterthoughts, rather than results of a planned design process (ECA 2003, 44).

Taking into consideration the broadest possible spectrum of human conditions, the truly equitable design approach should, therefore, emerge at the very beginning of design process and follow the project's progress from the draft to the construction, inform post-occupancy evaluations, and even reflect further throughout research (Preiser 2011). Unlike simply meeting accessibility codes and legislative framework, which often occurs as a 'review' in the middle or final design phases, universal design, design for all, inclusive design, and other strategies, are informed by a holistic approach to the process of developing and creating buildings, landscapes, systems, and cities. They are not orientated toward an end product. Rather, they stand for an active way of design thinking and practice based on the premise that if a single member of a society has specific needs, they become those of a society as a whole.

Due to the previously listed efforts, and strongly supported by legislation and building regulations globally, accessible solutions have become a standard feature of newly erected buildings. In Serbia, the Law on Planning and Construction defines accessibility standards as 'mandatory technical measures, standards and requirements of designing, planning and construction to ensure free movement and access for people with disabilities, children and the elderly' (*Official Gazette* 72/2009, 81/2009). This regulation relates to the standards which ensure free movement and accessibility by removing architectural barriers. According to the Book of Regulations on technical Standards of Accessibility, the accessibility is the result of application of technical solutions in design and construction of buildings, which allows the people with disabilities and reduced mobility uninterrupted access, movement, stay and work on an equal basis with others (*Official Gazette of RS* 19/2012). The mandatory elements of accessibility are the elements for designing and constructing, which determine the size, features, installations, appliances and other equipment of the building to ensure access, movement, residence and work of persons with disabilities and reduced mobility with the same quality as other persons (Official Gazette of RS 22/2015). The legislation, then, strictly regulates the accessibility standards in newly constructed buildings.

In contrast, the existing built environment, erected according to the standards of the past, remains a true challenge to creation of inclusive spaces that can be used equally by all members of the society. International practice shows that when changes need to be made to existing structures, the many different interests are often difficult to reconcile, especially in the case of heritage or buildings erected with a specific purpose. Focusing on a local Serbian example, the reconstruction of the 'Palace of Justice' building, the following section explores the practical challenges and strategies employed to remodel the existing built environment and update it in accordance to the contemporary accessibility standards.

3 Towards the Spaces of Inclusivity: necessity of contemporaneity or what is new in reconstructing?

Reconstructing on the notion of 'accessibility' (in its implicit and explicit meaning and effect) demands a particular mode of interpretation aimed at creating a new sense of architecture. Commitment to this sort of design approach should be primarily directed toward solutions in the present and within existing conditions. According to the 2022 national Long-Term Building Renovation Strategy document (*Official Gazette of RS 27/2022*) the current state of public buildings in Serbia, especially those of the institutions, are not state of the

art.[1] Mainly they are functionally obsolete and technically and technologically outdated. The building stock in Serbia approximately comprises a total of 2.2 million private and about 25,000 public buildings (N.Blagojević et al. 2023). [2] About half of all buildings are older than 50 years (*Long-term strategy*, Official Gazette of RS 27/2022). Given this condition of public facilities, the problem of accessibility principally is related to the need to create a better - more *contemporary* built environment to meet the goal of 'buildings and places that can be used and enjoyed by everyone' (*Building for Everyone 1*, 5).

The *contemporaneity* in this case should integrate all architectural qualities with modernizing interventions in relation with the time – seeing architectural design as a discipline which should lead to 'good practice to ascertain the needs of the range of expected users as early as possible' (*Building for Everyone 7*, 6). The requirements of our time place emphasis on a need for integrative architectural (*contemporary*) design approach as part of 'fluid, evolving patterns of practice that regularly traverse, transcend and transfigure historical disciplinary and conceptual boundaries'[3] (Rodgers and Bremner, 2011). Today's architectural design practice consequently moves in the realm of greater openness and accessibility of the built environment, both in its spaces and in its programs, as 'a design process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation' (Steinfeld and Maisel, 2012). 'Creating an environment that can be used by all people, regardless of their age, size, disability or ability,' (*Building for Everyone 1*, 1) is to identify and refine architectural ways of thinking in relation to demands of creation of an 'accessible and inclusive built environment' as a necessity of time. 'Accessibility' in architectural design is now a 'must' for the architectural discipline to keep up with the time, as the demands for *equal presence* (*The EIDD Stockholm Declaration*, 2004) where the object of architecture mediates the space for the realization of these principles in our time: 'In other words, to be contemporary is to be able to make a critical association with the present' (Ereš, 2023, 17). The methodological approach to the reconstruction project should therefore follow a time-based principle that combines the inherited values of the building design with the innovativeness of the architectural interventions. In the context of Serbian build environment, a step towards the 'design for all' approach should as well clearly determine the strategy of redesigning the massive volume of existing buildings.

3. 1 The Palace of Justice – Case of a Modernist "Urban Physiognomy"

The courthouse in Savska Street in Belgrade, better known as the Palace of Justice, is the largest building in the Republic of Serbia intended for judicial authorities. It is a unique complex of several judicial bodies with a total gross area of almost 29,000m^2 and more than 60 courtrooms.[4] The construction of the building was completed in 1973 according to the winning competition proposal, which was done by architects Zoran Žunković, Mihailo Živadinović and Božidar Simonović jointly with the constructor architect Oskar Hrabovski.[5] In terms of the form and structure of the program, the building is articulated by two forceful compositional elements: a nine-story tower and a lower three-story cubic wing. The firmness of the compact form emphasizes the refined connection in between the upper body of the building and the ground floor; whereby the lower ground level and ground floor *opens* the building program through the public plateau. What is perhaps the most recognizable feature of the building is its striking appearance which expression consists of architectural materiality assembled in concrete, brick, and transparent glass, giving the building look of an ever-fresh presence of modernity.[6]
The building was constructed from 1969 to 1973, when it was put into use after a design process that lasted from 1963 until 1966. This long period of realization (1962-1973) included a whole series of transitional changes that took place not only in the technical and technological aspects (Suša 1974), but also in the requirements of constant reforms and modernization of the judicial and administrative system. These constant modifications

[1] See also 'Nearly zero energy building in Serbia', Project: https://www.euzatebe.rs/en/projects/nearly-zero-energy-buildings-in-serbia
[2] The building stock was classified based on the floor area of residential buildings which account for 164 million m2 or 83% of the total floor area of all buildings in Serbia.
[3]'This mutability means that design research, education, and practice is constantly shifting, creating, contesting and negotiating new terrains of opportunities and re-shaping the boundaries of the discipline.' (Rodgers and Bremner, 2011)
[4] See: https://www.1x2studio.com/projects/20191101.htm acc. September 23, 2023.
[5] The project for the Palace of Justice was obtained from the open competition held in 1962, whereas the competition jury chose the design of Serbian architects Zoran Žunković, Mihailo Živadinović and Božidar Simović for the execution. The project took several years to be finished as the construction of the building which began in 1969 was finished in 1973.
[6] Due to its architectural features, the "Palace of Justice" is ranked among the most representative and significant buildings of post-war modernism in Belgrade and Socialistic Yugoslavia. As such, from the mid-seventies to present day, it has been recognized by critics in some of the most notable reviews of the achievements of Yugoslav architectural practice.

were reflected in numerous adjustments of the initial architectural design brief. Concerning these alternations, in order to firmly establish the conception of the building, the programmatic aspects were strictly set by the architects in the field of the modernist functional design approach.

Street view from Savska street (Slobodana Penezića Krcuna street), 1973 source: 'Palata pravde u Beogradu,' *Arhitektura urbanizam* 8(73), 23
Street view 2019 after the reconstruction, source:https://www.1x2studio.com/projects/20191101.htm

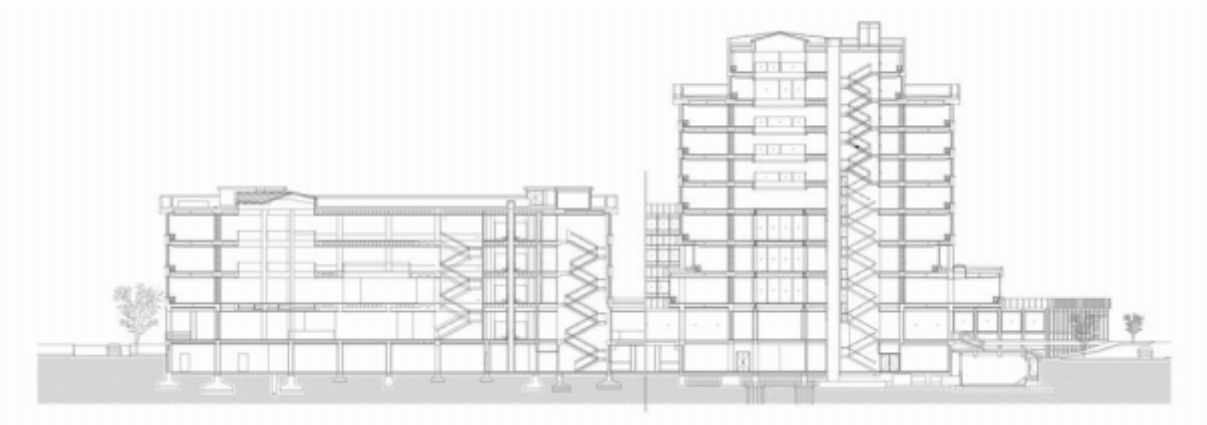
Architect Branislav Milenković, in his article about the Palace of Justice formulates the manifested requirements for constant adjustments, even during the construction phase, as a kind of exposure to *impermanence* caused by 'overturns that were changing previously adopted directions' (Milenković 1973, 25). At the same time, however, Milenković also points to the deeply rooted solidity of the essential architectural idea of the building`s setting. Following Milenković`s argumentation this idea is anchored as follows: 'the spatial conception of the court buildings is primarily determined by the urban physiognomy,' which is settled by aligning it with the level of the narrow street at the rear as the 'boundary line of the "constitutional" plane'. Consequently, the architects made this 'constitutive plane' as a pivotal positioning level, 'aligned' on one side 'with the terrain in order to be in a dominant position towards Slobodan Penezić Street, to regulate and justify its appearance in relation to the urban arrangement and the block' (Milenković 1973, 25).[7] The arrangement of the object, in conjunction with its surroundings and the morphology of the terrain, confirms that 'the conception of the space of court buildings is determined primarily by its urban physiognomy' (Milenković 1973, 25) which establishes accessibility, access and public open spaces as the primary starting point of the project.

3. 2 The Interweaving of Flows - The Programming Principle of Accessible Platform

In order to comprehend the approach, scope, and the idea of the reconstruction, it is needed to grasp the conception of the initial design solution. According to one of the authors, architect Mihailo Živadinović, the thought of the building is composed by two compositional elements 'with two different contents: vertically the same program of trials or administrations are grouped in cube, while horizontally the services of the same institutions are connected' (Milenković 1973, 25). The authors have lucidly placed two elements that at the same time, both compositionally and programmatically, differentiate the zones with overlaps on the ground floor. Živadinović further insisting that 'the ground floor and the basement are reserved for general and common services, as well as for the observers' (Milenković 1973, 25). Consequently, the architects of the initial project engaged the area of the basement, ground floor, and the parterre in a decisive way, as a kind of programming principle of an easily accessible platform which is *inviting* for the participation and presence of the public.

Starting from the ground floor, where the processes of administrative, judicial, and service functions take place, the zones intertwine through a flat horizontal flows and vertical movement. Correspondingly, architect Živadinović lists the '"constitutive" plane' program as follows: 'On the ground floor, in addition to the entrance halls, there is a hall, a counter hall, restaurants, a club, etc., as well as operating spaces that must be located on the ground floor for service purposes: substation, generator, kitchen, etc. The basement is reserved for other technical services: heating, air conditioning, archives, cloakrooms, reception prison, etc.' (Milenković 1973, 25). The ground floor parterre is here defined as the access plateau, and it is intended for the widest public - the 'audience' as the necessity for constructing public participation. This plateau, as a continuous flat surface which cover the whole plot, simultaneously brings a sense of 'accessibility' and 'openness' to the flow of employees, solicitors, clients, visitors, audience, and passersby.

[7] Slobodana Penezića Street was renamed, today it is Savska Street.



Longitude section, 2019 after the reconstruction, source: https://miesarch.com/work/4840

With this sort of building access strategy, as Milenković notes, the architects create the "'constitutive' plane", not only as a precise and consistent relation of the architectural base and morphology of the terrain, but also as a synchronous experience of movement that intertwines with the architectural materiality, the continuous presence of the horizon, and the overall effect of the building program as a spatially mediated sense of an open agora.

3. 3 The reconstruction as affirmation of the '"constitutive" plane'

The very intensive use of the building has led over the years to numerous adjustments and changes that contradicted the original logic of the program's design and the buildings spatial physiognomy. These adjustments were primarily related to the reorganization of the administrative units, the adaptations of the spaces, as well as changes in the program structure due to the interruption of the designed flow of the process. This series of ill-inert and uncoordinated modifications resulted in disrupting the conception of the working activities within the mandatory judicial protocols. All of this led to the condition in which the space of the building could no longer perform the expected function of the facility in a safe and appropriate manner (Petrović 2016). The reduced functionality of the facilities and the disordered flow logic were also reflected in the limitations of the accessibility of certain areas for users as well as for employees.

According to period press, the Ministry of Justice of the Republic of Serbia, as the user and one of the investor of the reconstruction (Petrović 2016), defined the expectation from the project as 'a spatial, programmatic, functional, technical and technological improvement and modernization of working conditions and standards, with implementing all the necessary facilities, systems and equipment for efficient working process' (Petrović 2016). In order to relate these general requirements for the 'modernization' and the upgrading of judiciary buildings and facilities [8] to the more specific spatial and programmatic qualities of the particular structure, it was necessary to define the priorities through the comprehensive value-based line of project principal determinations. In difference to the generalized tasks, the design approach settled accurate proposal. The architectural office '1x2 studio' from Belgrade, which already has extensive experience with the design and reconstruction of judicial buildings in Serbia [9], was commissioned to design the reconstruction of the building. The author of the reconstruction project architect Zoran Abadić, together with the team of architects and engineers, carried out the reconstruction project in two years in period 2012-14.[10] At the beginning of the design process, according to the authors of the reconstruction, there was a series of dialogues with the authors of the project, architects Žunković and Živadinović, 'during which, in relation to the authentic design principles and overall setting of the building, the basic principles of the reconstruction were traced out' (Ereš and Mađanović, 2023).

[8] 'The project forms part of a broader project – Upgrading of judiciary buildings and facilities, which is an integral and critical part of Serbia's extensive National Judiciary Reform Strategy and will assist in facilitating the country's EU integration and association.' (https://miesarch.com/work/4840).

[9] See more at https://www.1x2studio.com/projects_non-residential.htm and the publication 'Model Court Guidelines for Basic and Higher Court of the Republic of Serbia' (2015), Abadić, Z. at al, Belgrade: Grafolik.

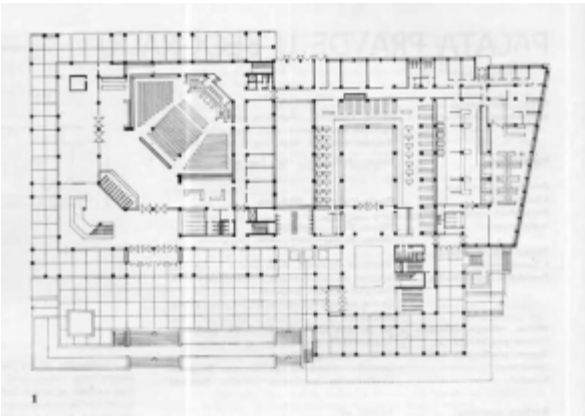
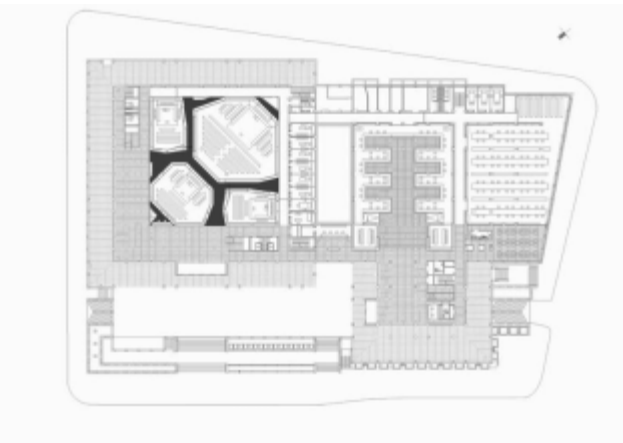
[10] The architectural team also included architects Dušan Milovanović, Jelena Zagorac, and Jelena Bogosavljević and associates Mirjana Lučić, Dušan Nikolić and Milian Karaklić (https://www.1x2studio.com/projects/20191101.htm)

Street view (Vojvode Milenka street), 1973 source: 'Palata pravde u Beogradu,' *Arhitektura urbanizam* 8(73), 23
Street view from Savska street 2019 after the reconstruction,
source:https://www.1x2studio.com/projects/20191101.htm

In the later descriptions of the reconstruction design process, the questions of the importance of the relation to the inherited architectural milieu and the matter of the flows which was facilitated by the building accesses, approaches and entrances were particularly emphasized: 'Vehicular and pedestrian approaches have been retained from existing streets and directions, designed in accordance with the regulations, especially for persons with disabilities or persons with reduced mobility. It is intended to accommodate and for functioning of the judicial authorities of the Ministry of Justice and Public Administration' (https://miesarch.com/work/4840).

3. 4 The main interventions and the idea of thoughtful differentiation

Placing the thoughtful logic of flows to the center of interest, the project prioritizes the affirmation of the qualities of the inherited building conception. According to the author of the reconstruction, architect Zoran Abadić, the area of the ground floor was found to have the greatest potential for reaffirming the ideas and authentic qualities of the building: 'With the reconstruction, we wanted to restore and improve the zones that had been "lost" in the changes made spontaneously over the years. Our intention was to restore a clear zoning according to processes, programs, and contents, considering the strict security procedures necessary for the smooth running of the parallel processes of users, employees, and visitors' (Ereš and Mađanović, 2023). The task of reconstruction of the Palace of Justice therefore set the task of the movement assesment as a way to thoroughly approach renovation of multi-layered program and multifaceted spatial structure of the building. According to the author of the reconstruction, who takes up the issues 'of enhancement of the architectural idea as a kind of reaffirmation,' (Ereš and Mađanović, 2023) the reconstruction opened up issues of contemporary interpretation of the building space conception through: 1) articulation of program zoning, 2) preservation of the authenticity of the materiality of architecture, 3) synchronization of flows, circulation and the increasing of accessibility, which should simultaneously allow separation and control of the audience, users and the staff.

Groundfloor plan, 1973, source: 'Palata pravde u Beogradu,' *Arhitektura urbanizam* 8(73), 24
Groundfloor plan, 2019 after the reconstruction, source: https://miesarch.com/work/4840

The major spatial intervention was the removal of the bulky staircase to the left of the main entrance. This was done with the aim of creating space of new courtrooms in line with the goal of 'concentrating the public area of the program as much as possible on the ground floor' (Ereš and Mađanović, 2023). At the same time, two smaller stairwells were constructed to take over its function, as well as the construction of two more spacious elevators, one in the lower wing and the other in the tower. Toilets for the disabled were also added on each floor. Beside fulfilments through typical elements required by-law guidelines (disabled elevators, toilets, the dimension of corridors and entrances, etc. *Rulebook - Official Gazette of RS* 22/2015), to provide the design in accordance with the present-day demands, the architects were forced to seek broader approach to issues of accessibility. To do so, the focus of the reconstruction was put on *strategies* of delicate reinterpretation of values of building conceptual base. Aiming to build the new relation between the public program of the courtrooms as well as set of public judicial services on one side, and the semipublic spaces of offices and judicial facilities on the other. This line of approach reaffirmed the necessity of improvement of the synchronicity of flows of different process that take place at the same time in the shared spaces. In this case, the design process was directed to on an integral approach to the demands of security procedures and multifaceted circulations of different categories. Scheme was developed from the point of the 'access plateau as a space of "amortization" of inflow of a large number of people' (Ereš and Mađanović, 2023), as an entry area to the contents of the building, wherefrom the public splits to clients and visitors. Well thought fluidity of forking trajectories is attaining the fundamental task of the reconstruction. This task was set as a reinforcement of the architectural qualities of the design concept of the building and within that the strengthening of the public areas by making it accessible as much as possible. The spaces created by adaptation meaningly upgraded the common areas, inserting three new courtrooms into the ground floor herewith evolving the plateau deeper to the public services of the building. By these set-ups of the 'constitutional plane' architects of reconstruction reached the possibility of recompositing and rebranching the programs in a way to achieve a sensible reaffirmation of the architectural project and at the same time to attain the new quality of modernized space both for the openness to the public and for the comfort of the workplace.[11] By these means project provided a thoughtful understanding of differentiation of accesses, approaches and entrances reaffirming the spatial segments that constitute the space and architecture of the building. This thoughtful differentiation shaped an efficient and renewed logic of program zoning, security flows and circulation tracks.

Detail of the façade; Courtrooms foyer, Source of the images: https://miesarch.com/work/4840

4 Towards inclusive spaces - conclusions on the case of the reconstruction

Reconstruction has without a doubt brought the building up to the contemporary laws, standards and regulations of accessibility. However, the investigation of the accessibility solution clearly showed that the ideas of inclusivity and equality were not of primary importance when developing the reconstruction design. As warned against in the literature about contemporary design strategies focused on equality, accessibility measures in the reconstruction project were a matter of responding to the legislative requirements, not one of the guiding ides. This can be considered an indication of the fact that even though the UN and EU conventions, recommendations, and guidelines foster the universal design and design for all principles as the basis for a truly inclusive society, it will take time for built environment professionals to catch up with the equitable design philosophies that these approaches foster.

On the other side, it should be noted that the complexity of the building program, various constraints, and the fact that the reconstruction took place within a protected, valuable architectural property meant that the models of inclusivity and equality could not be set as of primary importance when developing the reconstruction design. The issue of accessibility in this case also reveals that the guidelines of contemporary inclusive design strategies cannot always be applied to specific cases in different urban environments and circumstances of the reconstructions. For example, the main accessibility challenge in case of the Palace of Justice reconstruction was the fact that it was not possible to provide enough 'designated car parking – car parking spaces reserved for the use of car users with disabilities, whether as motorists or passengers', as well that 'travel distances should be minimized where possible' (*Building for Everyone 1*, 5). Considering this guideline, it was not achievable to develop a new capacity for designated parking spaces due to the limited amount of open space available, but also due to the problems and constrains of alternative means which could be Belgrade's public transport system. Perhaps some of these problems could be solved systematically by introducing 'all-humans-centered' methods and approaches, which should necessarily involve other disciplines, but also different stakeholders, in parallel with the design strategies.

The case of the reconstruction of the Palace of Justice reveals the structure of the intervention as a particular design approach based on the capacities of architectural knowledge to bridge the span between the values of the prior building conception and the time-based principle of the reconstruction as a set of contemporary acts. This sort of structuring aims to widen the perspective on "accessibility" from the basic "bureaucratized" architectural elements (ramp, handrail, minimal dimensions of openings and passages, minimal clearance, etc.) to a more advanced approach of more comprehensive and integral consideration of architecture as a design practice that structures *the public sphere*. The reconstruction in question was carried out as a kind of reinterpretation aimed at affirming precise correlations of surfaces-planes, movement, and materiality, based on the profound differentiation of the public realm, institutional space and common space. In regard to this case, we can conclude that the potential of architecture (as a design and as building practice) to interweave different notions of space and programs stems from the necessity for free movement as a kind of flow that defines accessibility as a wider plateau of a humanistic passage toward a more equitable version of our world.

References

Abadić, Z. at al (2015). Model Court Guidelines for Basic and Higher Court of the Republic of Serbia, Belgrade: Grafolik. https://vss.sud.rs/en/download-file/1408/Model%20Court%20Guideline%20for%20the%20BC%20and%20HC.pdf

Boys, J. (2015). 'The Disordinary Architecture Project: A Handy Guide for Doing Disability Differently in Architecture and Urban Design.' In *The Funambulist: Politics of Space and Bodies*, 36–43

Blagojević, N. at al (2023). 'Residential building stock in Serbia: classification and vulnerability for seismic risk studies.' Bulletin of Earthquake Engineering (2023) 21:4315–4383.https://doi.org/10.1007/s10518-023-01676-0

Building for Everyone, A Universal Design Approuch, Booklet 1 - External environment and approach. Available at: https://universaldesign.ie/Built-Environment/Building-for-Everyone/1-External-Environment.pdf. (Accessed 23 September 2023).

Building for Everyone, A Universal Design Approuch, Booklet 7 – Universal Design Approach. Available at: https://universaldesign.ie/Built-Environment/Building-for-Everyone/7-Building-Types.pdf (Accessed 23 September 2023).

The EIDD Stockholm Declaration (2004). Available at: https://dfaeurope.eu/what-is-dfa/dfa-documents/the-eidd-stockholm-declaration-2004/. (Accessed 1 September 2023).

Ereš, D. (2023) 'The Influence of Temporality: Exhibiting Architecture and the Prospect of Immediacy of Discipline at the Venice Biennale,' *AM Journal of Art and Media Studies* 31, pp. 11-22. doi: https://doi.org/10.25038/am.v0i29.569

Ereš, D. and Mađanović, M. (2023). *Interview with Zoran Abadić, the architect of the Palace of Justice Reconstruction*. 16 September. Belgrade: Faculty of Architecture, University of Belgrade. Unpublished.

European Concept for Accessibility: Technical Assistance Manual (2003). Luxembourg: EuCAN.

Gačić, A. (2013), 'Treatment of Pedestrian Communication Accessibility in the Process of Urban Design: Case Study of Institute for Orthopedic Surgery "Banjica,"' *FACTA UNIVERSITATIS. Series: Architecture and Civil Engineering* 11(1), 61 – 70.

Goldsmith, S. (1963) *Designing for the Disabled: A Manual of Technical Information*. London: Royal Institute of British Architects, Technical Information Service.

Hendren, S. (2020) 'Introduction. Who is the Built World Built for? In *What Can a Body Do? How We Meet the Built World.* New York: Riverhead Books, 11-36.

Klatch, R. E. (1999). *A Generation Divided: The New Left, the New Rught, and the 1960s.* Berkley and Los Angeles: University of California Pres.
Maisel, J. L. Steinfeld, E. Basnak, M. Smith, K. and Tauke, M. B. (2018). *Inclusive Design: Implementation and Evaluation*. New York: Routledge.
Lifchez, R. (1987) *Rethinking Architecture: Design Students and Physically Disabled People*. Berkley and Los Angeles: California University Press.
Mackenbach, J. P. Hu, Y. C. Looman, W.N. (2013) 'Democratization and life expectancy in Europe, 1960–2008,' *Social Science & Medicine* 93, 166-175.
'Model Court Guidelines for Basic and Higher Court of the Republic of Serbia.' Belgrade: Grafolink.
Mosca, E. Herssens, J. Rebecchi, A. and Capolongo, S. (2019). 'Inspiring architects in the application of design for all: knowledge transfer methods and tools.' *Journal of Accessibility and Design for All*, 9(1), pp. 1-24. doi:http://dx.doi.org/10.17411/jacces.v9i1.147
Milenković, B. (1973) 'Palata pravde u Beogradu,' *Arhitektura urbanizam* 8(73), 25.
"Nearly zero energy building in Serbia" Project, https://www.euzatebe.rs/en/projects/nearly-zero-energy-buildings-in-serbia (Accessed 23 September 2023).
'Planning and Building Act' (2009). *Official Gazette of RS* 72/2009.
'Planning and Building Act' (2009). *Official Gazette of RS* 81/2009.
'Book of regulations on technical standards of accessibility' (2012). *Official Gazette of RS* 19/2012.
'Rulebook on technical standards of planning, design and construction of facilities, which ensure unhindered movement and access for persons with disabilities, children and the elderly' (2015). *Official Gazette of RS 22/2015.*
'Long-term strategy for encouraging investment in the renovation of the national building fund of the Republic of Serbia until 2050' (2022). *Official Gazette of RS* 27/2022-5. Available at: https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/vlada/strategija/2022/27/1/reg, (Accessed 23 September 2023).
'Official Opening of the Refurbished Largest Judicial Building in Serbia.' (7 November 2019). Available at: https://wbif.eu/news-details/official-opening-refurbished-largest-judicial-building-serbia. (Accessed 23 September 2023).
'Palace of Justice.' Available at: https://miesarch.com/work/4840. (Accessed 23 September 2023).
Petrović, A. (2016). 'Palata pravde biće iseljena u avgustu,' *Politika* (22 May). Available at: https://www.politika.rs/sr/clanak/355583/ (Accessed 23 September 2023).
Preisr, W. F. E. Smith, K. H. (2011) *Universal Design Handbook*. New York: McGraw-Hill.
PROJECTS / PUBLIC / BUILT. PALACE OF JUSTICE, BELGRADE, SERBIA 2019 11 01. Available at: https://www.1x2studio.com/projects/20191101.htm. (Accessed 23 September 2023).
Rembis, M. A. Kudilck, C. J. and Nielsen, K. E., eds. (2018) *The Oxford Handbook of Disability History*. (Oxford University Press, 2018.
'Renovated building of Palace of Justice in Belgrade opens.' (1 November 2019) Available at: https://www.srbija.gov.rs/vest/en/147156/renovated-building-of-palace-of-justice-in-belgrade-opens.php. (Accessed 23 September 2023).
Rodgers, P. Bremner, J. (2011). '" Alternative Disciplinarity" in Future Art and Design Research Pursuits,' *Studies in Material Thinking* 6(12), 1-16.
'Rulebook on technical accessibility standards'. *Official Gazette of RS* 22/2015.
'Rulebook on house rules in the High Court buildings in Belgrade in 17a Savska Street (Palace of Justice building)' (2010). Available at: https://www.bg.vi.sud.rs/files/KUCNI%20RED%20-%20%20%20PALATA%20PRAVDE.pdf. (Accessed 23 September 2023).
Steinfeld,E. Maisel. J (2012). *Universal Design: Creating Inclusive Environments.* New Jersey: John Wiley & Sons, Inc., Hoboken,.
Stojanović, B. Matrinović, U.(1978). *Beograd 1945-1975 - Urbanizam, arhitektura*. Beograd: NIRO Tehnička knjiga.
Suša, J. (1974) 'Palata pravde u Beogradu – osvrt na klima-uređaje', *Izgradnja* 5.
WHO (2023). *Disability*. Available at: https://www.who.int/news-room/fact-sheets/detail/disability-and-health#:~:text=An%20estimated%201.3%20billion%20people,earlier%20than%20those%20without%20disabilities. (Accessed 07 July 2023).

Uncovering Fragmented Diachronies of The Transitional Skopje 2014

Tamara Koneska
PhD student, University of Belgrade – Faculty of Architecture
tkoneska@yahoo.com

Abstract: By intertwining a historical-critical approach and a methodology by design, this research aims to uncover the multifaceted problems and aspects inherent in the project Skopje 2014, shedding light on its broader implications within the contemporary theory of architecture. Drawing on the concept of urbicide, the paper explores the fragmented nature of Skopje's urban history and its impact on the non-architecture of the project. It posits that Skopje's complex matrix is intricately connected to the collective memory of the city before its destruction and subsequent changes. Consequently, the city emerges as both an ideal training ground for future urban planners and architects and a repository of neglected remnants from earlier large-scale projects influenced by the tenets of modern architecture. Moreover, the project itself can be seen as a turning point in the city's urban trajectory, leading to a socio-urban amnesia deeply ingrained in the social subconscious. This turning point aligns with Koolhaas's assertion of the emergence of the generic city—an urban form characterized by sprawl, uniformity, and repetition, drawing parallels between Koolhaas's notions and the evolving urban landscape of Skopje, where the neoliberal city centre's synthetic urban void forms the foundation of an artificial scenography. Such an approach enables a novel interpretation of the universal discourse surrounding urban trauma, confirming the city's wounded state and highlighting the project's role as a modern transitional reconstruction endeavour concerned with memory politics and the transformation of the city's image.
This research delves into the question of how modern urban amnesia, already subconsciously imprinted in architecture, can be addressed and rectified. The proposed hypotheses and aspects not only uncover themselves through a historical-critical examination of the Skopje project but also demonstrate the potential for ideas initiated in the themes of project memory and amnesia, as well as the representation of architectural power that can be extrapolated through axonometric and collage depictions. This brief discussion becomes a dialogue between these two voices, as their arguments intertwine in the contemporary theoretical context, and inevitably each one influences the significance and status of the other, while also adding another contribution to the existing body of research and interpretation of the project Skopje 2014.

Keywords: *Skopje 2014, urbicide, transitional reconstruction, memory politics*

1 Layers of time

Passing through the historical layers of the urban development of Skopje, one can see that it is characterized by a constant series of architectural and urban gaps: the city has been destroyed due to numerous conquests and natural disasters (it was hit by an earthquake in 518, later in 1689 the Austrian general Piccolomini set it on fire, it was flooded in 1962, etc.). The city's matrix developed in a very specific and informal way: the main city axes (north-south and east-west) intersected, thus creating the historical centre where different cultures and peoples found their residence over the centuries - Old Skopje Bazaar. This informal way of city formation exposed the existing urban matrix to many transformations adapted to the desires of each conqueror and occupier over the centuries. Despite various disasters and conquests, the city was rebuilt and rewrote new stories in its urban narrative. The constant reconstruction of the city represented a part of its identity, although this reconstruction was most often imposed rather than something that organically emerged during the city's urban development process.
The first steps toward modernizing Skopje are crucial for a better retroactive understanding of its contemporary phenomena and issues. Divided into several phases, the modernization of the city can be traced from the beginning of the 20th century and the transfer of the city centre to the right bank of the Vardar River through the planning and implementation of the first urban plan from 1914, developed by Dimitrije Leko. Using recognizable formal geometric urban patterns, with attention to all the conditions of a more modern city with a centre on both sides of the river, with an emphasis on the blocks that frame the new main city square. The 1914 plan created the foundation for the later modernist city by clearly defining the city wall in the form of a ring surrounding the city centre as one of the main elements of the plan. Residential peripheral urban blocks defined the well-known city wall and the main public spaces in the city. The concept of a city wall surrounding the city centre presented in this plan remained a key element in all subsequent plans. On the outskirts and near the city wall, existing city blocks were formed according to the grid system, rather than the previous organic mosaic that is still visible on the left bank in the structure of the Old Bazaar. Later, with social changes, constant migrations, and technological improvements, the transportation system also developed. The new railway line (south-north) defined the eastern part of the city, so it began to integrate even more into the existing patterns of the future

city developed according to the general urban plan of Josif Mihailović from 1929. The specificity of this plan was the formation and realization of the idea of two main city squares connected by the Old Stone Bridge. The development of these squares began shortly after the adoption of the general urban plan, marking the beginning of the new modern urban planning for the city.

Post-war reconstruction and restoration of Skopje started with the adoption of a new plan by Ludjek Kubeš and a group of Czech engineers from the Prague Architecture Studio in 1948. The city began to grow and develop into a modern European city based on the basic postulates of modernity with a direct analogy to Le Corbusier's idea of La Ville Radieuse from 1931, CIAM principles with a strong influence on functionalist doctrine, the Bauhaus school, and the model of the linear city by Milyutin. This created a new look of a functionalist city with a modernist paradigm of zoning of the main urban zones, a linear distribution of zones around the city centre, which served as the basis for further planning and remained fundamental in subsequent plans. All previous initiatives and urban plans and documents were applied to the existing urban fabric and slowly transformed the city's image, but they did not produce any significant and shocking changes that could have had harmful effects on the perception of the urban space and current collective memories. A large part of the architecture in the early decades of the 20th century was originally designed as part of filling existing urban gaps, especially close to the town square. A linear street axis, which once passed through the square, resembled a typical Western European city centre. A forgotten and atypical fact, which remained unchanged, is that the main city square opens towards the river and the old town, creating a complex combination of multiple different forms that radiate outwards, together with the peripheral streets and pedestrian zones.

After the catastrophic earthquake of 1963, Skopje embarked on a new path of development that did not correspond in morphology and scale to the previous urban matrix. The disaster itself created an urgent need and an opportunity to build a new city centre. The Skopje city centre project was carried out in a way that had no precedent in the then Yugoslav and global planning practice. It emerged as a need and affirmation of the universality of the problem of reconstructing and planning the development of city centres and designing their future physiognomy. It was an opportunity to equalize the urban disparities on both sides of the Vardar River. Croatian architectural critic Maroje Mrduljaš stated that after the earthquake, Skopje became a hub of architectural experimentation involving a large number of architects from Europe and the former Yugoslavia, gathered around the innovative vision of a new city core designed by the Japanese architect Kenzo Tange. "Skopje was truly a large urban and architectural experiment at that time, certainly progressive," he says. "Today, we are witnessing a new kind of experiment, which is mainly bizarre. I don't remember seeing anything similar anywhere." Although significant donations and massive investments were gathered with the help of the United Nations and 75 countries worldwide during the 25 years after the earthquake, the Skopje city centre was never fully completed. Tange's plan was not realized and implemented, most likely due to the discrepancy between bold, post-modernist desires and local (in)conditions, primarily due to a lack of funds.

The unfinished post-earthquake modernization of Skopje left the city with many gaps, especially in the area around the main city square and the left bank of the river. Moreover, even though socialist urbanism sought to break ties with the past, most historical landmarks from the period before the earthquake in Skopje were not reconstructed, leaving them forgotten or lost in the past. So, in the early 1990s, the city centre was fragmented, full of gaps in important historical layers, with a significant absence of important figures and memory artefacts in the city, which together produced a new "trauma," also known as the "crisis of urban identity." This transitional crisis continues to this day, primarily manifested through the city's inability to transform its image and landscape for the needs of the new social and political system in the 21st century through urban planning and methodology in designing new objects. During the transition to functioning as the capital of a new state and the shift in the political system, the Skopje city centre desperately needed renovation, but the country's economic decline and the difficult political situation until recently provided no opportunities.

The entire history of the square and the centre can be seen as a series of extraordinary attempts resulting in a complex, contradictory, fragmented foundation: a traditional city from the late 19th century; a city with the introduction of late European city theories and practices from the first half of the 20th century; a functionalist city from the second half of the 20th century; a city of solidarity and functionalism of post-earthquake reconstruction; and finally, a city in the post-socialist transition of the 21st century. Post-earthquake loss and the creation of new urban gaps left the city somewhat resembling a capital city, a question that arose particularly after gaining independence in 1991 and was often cited as a justification for the creation of the "Skopje 2014" project. Today's result and appearance of Skopje are a heterogeneous and fragmented morphology of the city matrix that provides us with a somewhat cleaner urban image of the city. Historically, the collage of morphologies and the city's memory theoretically provided an ideal foundation for contemporary urban planning, but in practice, it led to the production of new traumas and even greater fragmentation of the urban image.

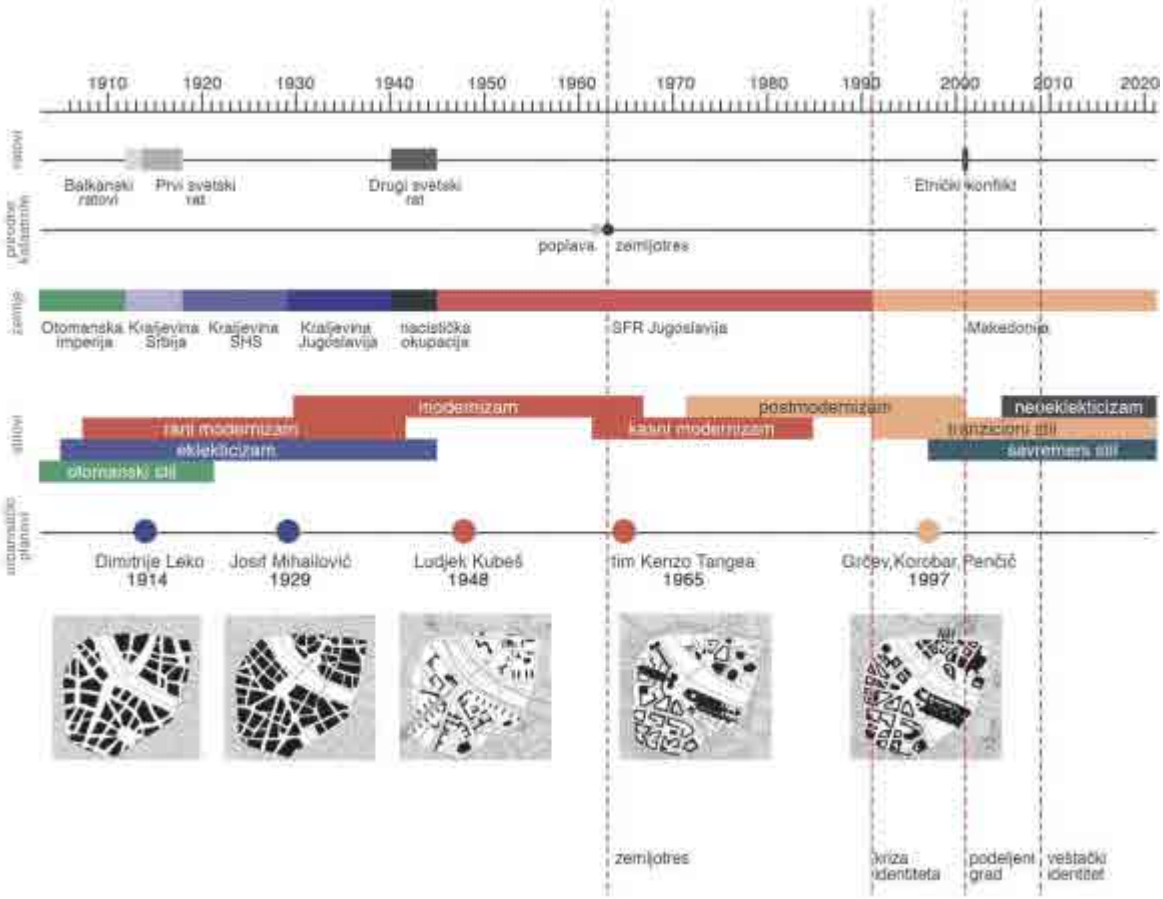


Figure 1 *Historical development timeline of Skopje* – authors drawing

2 Layers of theory of Skopje 2014

Most of the previous research on the Skopje 2014 project has focused on sociological, ethnological, anthropological, aesthetic, cultural, and urban issues, their symbolic meanings, political messages, historical inconsistencies, and attempts to assess the damage and further consequences of the project.

This research aims to provide a part of the broader perspective on the new reconstruction of Skopje's centre because the Skopje 2014 project is not just a unique historical moment but is connected to the political regime and specific historical and urban political circumstances. The assumption is that a new reading of the urban history of the city requires that this project not be treated only as a specific moment in the continuous narrative of the centre, which includes its relatively unexplored recent history in the context of architectural and urban development.

Further research aims to place Skopje 2014 in the context of other projects dealing with the politics of problematic collective memory, the creation of a new artificial image of the centre, and the deepening of the idea of a divided city.

To better understand and study this architectural and urban phenomenon, we can rely on the hypothesis that projects like this are not just a product of the identity politics of one government and its ambitions. They should not be viewed solely as the imposition of a new national identity and a new city image. The complex urban matrix demonstrates that in the urban discourse, knowledge is inseparable from action. As the city strives for a certain level of social sustainability, the battle for functionalism within its patterns intensifies. All previous urban plans for Skopje, despite their different concepts and historical contexts, share very similar views regarding the power of modernization, progress, and technological development as the main driving forces for securing and building a better city.

One of the proposed hypotheses is that projects like this are the product of a complex and traumatized urban history, the city's fragmented situation, and an unstable and inconsistent city image. It is deeply connected to the collective memory of the city before its major changes and destruction. A certain focus of the research would be a critical understanding and mapping of the catalysts that led to this eclectic approach to reconstruction, design, planning, and project implementation. Future research will also provide a new basis to examine the hypothesis

that the Skopje 2014 project is a result of the maturation of the transitional post-socialist city, a city with a longer history of traumatic events. It assumes that a new reading of urban and architectural history requires that the 1963 earthquake be treated as just one of many traumas in a continuous narrative, which includes its relatively unexplored recent history in the context of the city's current development.

There is a hypothesis that in the specific case of Skopje, the escape existed in eclecticism even before the 1940s. By using this layer as a basis, the overall aesthetics of the new Skopje 2014 project was developed; with the pretext that the existing Ottoman and modernist heritage does not correspond to the newer nationalist agenda of the transition country. Although the memories of only three buildings were used as initiation/inspiration, the whole project managed to be realized, with another excuse that the new reconstruction offers Skopje a picture of the monumentality of the 19th-century European capital, which the city lacks to "become European and modern ". This reconstruction project completely erases the modernist and traditional past, which not only reminds the inhabitants of the previous political system but also "erases" the earthquake and the memories of that trauma.

The specific urban and architectural problem of inadequacy and the failure of design and planning strategies imposed by the neoliberal elite radicalizes the urban agenda, once again highlighting the importance of urban and architectural theory and practice in understanding and addressing the challenges of the contemporary post-socialist transitional city. Only by acknowledging the principles of the system, yet criticizing and constantly challenging its specific manifestations, can we gain a better understanding of the complexity of the city. It is evident that when theory confronts reality, whether at the level of an object, urban structure, or public space, it is always a reaction and a result of social, spatial, political, and architectural paradigms. It can also be assumed that this type of reconstruction and the creation of a new city image and centre use the tools of collective and individual memory to offer a kind of solution for some forgotten artefacts or layers, or even "urban traumas" from the past.

The additional aim of this research is to determine to what extent the gradual disappearance of collective memory due to all the architectural and urban changes has influenced the emergence and realization of the Skopje 2014 project and how the forgotten and lost image of pre-earthquake Skopje actually affects this new reconstruction. The key is to see to what extent the fragmented state of urban morphology and the collective perception of the city have led to this kind of change. One of the problems is that this phenomenon destroys all other architectural and urban layers of the city, which today have a living connection with the residents and their collective and individual memories of the city. Therefore, projects like this become a very modern, specific, and underexplored phenomenon. According to this, the purpose of the study is to provide a clear vision of the latest events in terms of architectural and urban development in Skopje. The motivation is to offer basic research material that will facilitate the understanding of the origin, realization, and functioning of the Skopje 2014 project because it is now becoming increasingly clear that this project should become the subject of further research as a decisive moment in the city's history and a lesson for further planning not only in Skopje but also in other cities in the region. Thus, projects like this ultimately fail to bring existing public spaces to the level of coherent images, and their method of setting up an artificial urban scenography will not change the existing heterogeneous morphology of the city.

Figure 2 *Montage of situations of Skopje 1918-2023.* – authors drawing

3 Never-ending transition and traces of urbicide of the former city of solidarity

In the post-industrial, globalized world, our understanding of the urban environment has significantly changed. Under the pressure of a neoliberal market economy, cities and their elites are increasingly seeking to redefine and reimagine the meaning of a city in ways that allow them to compete in the global market. These reimaginings, often achieved through symbolic reconstructions, are fundamentally linked to the urban, which is increasingly treated as a commodity according to market logic. It often happens that the reimagining of cities involves radical changes and interventions in urban space to create entirely new urban narratives without reference to the past. Such symbolic urban reconstructions have a significant impact on the city's image and the retelling of urban stories and meanings.

When trauma hits a city, the post-traumatic period focuses on its future development and urban possibilities. Architects and urban planners take great pleasure in experimenting and providing new ideas for such places as a kind of tabula rasa. The past is usually respected through symbolic preservation of what is considered the most precious elements of urban and architectural history. Previous studies on architectural and urban memories have typically focused on cities that have survived wars or severe repressive political systems.

"Now we are left with a world without urbanism, only architecture, ever more architecture. The neatness of architecture is its seduction; it defines, excludes, limits, separates from the 'rest' – but it also consumes" noted Rem Koolhaas (1996: 193) in his essay "Whatever happened to urbanism?" Skopje seems to have been trapped in such a predicament with the latest proposals and developments for its city centre. Architecture, and even more architecture if it can be considered as such, is being proposed and erected – except that what is currently happening in the city centre can hardly be described as either planning or architecture. The latest developments in the city centre do represent the death of the profession, and a step back from its path to overpass the transition phase and surmount its overall disorientation, questing for immediate exploration of the "right to the city" (Harvey, 2008).

The specific urban and architectural problem of inadequacy and failure of design and planning strategies imposed by the neoliberal elite radicalizes the city's urban agenda, pointing out once again the importance of urban and architectural theory and practice in understanding and solving the challenges of the modern post-socialist transition city. Only by recognizing the principles of the system, and yet by criticizing and always

disputing its concrete manifestation, can we come to a better understanding of the complexity of the city. It is evident that when a theory confronts reality, whether, at the level of one object, urban structure or public space, it is always a reaction and the result of social, spatial, political and architectural paradigms. Also, it can be assumed that this type of reconstruction and creating a new image of the city and centre, uses tools of collective and individual memory to offer a solution to some forgotten artefacts or layers, or even "urban trauma" from the past. An additional goal of this research is to determine the extent to which the slow disappearance of collective memory due to all architectural and urban changes has affected the emergence and realization of the Skopje 2014 project and how much the forgotten and lost image of pre- earthquake Skopje affects this new reconstruction. It is crucial to see to what extent the fragmented state of urban morphology and the collective perception of the city have led to this kind of change.

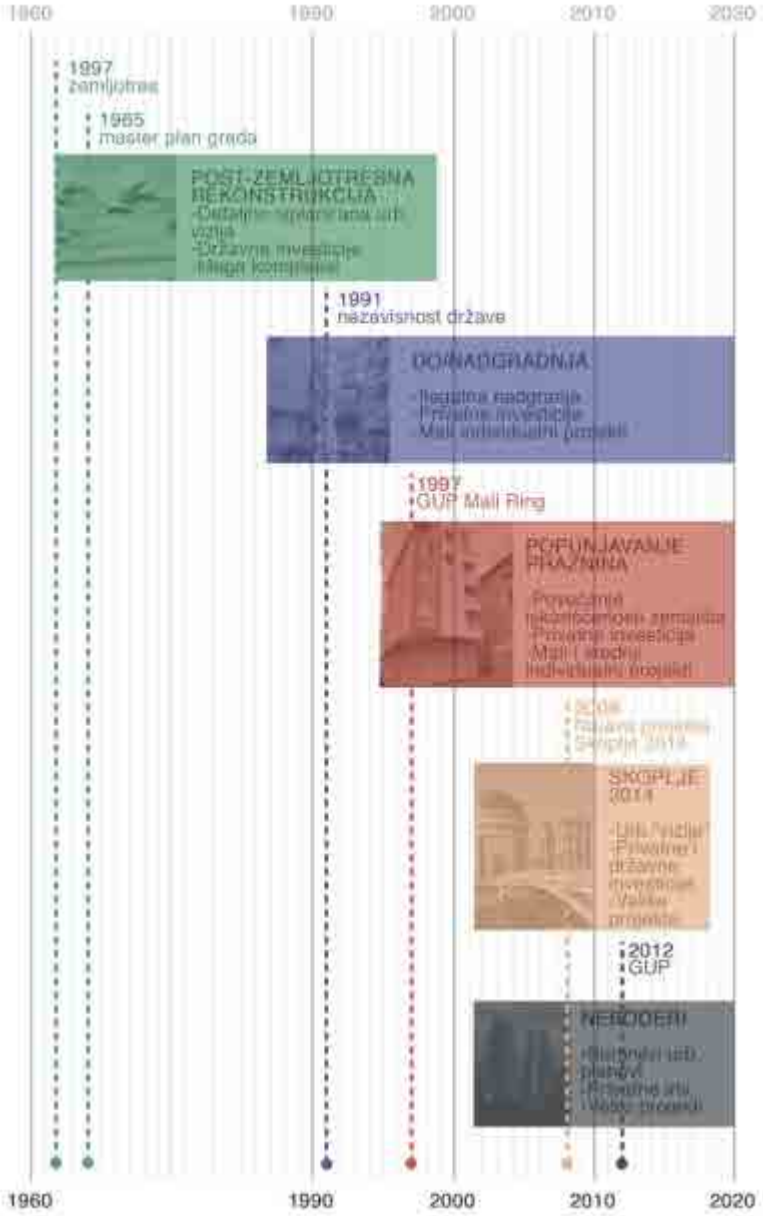


Figure 3 *Urban "quakes" throughout different phases of Skopje's development* - author's drawing

All the previous urban phases illustrate that Skopje has undergone radical processes that are not only institutional, social, or political but also affect the architecture of the city centre. In fact, Skopje is still going through the process of adapting to new complexities. Forgetting, as a forced erasure, is a way to establish different spatial models of the city during the process of modernization. Suppressing the old and introducing a new architectural language is a practice of the modernization process. In the case of Skopje, it is clear that the city is still in a transitional phase and has not yet reached the stage of complete transformation from one organizational system to another. Parallel to this dynamic in the city centre, the periphery of the square and the central part of

Skopje have also been overrun by excessive construction, and unplanned and illegal development, which largely goes unnoticed but fundamentally changes the appearance of the centre and further contributes to its uncertain future. Skopje will have to rise again, as it has already done several times in its history.

Ironically, almost a century since the first plan for the city was created, and almost half a century after the 1963 earthquake and the heroic plan created for the city that also resulted in massive involvement of the public through its public display and astounding visits, in the 21st century Skopje seems to have become a reversal of all previous initiatives. There are no longer bold and contemporary visions for the city or exhibitions inviting public exploration and participation, and very few discussions among professionals fail to produce any major result.

Today, on the one hand, the city is an ideal training ground for future urban planners and architects, and on the other, a museum of the remains of former large projects based on recent postulates of modern architecture, frozen in time and neglected by owners and users. There was a turning point, which created a kind of socio-urban amnesia that still resides deep in the social subconscious. This turning point can be related to Koolhaas and his thesis that the generic city is a new urban form that represents everything that the archetypal urban sociologist does not like: expansion, uniformity and repetition. In this regard, we can say that Skopje is slowly becoming a city without history, a modern place created on the forgotten modernist terrain vague. Koolhaas extrapolates the phenomenon of urban expansion as an essential characteristic of the future in which density is artificially created in the form of urban simulacra: shopping malls, theme parks and museum environments. Koolhaas's idea of a culture of congestion seems to hit the sociological analysis of the emergence of a new generic Skopje: the cumulation of programs and the idea of proximity pave the way for urbanization on a wider level where program accommodation —somehow, is all that matters.

5 Conclusion

Starting from the assumption that the Skopje 2014 project cannot be treated solely as a product of one government's agenda and identity politics, future research would explore the project's relationship with public opinion influenced by the collective memory of the city. The research would aim to present a broader perspective on this phenomenon, including recent and earlier events in the architectural and urban history of the city, providing a new interpretation of the universal discourse of trauma in cities and confirming the wounded state of the city. In this context, the outcome of the Skopje 2014 project is a new "contemporary" appearance of the square that reveals the reality of the transitional post-socialist city, its true opportunities and limitations in the implementation and interpretation of complex, yet everyday matters, ideas, as well as addressing specific contemporary architectural and urban challenges.

At present, the almost endemic state of ignorance and incompetence complicates the mastering of the new urban landscape and public space in the central area of the Small Ring. Future research would aim to present a sufficient amount of data to support the assumed hypotheses. Previous research on the subject of collective urban and architectural memory shows that contemporary city reconstructions have had a selective approach to interpreting and reinterpreting the past, favouring the idealized part of it, exploiting collective memory to erase and neglect unpleasant parts of history. In the case of the Skopje 2014 project, we witness the invention of a nonexistent past.

The main part of this research was to focus on the case study of Skopje and the chronological analysis and interpretation of its urban and architectural history from the beginning of urban and architectural planning to the present day. One of the questions that this research may imply is: if Skopje has a wounded condition and a history of recurring traumas, what should be the appropriate urban and architectural strategy to prevent the phenomenon and consequences of the Skopje 2014 project? How to react post-traumatically after this project?

Based on initial analyses, it can be said that the city was trapped in a specific urban dilemma with the latest proposals to revise the Skopje 2014 project and amend the current state of the square and its surroundings. In fact, the latest events during the Skopje 2014 project represent, to a certain extent, the death of the profession and a step back from its path to transition and overcoming its overall disorientation, seeking current research on the "right to the city."

In conclusion, this research leaves room for further improvement of the scientific apparatus for interpreting and monitoring the urban and architectural development of Skopje, offering a new way of reading the city's history that should contribute to the literature for the city's future urban and architectural progress.

References

Foucault, M. (1980). "Power/Knowledge" (Translated from French by C. Gordon, et al. Ed. by C. Gordon). New York, NY: Pantheon Books. (pp. 148-160)
Held, M., Deipenbrock, E., Kaulen, S., Kohler, L., Vincent, K., Rohde, M. (2009). "Skopje - A Modern City?" Hafencity Universität Hamburg, Department of Urban Planning.
Herold, S., Langer, B., Lecher, J. (2010). "Reading the City: Urban Space and Memory in Skopje." Technische Universität Berlin, Berlin.
Koolhaas, R. (1995). "Whatever happened to urbanism?" In Koolhaas, R. & Mau, B. (Eds.), "S, M, L, XL." New York: Monicelli Press. (pp. 959-971)
Majer, T. (2014). "Nacionalnata rekonstrukcija na Makedonija: Grad koj tone vo kič." In "50 godini od zemjotresot vo Skopje 1963-2013." Templum, Skopje. (pp. 303-309)
Muličkovski, P. (2014). "Skopje - včera, denes i utre." In "50 godini od zemjotresot vo Skopje 1963-2013." Templum, Skopje. (pp. 287-293)
Popovski, Ž. (2014). "Na Skopje, so ljubov." In "50 godini od zemjotresot vo Skopje 1963-2013." Templum, Skopje. (pp. 219-223)
Urbanek, K., Mijalković, M. (2011). "Skopje - The World's Bastard: Architecture of the Divided City." Wieser Verlag, Klagenfurt.
Weiss, S. (2010). "Skopje Will Disappear." Abitare International Design Magazine, Issue 504, July-August 2010. Accessed 03.10.2023, from https://www.abitare.it/en/architecture/2010/07/13/skopje-scomparira-2

An Interdisciplinary and Integral Approach to the Relationship between Interior, Architecture and Urbanism - Case Study of Ivo Lola Ribara Street in Kragujevac

PhD Bojana Pašajlić[1], MA Natalija Bogdanović[2]
[1] Assistant professor, University od Kragujevac, Faculty of Philology and Arts, Kragujevac, Serbia
[2] Assistant professor, University od Kragujevac, Faculty of Philology and Arts, Kragujevac, Serbia
bojana.pasajlic@filum.kg.ac.rs
natalija.bogdanovic@filum.kg.ac.rs

Abstract: The text problematizes pedagogical methodologies in education in the field of Applied Art and Design, through the connection with fields of Architecture and Urbanism. As a link, a common subfield, urban design is recognized as a framework for connecting scientific and artistic methods, through the need to develop new methods and techniques of professional production of space that are able to generate multi-layered and sustainable solutions within specific social, economic and institutional circumstances.
An integral approach implies combining the creative potential of urban design with a more socially conscious and responsible approach in order to develop more efficient techniques through dealing with the concrete space and urban problems in Kragujevac.
The complex methodology that follows this approach integrates experiences from the domain of architecture and urban projects, emphasizing the importance of the research dimension in planning a space with a unique identity and a specific atmosphere, whether it is urban planning, architecture or interior design. The paper shows the applied experimental pedagogical approach implemented in the 2020/2021 school year of Master's academic studies at the Interior Architecture study program at the Faculty of Arts and Philology, University of Kragujevac. The pedagogical approach and the proposed student projects are not based only on problem solving, but on a research-oriented approach, which explores the possibilities and limitations of the development of urban units, by training students for their evaluation, which enables a better understanding of the local context, which leads to the adaptation of work methods and creation of more adequate proposals for interventions.

Keywords: integral pedagogical approach; interdisciplinarity; applied arts and design; Ivo Lola Ribara street; Kragujevac

1 Introduction to Methodology and Main Aspects of Pedagogical and Educational Research

During the last three academic years (2020/2021, 2021/2022, 2022/2023) as part of the Master's academic studies of the Interior Architecture study program at the Faculty of Philology and Arts of the University of Kragujevac, on the subjects *Typology and artistic elements of traditional architecture* and *Urban design*, synthesis projects were realized according to the principles of an integral understanding of the relationship between interior, architecture and urbanism, through the application of the methodology of *reinterpretation of tradition*, simultaneously through multiple scales - city, street, object, interior, furniture, detail. Through the curriculum concept set in this way, design topics are intertwined with the topic of modernization of crafts, their material and immaterial aspects on the micro-level, but also the topic of urban renewal of the ambient whole on the macro-level. On the example of the considered student work, on the macro-level, as the first stage of renovation, tactics of ephemeral and changing spatial interventions (tactical urbanism) are applied due to the fact that Ivo Lola Ribara street belongs to the type of traditional trade and craft streets whose character has been significantly changed today. (Пашајлић, Богдановић 2022: 153-155) The curriculum was designed with the aim of pointing out the specific values of the architectural heritage of Kragujevac, so that through proposals for the revitalization of the ambient whole, individual buildings and their interiors, as well as the concepts of craft modernization, students would improve and enrich their knowledge and approaches to the preservation of immovable and movable cultural assets through research and design processes.
The basic principles and methodology of the course work is based on the very nature of the narrower art field of *Interior Architecture*, which belongs to the art field of *Applied Arts and Design*, at the core of which is precisely the relationship between craftsmanship and design. Angelo Eugenio "Gillo" Dorfles made important observations about the relationship between craftsmanship and design in the book "Introduction to Design" through the analysis of the design-process in craftsmanship and design, noting that an industrial object (the idea can also be extended to an interior, an architectural object etc.) already exists from the moment it is designed, i.e. from the moment the executive design on the basis of which it will be realized is completed, while in the case of artisan creations, the artist's work is revealed "at the end" of the creation. (Dorfles 1994: 31-32) However, bearing in mind that the nature of design problems in the field of interior architecture does not rest on the design of a single design object, but a set of objects through their complex interrelationships, in

relation to space and people, as well as that contextuality is a necessity, the uniqueness and unrepeatability of each project is inevitable , which brings the discipline of interior architecture closer to aspects of craftsmanship.

The approach of pedagogical-educational research is based on the collection of data, their orientation and the selection of contextual knowledge. The starting point is the selection of topics that allow a comprehensive picture of the individual craft, practice and production, as well as the geographical, historical and social context and place of the craft workshop. The reinterpretation of tradition is applied from the micro-level to the macro-level, from the craft item to the city level. The goal is for students to understand how tradition is transmitted on the micro-level of crafts, through the transfer of knowledge about production processes, skills and techniques as an intangible aspect, through craft objects and work space as a material aspect of craft production, in order to create appropriate spatial frameworks for the macro-level reinterpretation of tradition.

For the needs of attending this program, the lecturers provided a previously prepared set of materials consisting of archival material (location shots and plans from different time periods), photo documentation, excerpts from periodicals related to the commercial and craft aspect of the research, recommended reading. During the two-semester course, which consisted of lectures and exercises, data collection in the field and documentation analysis, the students were introduced to the modern methodological approach to research and valorization of the architectural heritage in general and the city of Kragujevac, as well as the problems and methods of defining the potential and possibilities of the regeneration of the architectural heritage in in accordance with modern needs, comparative analyzes of the advantages and disadvantages of different possibilities and approaches to protection and presentation in our country and in the world.

Within this first phase of work on the subjects, through literature, field research, data analysis in the documentation of the Institute for the Protection of Cultural Monuments of the City of Kragujevac, students became better acquainted with the historical, morphological, socio-economic development and importance of Ivo Lola Ribara Street within the core of Kragujevac. As important buildings and catalysts of development are recognized Aleksa J. Obradovic's shop, the Grand Hotel "Gušić", the tavern "Šumadija", but also that the street, as evidenced by the "Elaborate on the Old City Architecture of Kragujevac" from 1971, has preserved its trade and craft character. Almost every building belonged to one craft workshop, which was only disturbed in the period from 1971-2021. Craft contents are mostly replaced by catering and commercial contents.

On the basis of previously researched material by the subject professors, the thematic framework was set through the idea of modernizing the craft, which is followed through two lines - scientific-research and artistic-design. Initially, a list of trades that were represented in Kragujevac was formed, which students chose according to their own affinities (depending on the area of the selected objects, students chose 2 or 3 trades). The second step involved the preparation of unique databases of *contextual knowledge* for each student individually in relation to the selected trades, which included the selection of relevant materials - photo documentation, periodicals (from which separates were extracted - ads, illustrations, photo materials), project and technical documentation. Special attention is focused on the idea of bringing students closer to the visual identity of the building, interior, craft and handicraft products, through advertising systems both on the facade of the building, through the idea of a shop window, where the relationship between the interior and the street is seen, and through advertisements in periodicals, which were primarily of a textual and descriptive character, thus establishing an important link between the textual and the visual, where the visual is created by reading or materializing the textual, which due to the ephemerality of craft objects remains the only testimony.

2 The Case Study Area - Timeline of Important Events Relating Urban Development and Emerging Crafts

The development of the urban matrix of the city core of Kragujevac is closely related to the development of crafts and trade in the transition period from the 19th to the 20th century. The urban character of a town in Serbia in this period came from its dominant functions (administrative, judicial, educational, health, traffic, trade and crafts) as well as its population, which, among others, consisted of officials, merchants and craftsmen. (Вуксановић-Мацура, Тодорић 2019: 200-201) According to Boriša Radovanović, artisans have always been considered a special layer of the town's population, they were considered the first citizens of the town whose shops were open "from early morning until sunset". (Радовановић 2012: 26-27) Vladimir Macura in the book "Čaršija i gradski centar" (1984) points out that behind the two key triads, bazaar-town-nineteenth century and the other, center-city-twentieth century, lies the growth of a proto-urban guild world of the former Serbia into a simple type of capitalist society between the two world wars. According to Macura, the bazaar was a special space of the town that had many meanings, from spatial-functional to symbolic, which pointed to the deep connection of the town's spaces with "complex states of the social spirit that took shape in it, but which also shaped it". He defined it as the business part of the town, in which trade and craft shops, a few taverns, and a few mezulans or inns were mostly located. (Macura 1984:7) It is precisely from Matsura's

research that we can learn a great deal about the morphology and content of the Kragujevac bazaar and its urban development up to the modern city center. According to morphological features, Macura distinguishes four types of bazaars in Serbian towns during the first half of the 19th century: linear, forked, cross-shaped and grid, of which the first three types were characteristic of smaller towns, while the fourth, grid, was characteristic of larger urban environments. (Macura 1984:63-66) Analyzing various sources, Macura shows the genesis of the city center of Kragujevac in the period from 1815-1940. and the gradual development of the grid structure of the bazaar that followed the town matrix, concluding that by the 1940s a clear system with three centers had developed in Kragujevac. (Macura 1984:66-69) Ivo Lola Ribara Street (formerly Cara Nikole Street) was part of this network of bazaars. In the period from 1815-1840, the Kragujevac bazaar developed linearly between two squares - from the square near the Lower Stone Bridge to the square of the District Headquarters (Trga Okružnog načelstva). We can get information about the original linear bazaar and its character from the statements of the Čeh Josif Konstantin Jirček written in 1874:

"The bazaar, a long, wide street, or rather a square, paved with white stones, runs through the middle of the town. It has a completely eastern character. On both sides, shop after shop can be seen, under a seemingly continuous wooden canopy. These shops are almost completely open to the street according to the Eastern style, they also have neither doors nor windows; at night, of course, they close tightly".[1]

In the period up to 1887, the bazaar began to develop into two parallel streams that meet on the square near "Krst" and are connected to each other in the upper zone by Ivo Lola Ribara Street, which becomes part of the emerging main bazaar system. In the period around the 1920s, the system of the main bazaar expanded along Main Street, while parallel centers were formed on Palilula and around the Railway Station, following the logic of the hierarchical organization of the system of centers - a strict center created by the development of the old bazaar and the group of contents that are provided along the exit roads. Referring to the research of Nikola Vučo (Vučo, 1954), Macura claims that the data from 1895, 1900, and 1905 unequivocally indicate the closure of a large number of shops in Serbian cities - many became impoverished and moved to the outskirts of the city, where they locations managed to find new markets and survive. Some survived, and those that we find in some maps or travel guides, as evidenced by the analyzed reconstructions of the plans. (Macura 1984:55) For the period from 1920 to 1930, Macura creates a map that simultaneously shows the morphology of the centers along with the number of trade and craft shops. In the main center, which also includes Ivo Lola Ribara Street, there were a total of 315 shops in this period, which is more than half of the total number of trade and craft shops (a total of 501 shops) in Kragujevac at the time. The second center with 105 shops is Palilula, while the third center near the station had a total of 60 shops.[2] (Macura 1984:66-69) In contrast to the peripheral groups of contents that formed a kind of lower-order centers, the main center reached its ultimate level of density in terms of land use in conditions of single-story and low-rise construction. There are only a few properties on the peripheral stretches over a length of several hundred meters, rarely exceeding a dozen, while the density of contents in the core exceeds 20 shops per 100 meters of street frontage. This change in image was on the one hand a consequence of urbanization, and on the other hand it was related to the development of crafts and changes within craft activities. The groups of shops along the exit roads were oriented towards several professions - bakers, grocers, a few artisans who were displaced by the center due to circumstances, and cheap taverns. The center was a representative of trade, craft or hospitality professions. The relationship between the number of shops in certain centers and the number of their professions functioned according to the principle of an almost measurable ratio of quantity and quality - the larger the group of shops, the greater the number of activities. From the list of shops along Main Street, we have an insight into the representation of certain activities in the area of the strict center, of which trade shops stand out - pharmacy, grocery store, butcher shop, sawmill, barrel shop, delicatessen, shoe store (Boston and Bata), electrical shop, optical shop, drugstores, bookstores, etc.; crafts shops - shoemaker, abadžija, locksmith, tanner, tailor, carpenter, brusher, hairdresser, barber, baker, photographer, etc. (Fig. 1-5)

[1] Taken from Стефановић, М. (2013) Крагујевачки лексикон, Београд: ЈП Службени гласник и Град Крагујевац, 147-148.

[2] Macura points out that the contents of bazaars from official censuses and, like data on the number of craftsmen located in them and their profession, can hardly be concluded, given that the censuses that were made in the first decades of the 19th century were not so much interested in the location as in total tax potential of the settlement. If the locations were marked somewhere, it was only to make it easier to find a taxpayer. (Macura 1984:113)

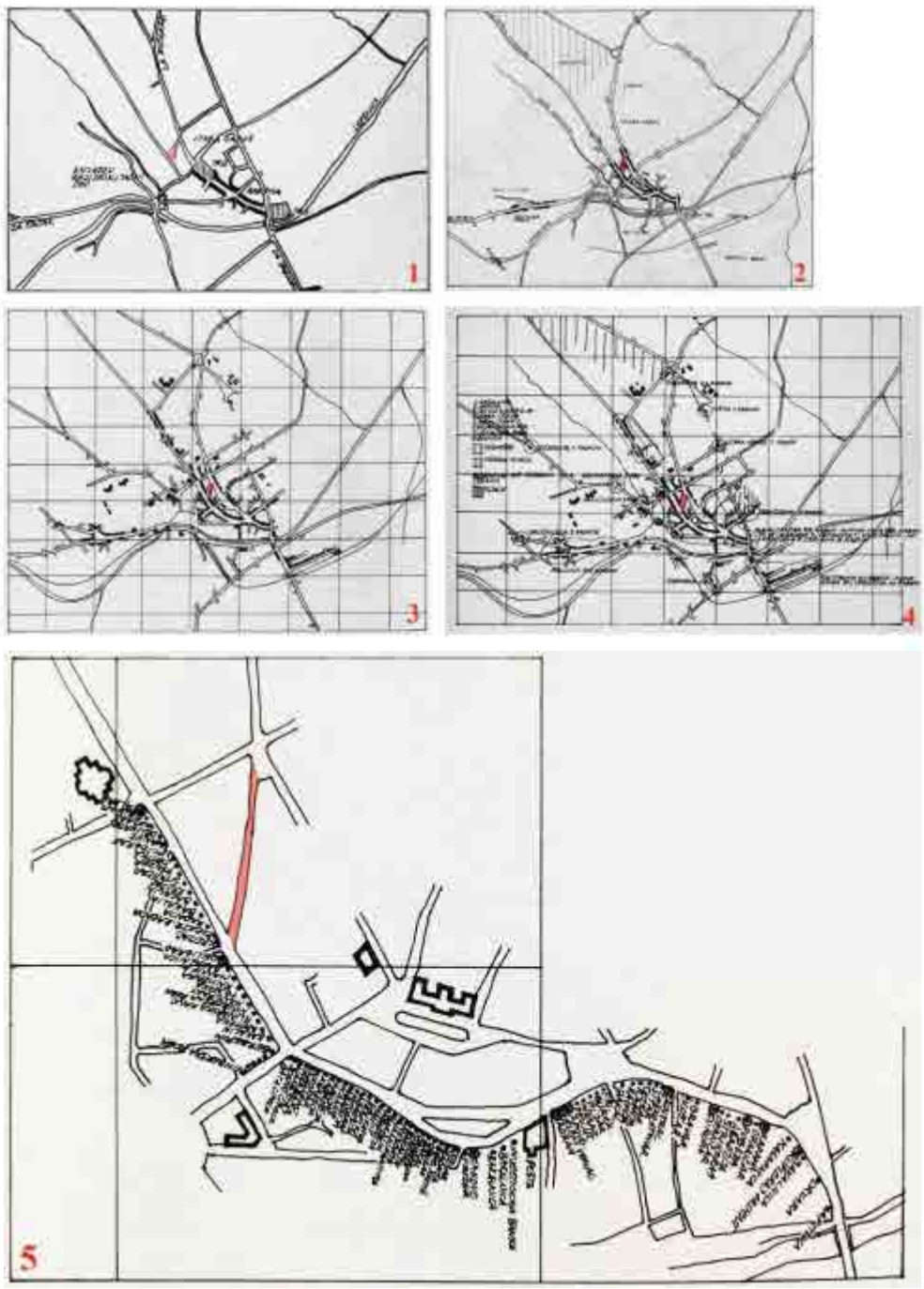


Figure 1-5. 1 – Kragujevac 1815-1840. The location of the bazaar between two squares. 2 - The system of Kragujevac bazaars around 1887 (Reconstruction according to various sources); 3 - Layout of the center in Kragujevac around 1928 (Reconstruction according to various sources); 4 - Kragujevac. Center layout and size; 5 – Kragujevac 1920-30. Correlation of the number of stores in the center and the number of professions in it. Source: Macura, V. (1984) *Čaršija i gradski centar. Razvoj središta varoši i grada Srbije XIX i prve polovine XX veka*, Niš: IRO "Gradina", Kragujevac: NRIO "Svetlost"

Macura warns that one should be careful when using modern terminology to describe the contents of former bazaars, especially with the meaning or iconic representations of the attributes of trade, craft, given that occupations began to branch out already in the first years after the Second Serbian Uprising, (Drugi srpski ustanak) but also that there are significant interruptions in relation to the earlier social order. (Macura 1984:7-8) After the liberation from the Ottoman rule, new trades were introduced, but also the names of the existing ones were changed (mumdžija - waxer, sarač - saddler, papudžija - shoemaker). (Bogdanović, Pašajlić 2022:

337) In the period up to the First World War, many professions were interwoven and supplemented both in terms of content and in terms of their carrier, such as the abadžija craft, the boltadžija craft, the mehandžijai craft, etc..[3] Specialized occupations and activities of the future center and city gradually developed from the *proto-activity*, as Matsura calls it, the shops connected to the original bazaars. A particularly intensive period for the development of crafts in Kragujevac is the hundred-year period from 1836-1931. year, when the number of craftsmen was almost tripled. In 1836, there were 336 craftsmen in Kragujevac, the most numerous of whom were tertiary workers, mechanics and carpenters, while in 1931 there were 534 master craftsmen and 585 artisan workers, the most numerous of whom were masons-carpenters, abbots, tailors, and shoemakers. According to the census from 1836, there were 19 craft activities in Kragujevac, while in 1931 there were 25 activities. In the context of this research, it is particularly important to mention that the trades involved in making suits (whether national or civil) were distinctly dominant during the entire observed period, while the watchmaking craft was more characteristic of the later period between the two wars, where according to the census from 1931 can see that there were 10 master watchmakers and 8 artisans. In 1936, which can conclude the observed hundred-year period of craft development, in "Službene novine" no. 112 from 18. may, it was published "Uredba o izmenama i dopunama spiska zanatskih radnji" with a list of 88 crafts represented in the Kingdom of Yugoslavia. Within this list, a higher level of specialization of trades is noticeable, especially those related to the production of clothing, where, in addition to tailors of folk and civilian clothes, additional craftsmen specialize in the production of men's, women's or children's clothing, then there are profilers of laundry, milliners, bodice manufacturers , waists and belts, etc. (Fig. 6, 7)

The prosperity of artisans in the period between the two wars in Kragujevac is best evidenced by the decision to design the Craft House in 1936 on the ceded municipal plot known as "Staro Načelstvo", which was entrusted to the municipal architect Radet Milosavljević. The building was built in 1939 at the place where the development of the original bazaar began in two parallel streams, which meet right next to the House of Crafts.[4]

#	Врста заната / Type of Craft	Број занатлија / Number of Craftmans
1.	Терзијски / Tailor of civilian clothes	85
2.	Механџијски / Innkeeper	72
3.	Ћурчијски / Furrier	46
4.	Мутавџијски / Knitter	20
5.	Абаџијски / Tailor of national clothes - folk costumes	19
6.	Папуџијски / Cobbler	18
7.	Болтаџијски / Trader of imported luxury and industrial goods	13
8.	Берберски / Barber	11
9.	Кујунџијски / Silversmith	8
10.	Мумџијски / Candlemaker	7
11.	Бојаџијски / Textile dyer	7
12.	Туфегџијски / Gunsmith	6
13.	Грнчарски / Potter	6
14.	Сарачки / A craftsman who makes saddles and other horse equipment	5
15.	Табачки / Tanner	4
16.	Налбантски / Repairer of rifles and pistols	3
17.	Фишегџијски / Masters of making and loading cartridges for rifles	2
18.	Чутурџијски / Wooden flasks maker	2
19.	Дуванџијски / Tobacconist	2
Укупно / SUM		336

#	Врста заната / Type of Craft	Број мајстора / Number of Master Craftsmans	Број радника / Number of Workers
1.	Грађевинарски / Builder	14	4
2.	Зидар. Тесачки / Mason	25	12
3.	Часовничарски / Watchmaker	10	8
4.	Димничарски / Chimney sweeper	2	6
5.	Лимарски / Whitesmith	12	22
6.	Ковачки II / Blacksmith	25	10
7.	Абаџијски / Tailor of national clothes - folk costumes	30	57
8.	Колар-качарски / Woodworkers, a craftsman who makes horse and ox carts out of wood	15	11
9.	Браварски / Locksmith	20	36
10.	Ћурчијски / Furrier	8	4
11.	Кројачки / Tailor	26	48
12.	Потковачки / Farrier	12	8
13.	Обућарски / Shoemaker	31	68
14.	Пекарски / Baker	65	52
15.	Берберски / Barber	35	42
16.	Опанчарски / A craftsman who is engaged in hand-made footwear, primarily "opanak"	54	65
17.	Седларски / Saddler	4	10
18.	Столарски / Carpenter	18	34
19.	Ковачки I / Blacksmith	16	11
20.	Воскарски / Candlemaker	6	3
21.	Лончарски / Metal pot maker	3	2
22.	Месар-кобасичарски / Butcher	75	52
23.	Посластичарски / Pastry maker	15	12
24.	Фотографски / Photograper	4	6
25.	Бојаџијски / Textile dyer	9	2
Укупно / SUM		534	585

Figure 6. Comparative analysis of the development of crafts in Kragujevac in the period of one century (1836-1931). *Number of craftsmen in Kragujevac by type of trade* in 1836 (table on the left), source: Поповић, Вулетић, Илић 2019: Р. Поповић, А. Вулетић, П. Илић, *Престони Крагујевац*, Друштво историчара Шумадије: Крагујевац, 109. *Craftsmanship in Kragujevac in 1931* (table on the right), source: *Југословенски дневник*, 1931. год. бр. 96, 35.

[3] On the overlapping and complementing of activities within the mechanical activity, see in: Bogdanović, Pašajlić 2022: 346-348.

[4] *Јавно мњење,* 1937. no. 9, pg. 2.

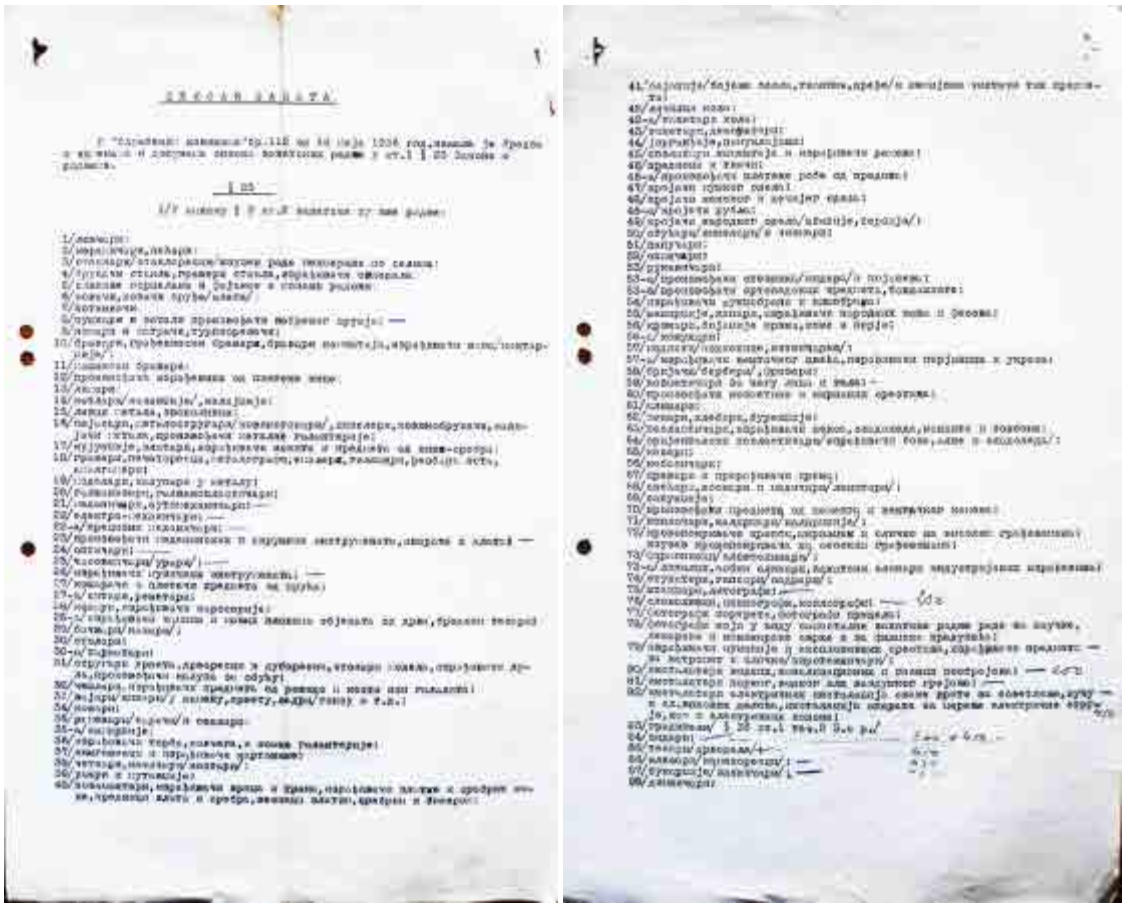


Figure 7. List of trades, issued in ,,Службене новине'' no. 112, 16. May 1936.
(Fund – Удружење занатлија у Крагујевцу 1847-1946. *Историјски архив Шумадије*)

3 Macro-Level - Tactical Urbanism as the First Level of Urban Renewal

In the literature, there is a noticeable growing interest in considering the impact of temporary interventions and actors who implement the methods of tactical urbanism as a catalyst for changing the established relationship of users towards public space and the ways of its daily use.

The literature is mostly based on examples from practice (case studies) that are more or less theoretically supported, the most significant of which are the works of Bishop and Williams, "The Temporary City" (2012), Oswalt et al. "Urban Catalyst" (2013) and Lyndon and Garcia "Tactical Urbanism" (2015). Lyndon and Garcia define their approach more closely based on the meaning of tactical according to the Merriam-Webster dictionary - "of or relating to small-scale actions serving a larger purpose" or "adroit in planning or manoeuvring to accomplish a purpose." (Lydon & Garcia, 2015, p. 3). Tactical urbanism emphasizes the ways in which the interventions themselves, as well as the processes that generate them, can potentially transform large-scale, formal and institutionalized planning practices and the physical environment, hence the catchphrase - "short-term action for long-term change" (Short-term Action for Long -term Change). Lyndon and Garcia, in cooperation with urban planners and activists from the USA, share their experiences of guerilla, pop-up actions, *do it yourself* (DIY - Do It Yourself) and ad hoc *urbanism*, describe the methods and potential of their theoretical and practical research. According to David Webb, their work attracts particular academic interest due to its emphasis on linking fast, cheap, creative, unexpected and transformational scenarios with more sustainable processes of changing the physical environment involving established actors such as city government and large developers. (Webb 2018) Lyndon and Garcia emphasize, the greatest contribution of these practices lies in emphasizing *tactics* in terms of approaches initiated by citizens and users of the space, how to circumvent conventional and established projects and ways of using space through methods of protest, rebellion, prototyping or physical and visually demonstrating the possibility of changes. They favor taking actions and actions without permission, as a means to cut through and bypass bureaucracy, conflicting interests and official legislation. The considered examples indicate that if the action is directly and efficiently planned and implemented, it can create a semi-political wave, public interest and successful involvement of

citizens, so that subsequently the institutions and the city administration cannot oppose it. In this sense, the authors single out five characteristics of tactical urbanism:
1. A thoughtful phased approach to fostering change
2. Local solutions for local planning challenges
3. Short-term commitment to long-term change
4. Potentially high reward, low risk
5. Building social capital and organizational capacities between citizens, public and private institutions and non-profit organizations.

Quentin Stevens and Kim Dovey, as well as David Webb, emphasize the complexity of tactical urbanism and its progressive potential, taking into account the institutionalized creative, economic and political forces that shape contemporary cities, but also express the justification of doubting urban policymakers who promote actions beyond the state. Stevens and Dovey, although aware of critical attitudes as urban designers focus predominantly on analyzes of space, as well as on the role of spatial, material and design aspects that contribute to change. (Stevens and Dovey, 2023) On the other hand, Webb considers how it is possible to use tactical urbanism to experiment with the development of ideas inspired by anarchist and cooperative ideas, as well as how it is possible to avoid the danger of including alternative practices in conservative or neoliberal programs, considering that each an attempt to act on this desire immediately brings with it the problem of political demarcation. Webb advocates paying great attention to political theory as a means to solve this problem, believing that theoretical means are needed that are able to differentiate the political discourses at play within urban practice, that is, that the advocates of a certain practice recognize the political nature of the identities they produce through practice. (Webb 2018, p.70) Webb establishes a typology that shows that tactical urbanism is not necessarily a challenge to established democratic processes or to conventional neoliberal development processes, but that some of its articulations have the potential to call them into question and concludes that tactical urbanism has the potential to open up alternative political sites in the city, as and establish alternative methods of political debate that do not depend on or focus on verbal and textual exchanges. (Webb 2018, p.63) Tactical urbanism involves what might be called "more than verbal debates" about the future of place: debates that focus on the use of art, objects, and other changes in the environment to elicit responses, inclusion, and surveying local residents, planners and politicians. According to Webb, tactical urbanism lies in a broader turn towards recognizing the "sociomateriality" (McFarlane, 2011, p. 734) of practice, and with it the potential of an expanded range of tools and tactics available to those seeking to influence the future of meat. These tactics differ from traditional approaches to planning that rely on a linear separation of debate from action, instead of including action in the form of experimentation with temporary physical changes and social events as an instrument in the process of understanding a place and its possible future.
Webb emphasizes that his political typology of tactical urbanism inevitably carries with it the danger of reductionism associated with a focus on ideal types, and raises three questions that serve as a means of exploring nature and guiding critical practice:
1. Is tactical urbanism an advanced tool for promoting universal, paternalistic notions of acceptable behavior or the situated negotiation of such behavior?
2. Should it complement existing forms of political representation or radically expand them?
3. Is it designed to seek appropriation and institutionalization of physical changes into mainstream systems or to promote transformation and reorientation of those systems? (Webb 2018, p.63)

Pedagogical-educational research designed with the aim of pointing out the specific values of the architectural heritage of Kragujevac, so that through proposals for the revitalization of the ambient whole, individual buildings and their interiors, as well as the concepts of craft modernization, students could improve and enrich their knowledge and approaches to the preservation of immovable and movable cultural assets through research and design processes. The example of student work under consideration involved combining the creative potential of urban design with a more socially conscious and responsible approach by applying the methods of tactical urbanism at the macro-level. The methods of tactical urbanism were applied precisely because of the possibility of connecting fast, creative, unexpected and transformational scenarios with more sustainable processes of changing the physical environment. The proposed project involves examining the potential and possibility of revitalizing Ivo Lola Ribara Street in the direction of modernizing and modernizing crafts and the possibility of establishing continuity between the past and present, the social and cultural context, the time of origin and the history of the development of the street, i.e. examining the possibility and necessity of re-establishing the street as a craft district. The project implies finding proposals and content that

would contribute to a better use of space through design and program proposals and scenarios, active action on the ground with the implementation of various program activities, with the aim of overcoming the shortcomings of the urban structure found in accordance with the changing needs of residents and users of the space. As the main catalyst for examining the possibility of change and directing urban renewal, an adaptable, temporary spatial installation was proposed that establishes a connection between artisans - artists, street dwellers and citizens, in order to manifest a change in the environment in the desired direction, to provoke and examine reactions, involved local residents, planners and politicians.

The proposed spatial installation represents an intervention in the concrete space through which the perceptual and user experience is modified, thereby enriching the space with new meanings and content. The installation represents a tactical urban strategy, a temporary physical change that would examine the basis and justification of the proposed vision of the development of the space and provide the opportunity to, in a space that has acquired great historical value and importance over time, and which today has largely changed its original form, captures the attention of observers and encourages an alternative method of debate. The installation enriches the space with new primarily informative (audio, visual and textual content about the history and potential of the space), changing its appearance in relation to the immediate context of neighboring objects and enriching the ambient whole with meanings that people could not perceive in the everyday existing experience of the space in its current state.

The structure is a multifunctional installation, which, in addition to temporary physical changes and informative character, leaves space for free programming and organizing events. It consists of vertical and horizontal rod elements and cubes of dimensions that enable various transformations, the establishment of smaller and larger points, but also the introduction of greenery. Within the structure, there is also a canvas that was introduced as a segment of the link with the analyzed historical period in a dual function as protection from weather conditions, but also through the possibility of its repositioning, by pulling and lowering the canvas, the users decide whether the awning or the canvas will take over the function of a lounge chair. All elements are designed so that they can function independently with the possibility of grouping them into a more complex structure that can function in multiple formations and be organized as an auditorium, exhibition space, rest area, information point, etc. The installation can also have a permanent character, developing over time in areas in front of revitalized craft buildings (tailor shops, watchmaking shops and pastry shops). (Fig. 8)

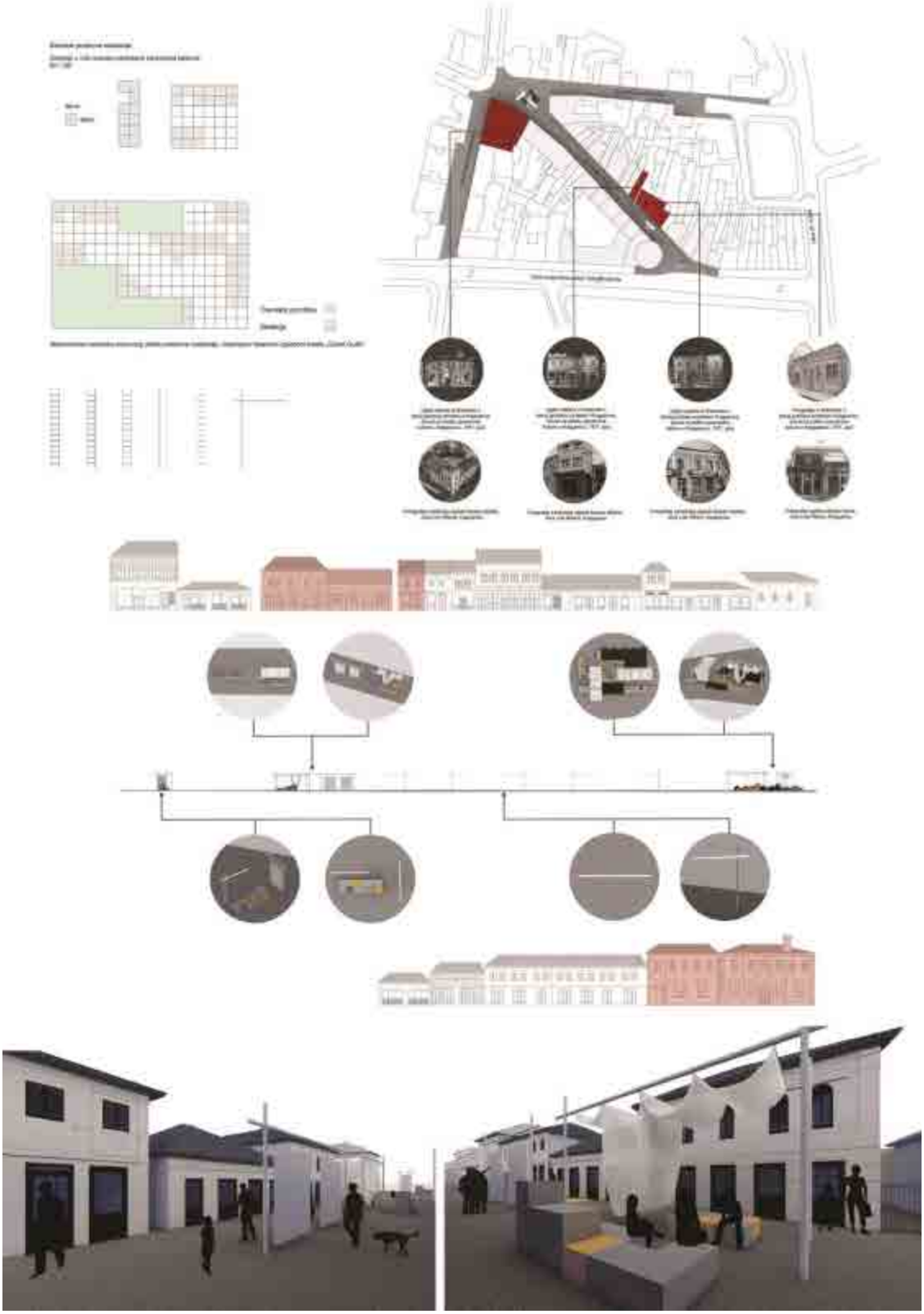


Figure 8. Line structure, author Nevena Ristić

4 Micro-Level - Modernization of Crafts as a Program in Architecture

The reinterpretation of tradition from the micro to the macro-level, from the craft object to the city level, is followed through student projects through two lines - scientific-research and artistic-design line, applied on the example of the old city center of Kragujevac, i.e. Ivo Lola Ribara Street. Through research and project work, the

students had the task of applying the above discussed models of transmission of tradition on a micro-level, investigating the material and immaterial aspects of the chosen craft. On the example of this student work, tailoring craft is selected, in order to create appropriate spatial frameworks for the reinterpretation of tradition through models of integral transmission of craft heritage in architecture on a macro-level.

4.1 Tailoring Craft

Among the oldest guilds in Kragujevac, according to Boriša Radovanović, we can mention the tertiary guild, which had 115 members since 1818 (the year Kragujevac was declared the capital of Serbia).[5] In 1827, for the purpose of sewing military uniforms, schneiders came to Kragujevac. At the beginning of the 1930s, XIX century Schneider Đoka Valenić worked in Kragujevac with four of his journeymen for the needs of the army; In 1834, Schneider Jozef Tataj, "who knows how to cut both German and Hungarian dresses" came to sew uniforms for the prince and his officials. Writer Sreten L. Popović noted that as a student from Kragujevac, he saw the coat and trousers for the first time on a schneider called Pobra Miško, who arrived in Kragujevac. The European way of dressing quickly attracted townspeople, at least those who could afford Schneider's services. Therefore, in addition to sewing for the court and the army, many schneiders begin to work "privately", while some turn only to work for the town population. (Поповић, Вулетић, Илић 2019) The separation of tailors from the Terzija-Schneider guild in 1869 increased the number of members of the tailors' association and encouraged its development. Tailor workers from Kragujevac founded a fund in 1885 to help comrades who "befallen in trouble". At the beginning of the 20th century, the number of tailor shops in Kragujevac increased. The earnings of tailor workers ranged from 30 to 80 dinars, and they worked from 10 a.m. to 4 p.m. a day. (Радовановић 1996) The new fashion that arrived from Europe via Belgrade to the interior, as well as the appearance of the sewing machine, enabled the development of tailoring to the detriment of the tailor of civilian clothes (terzija) and tailor of natonal clothes/folk costumes (abadžija). Terzija experienced its collapse already at the beginning of the 20th century. (Дробац-Крстић 2021) In the periodicals of that time, you can find advertisements such as Mihailo I. Obradović, a seller of bicycle and sewing machines from Kragujevac, which reads:

"I have Wertheim and Singer systems of sewing machines as well as bicycles from the first German factories in the warehouse and I am selling them on favorable terms for monthly payments and for sale. I give 2 years for sewing machines. guarantees."[6] (Fig. 9)

Figure 9. Advertisement of Mihail I. Obradovića, source: *Нова задруга*, no. 5, 1900, p. 4

[5] The main purpose of this guild was to protect its members, to regulate the relationship with the state and to serve as protection against competition. Б. Радовановић, Стари Крагујевац, Крагујевац: ПИП „Круг“, 1996, pg. 4-5.

[6] *Нова задруга*, no. 5, 1900, pg. 4

From 1901. for consideration is an interesting ad published in Nova zadruga (Нова задруга), a "Russian woman" who moved to Kragujevac and performed the services of a tailor for women's suits, making dresses, jackets, coats, collars, remaking women's hats and making hats according to French models. Anka M. Sisaćka, "Russian", had an apartment in the yard of the house of Mr. Obrena Janković, where she performed tailoring services.

Near Mala Vaga square was the shop "Kern i Beli Hem", the shops of Marko Bojović, Milentije Ignjatović, Kosta Jovanović, Nestor Milović were also known. The Schneider School for Girls worked not far from the Green Market. The more famous tailors of the post-war period include: the Schneider family Dinić (father Svetozar Toza and son) in Ivo Lola Ribara Street, where Pantović's shop was also located, then master Vladimir Marić's shop in the pedestrian zone, Dragomir Strizović and Ika Babić's shop, Tihomir Radenković's shop "Kosmajac and sons" near the Lower Stone Bridge. Famous designers of women's toilets were Nada Savić (in Erdoglia) and Stanica Lazić, who lived and worked in the building of the former "Kruna" hotel. (Стефановић 2013) (Fig. 10 and 11)

Figure 10. Svetozar Dinić in front of his shop,
source: personal collection of Svetozar Dinić's great-grandson, Mihailo Vasiljević
Figure 11. Nestor Milović in front of his tailor's shop in Kralja Petra I street,
source: *Крагујевачки лексикон*, Град Крагујевац, Београд: ЈП Службени гласник, 2013, pg. 234.

The advertisements of Vladimir Marić's tailoring salon in the period from 1920-1927 are characteristic of this period for considering the development and state of the tailoring industry. According to an advertisement from 1920 published in the 26th issue of the Šumadijska demokratija (Шумадијска демократија), the salon based its activity on the import and sale of fabrics, the provision of tailoring services for gentlemen and ladies, and the sale of tailoring accessories.[7] The advertisement published by the salon in issue 143 in 1923 was framed with the text "Let's help domestic production" with the call "Let's help domestic industry because that is the only way to save the real value of our dinar". With an ad, the tailor's salon informs customers that it has received "a large and beautiful selection of the best quality FABRICS from the first English factories in all the most fashionable colors for the upcoming spring season." The Marić tailoring salon in its salon offered ready-made suits that were made in its workshop according to the "latest fashion" with the possibility of free corrections according to the wishes and needs of the customer.[8] From an advertisement from 1927, number 6 of the Šumadijska demokratija, we learn that the tailor's salon expands its activities and becomes a "tailor's salon and warehouse of ready-made suits". The content of the ad is similar to the ad from 1923, with the fact that in the

[7] *Шумадијска демократија*, no. 26, 1920, pg. 4.
[8] *Шумадијска демократија*, no. 141, 1923, pg. 4.

ad from 1927 there is a visible turn in the marketing and visual approach to advertising, as evidenced by two illustrations - graphics of male models, as well as the text emphasizing the accessibility of the items by announcing the current discount of 30 % on goods.[9] (Fig. 12)

Figure 12. Advertisement of Vladimir Marić's tailor shop published in *Шумадијска демократија*, no. 26, 1920, p. 4

During the research of the archive material of the association of artisans in Kragujevac, which covers the hundred-year period of activity of this association, from 1847 to 1946, a letter was found from Vladimir Marić addressed to the "Guild of All Crafts for Varoš Kragujevac and Srezove Krag and Gruž" on October 5, 1931. from which one can see the significant social role of this craftsman in managing the tailor's guild, but also the dedication to his tailor shop. In the letter, Marić declares that he is no longer able to perform the function of President of the Guild because he is "prevented by his personal affairs in the Shop", requesting the members of the board of directors to accept his resignation at the next meeting and elect another president. (Fig. 13)

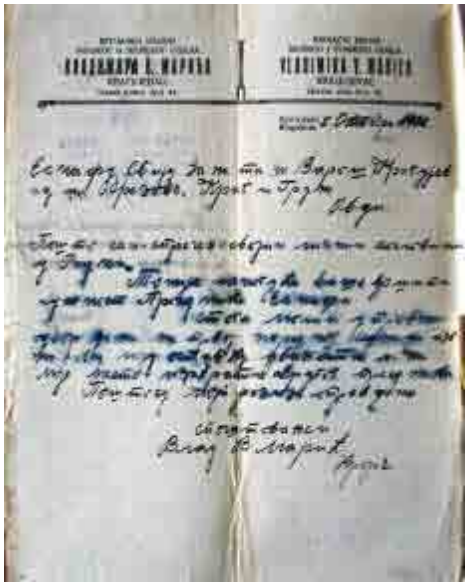


Figure 13. Marić's letter addressed to the "All Crafts Guild for Varoš Kragujevac and Srezove Krag and Gruž" in which he announces his resignation from the position of President of the Guild.
Source: Фонд ПО/4 Удружење занатлија у Крагујевцу од 1847-1946. Историјски архив Шумадије

[9] *Шумадијска демократија*, no. 6, 1927, pg. 4.

Also characteristic of this period is the example of the newly opened tailor shop of Ilija Kiković (1921), who, in addition to civilian suits, made all kinds of uniforms, and in the advertisement, it is especially emphasized[10] that the tailor masters "the tailoring of the famous Studgara tailoring academy". Over the next four years, Ilija Kiković's tailoring salon profiled its activity and grew into "the largest warehouse of ready-made suits", but it is still engaged in the production of "men's suits of all styles according to the latest world magazines". (Анђелковић 1925) In *Putovođa* (1925), 14 tailor shops were recorded, 6 of which were in Glavna Street, and 4 in today's Karađorđeva Street. In one of the advertisements, we find information about Lazar Nikolić's "Elita" salon, which reads:

"The modern tailoring salon of men's and women's suits "Elita" by Lazar Nikolić, Glavna 140, Kragujevac, has a large stock of first-class English fabrics to choose from." (Анђелковић 1925) (Fig. 14)

Figure 14. Advertisement of Lazar Nikolić's tailoring salon Source: *Путовођа*, 1925, pg. 44.

In the fourth decade of the 20th century, 58 tailor shops, 15 tailors and 43 men's suit tailors, 32 folk costume tailoring shops and 3 linen sewing shops were registered. In Glavna Street there were 10 tailor shops and 8 tailors of folk costumes. (Стефановић 2013) In Vođ kroz Kragujevac (1938) you can find an advertisement of a tailor's shop of folk costume, where it is stated:

"Dimitrije Maksimović's folk costume tailor's shop "Šumadinca", Kralja Petra 83, makes all kinds of suits in its own workshop: brocaded, shacked and quilted, as well as all existing uniforms made to measure for the general satisfaction of customers. The shop has a large stock of various suitable fabrics. Viewing without obligation is free for everyone. Solid prices."[11] (Драгићевић 1938)

From the same period comes the advertisement of the company "Singer"[12], whose store was located in the pedestrian zone in the city center, next to the famous store "Kosta Jakovljević i Sonovi":

"Visit our stores of the famous "Singer" sewing machines, which are located in all parts of our country, where we hold free tailoring, embroidery and sewing courses, and you will be convinced that our machines are the most perfect in the world and, in addition, the most favorable conditions for purchase, whether for ready or for repayment." (Драгићевић 1938) (Fig. 15 and 16)

[10] *Нови покрет*, no. 39, 1921, pg. 4.
[11] Драгићевић, Б. В. *Вођ кроз Крагујевац*, 1938, pg. 73
[12] Based on the New Year's card published in *Шумадијска демократија*, no. 2 on page 4 from 1924, we can conclude that the "Singer" machine dealership was present in Kragujevac more than a decade before the mentioned source. "The representative of "Singer" sewing machines in Kragujevac congratulates his customers on the new year 1924". Along with "Singer's" greeting card, on the same page you can also find a greeting card from the aforementioned Vladimir Marić tailoring salon, which reads "Vladimir Marić's tailoring salon and warehouse of ready-made suits congratulates the new year 1924 to its customers".

Figure 15. "Singer" store in the pedestrian zone in Kraguevac,
source: Zvonko Marković, private collection

Figure 16. "Singer" store next to the store "Kosta Jakovljević i sinovi" in the pedestrian zone in Kraguevac,
source: Dejan Lekić, private collection

During the 1941-45. War, tailoring artisans lost most of their personnel and equipment, so they were slow to rebuild in the first post-war years. (Радовановић 1996)

One of the few trades that has survived in the modern age in an almost unchanged form is tailoring. As the entire work on the subject is based on the formation of a contextual knowledge base, the starting point for creating the conceptual solution and program of the tailoring shop were previously discussed advertisements from which the work modalities and organization of tailoring shops were taken, then the transposition of the visual identity and graphic language of the advertisement into a design expression. The program task was conceived so that the tailor's shop has an exhibition-sales character, with an integrated workshop for the work and training of tailors.

The conceptual solution of the tailor's shop is spatially divided into two units: service and work area and sanitary block. The service-work space, although visually and spatially designed as a unified whole, contains sub-spaces such as the reception area, the work area and the whole with the cabins, which are physically separated from the two previously mentioned. Through the research of the character of the craft and its adaptation to modern flows of use, it was recognized that the service area should also represent a work-exhibition space in which various workshops and tailoring and sewing courses would be held. This is one of the dedicated links taken from the analyzed period, which states in the advertisement Singer machine in Šumadijska demokratija (*Шумадијска демократија)*, no. 2 on page 4 from 1924. In a visual sense, through the interior of the aforementioned craft space, architectural elements can be recognized that emphasize the purpose of the craft with their aesthetics. This primarily refers to the linear character of the interior elements, which are associated with thread as an integral element of every fabric, but also thread as a binding segment and one of the main tools in the work of this craft. The aforementioned principle was conveyed through the spatial partition in the central, working area, but also through the shape of the lighting and the character of the storage space. As a third type of connection with the stylistic characteristics of the analyzed period, the equipment of the *Tonet* brand whose chairs are placed in the work and reception area, as well as the inscription in the reception area, which typographically and visually associates with stamps and advertisements used in the analyzed period. (Fig. 17 and 18)

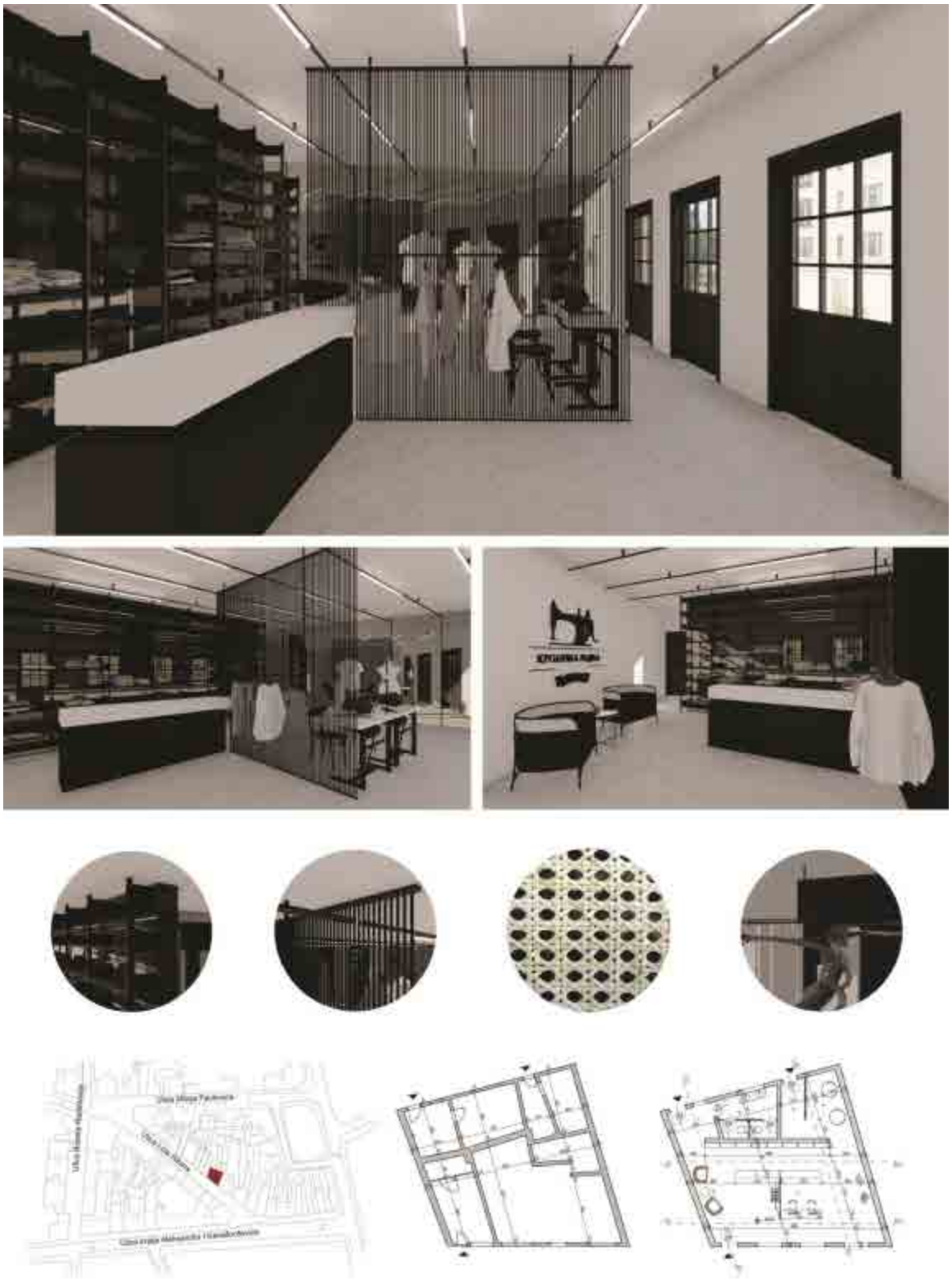


Figure 17. Conceptual solution of Tailoring Craft shop, author Nevena Ristić

Figure 18. Conceptual solution of Tailoring Craft shop, author Nevena Ristić

4.2 Watchmaker Craft

The first watchmaker's shop in Serbia was opened in 1835 in Kragujevac, the then capital, by Jozef Piler, an immigrant from Petrograd, with the title "learned watchmaker". Due to the small need for repairing watches and the small number of customers, Piller had to adapt and expand his activity to the production and sale of red wax for letters. (Радовановић 1996, Стефановић 2013) After Kragujevac lost its administrative function, Piler moved to the new capital of Serbia, Belgrade, in 1836. In the second half of the 19th century, owning a watch became a certain status symbol. Richer people from Kragujevac emphasized their social position by decorating their homes and costumes with expensive details, but also with watches. (Радовановић 1996,

Стефановић 2013) The best testimony to the development of the watchmaker's craft, are the advertisements in periodicals covering the sixteen-year period from 1924 to 1940, which can be divided into two groups: advertisements from 1924-1925. and ads from 1935-1940. years. As in the case of the first watchmaker Piler from Kragujevac, watchmaking craftsmen could not fully support themselves only from their basic activity. As can be seen from the advertisements published in periodicals as early as 1925, watchmakers expanded their activities to jewelry, goldsmithing, optics, but also to the purchase of jewelry and gold.
From this period, Dragiša Fulkić's watchmaking-jewellery and optician shop in Glavna street no. 90, Anton Gajger's watchmaking shop in Draškovićeva street no. 2 near the Court of First Instance and Nikola Paligorić's watchmaker, jeweler and optician shop in Glavna street no. 46. In addition to being a basic craft product, the clock was also the main visual motif of the ad, but also a feature of the store within the facade of the building's ground floor. In the case of Nikola Paligorić's shop, the clock appears in the form of a logo, but also in the form of a three-dimensional motif - the clock as an integral part of the facade. (Fig. 19)

Figure 19. Nikola Paligorić's watchmaking, jewelry and optical shop in the background, source: Dejan Lekić, private collection

In the ad, Dragiša Fulkić directs the sale of her items to a specific group of customers, advertising them with the slogan: "The most beautiful present for newlyweds is a watch!". (Fig. 20)

Figure 20. Advertisement of Dragiša Fulkić's watchmaking, jewelry and optician shop, source: *Шумадијаска демократија*, no. 10, 1924, pg. 4.

In the periodical from 1935 to 1940, there are advertisements of Miloš Đorđević's watchmaking, jewelry and optician's shop located at Masarikova street no. 14, Dušan Branković's watchmaking shop at Draškovićeva street no. 1, then the jewelry, goldsmith's and watchmaking shop of Milan K. Đorđevića, which was located at Kralja Petra Street 56. In this period, in addition to pocket watches, a wristwatch appears as a motif. Emphasis is placed on the manufacture and repair of watches on the import and sale of watches and jewelry, that is, the trade is predominantly shifted from craftsmanship. Miloš Đorđević published 4 advertisements in 1939. In addition to Masarikova street, the same year he opened a shop in Kralja Aleksandra street no. 6. In the ad published in the 28th issue of Odjek Šumadije, Miloš Đorđević advertises exclusively optical products - glasses "in all forms and styles". From the advertisement published in Odjek Šumadije no. 31, on page 4, we learn that the shop from Masarikova is completely moving to Kralja Aleksandra Street. (Fig. 18, 19 and 20) From individual advertisements, one can also get an impression of the rivalry and competitive atmosphere between craft shops, such as the relationship between the watchmaking shops of Miloš Đorđević and Milan K. Đordjević.
We can learn about the nature of the Watchmaker craft and the method of production from the publication "When the craft was golden - Old crafts in Aranđelovac". The typology of clocks includes wall, table, plug and hand clocks, of which wall clocks can be with pendulum, weights, cuckoo. They could be of different sizes and shapes, which mainly depended on the size of the case and the material from which it was made - metal or wood. (Дробац-Крстић 2021) Other artisans, such as goldsmiths, carvers of wood, stone, etc., could be in charge of the decorations and external (finishing) treatment of watches. In their work, carpenters used numerous tools - screwdrivers, monocle, magnifying glass, files, carpenter's wheels, specialized tweezers, mechanism holders, tools for cleaning and lubrication, tools for making and checking mechanisms (its movement and accuracy) and housing (its airtightness and collapsibility). (Дробац-Крстић 2021) Today's watchmakers mainly repair or replace factory-made parts of both mechanical and electronic watches.
The conceptual solution of the watchmaking shop is spatially divided into two units of longitudinal orientation. In the first part of the space there is a sales and exhibition unit intended for future customers, while in the last part of the building there is a sanitary block. The sales and exhibition space in the first part is equipped to represent a whole for rest or reception of clients, while in the second part there is a presenting desk for items. As in the first presented solution, the link with the researched period is the furnishing of the space with *Thonet* elements for sitting in the form of benches (Mos Bench model - Gebrüder Thonet Vienna) placed in the direction of the spatial orientation of the craft shop. The treatment of wall surfaces was carried out in two forms, as a designed structure for the display of sales items and as a decorative covering in the form of typographic wallpaper. The analysis of the advertisements presented in the periodicals published in the city of Kragujevac provides a detailed description of the items that the facilities had, and accordingly the current brands represented by the watch shops are listed. One of them, Miloš Đorđević's watch, jeweler and optician's shop, in an advertisement published in Odjek Šumadije (Одјек Шумадије) no. 27 of 1939, on page 6, he lists some of the brands: Omega, Schaffhausen, Doxa, Zenit and others. The mentioned type of advertising, what the craft shop has, was transferred to the modern context through the installation of typographic wallpaper over the entire surface of the wall with the indication of craft content that characterizes the watch shop. In the visual sense, the artistry that comes with the craft was used and transferred to the designed structure for exhibiting objects through a stylized relationship of materials and forms. The display shelf in the area of the lining, processing and texture of the material is associated with the hands of a clock, while the other part of the exhibition structure, through the principle of displaying the clock, emphasizes its longitudinal character. (Fig. 21 and 22)

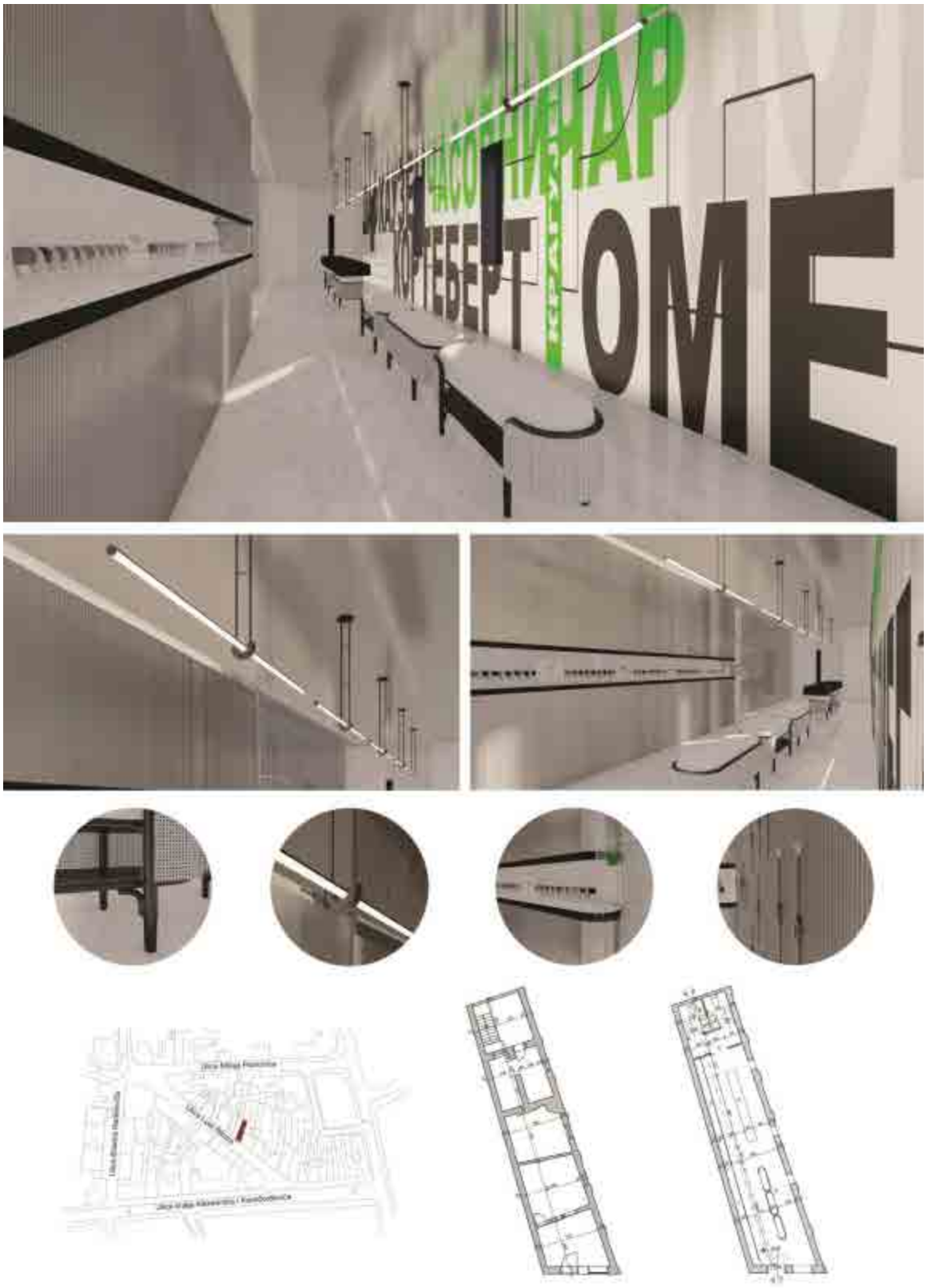


Figure 21. Conceptual solution of Watchmaker Craft shop, author Nevena Ristić

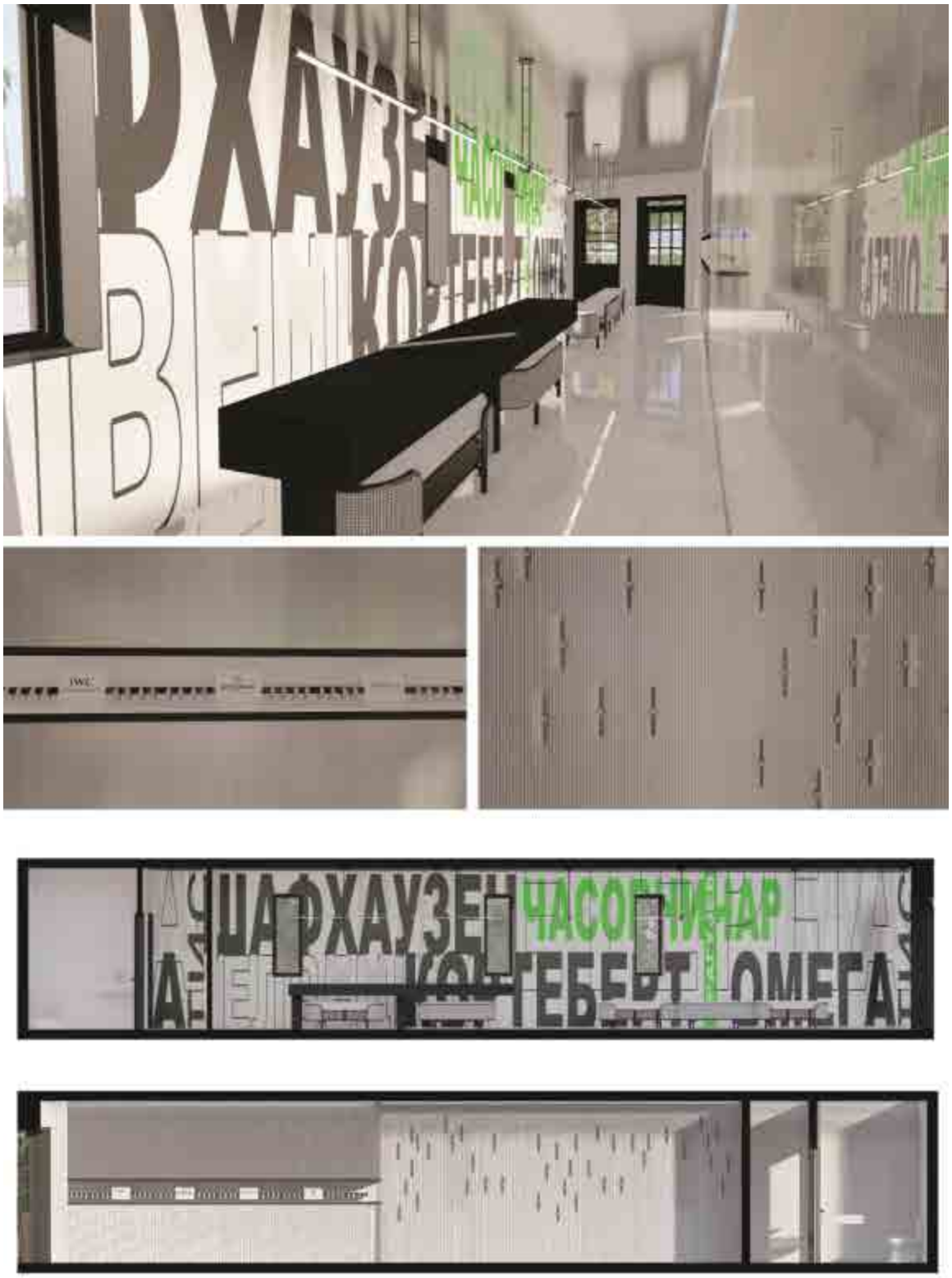


Figure 22. Conceptual solution of Watchmaker Craft shop, author Nevena Ristić

Conclusion

An interdisciplinary and integral approach to design involves combining the creative potential of urban design with a more socially conscious and responsible approach to interior design in order to develop more efficient urban renewal techniques. Integral understanding and connection of the problems of interior design, architecture and urban planning on a theoretical and practical level in pedagogical-educational research is considered in the context of the reinterpretation of tradition on a micro and macro-level, through dealing with

concrete space and urban problems, meeting with real people and their environment. At the micro level, this means finding program proposals and content that would contribute to a better use of the locality in order to establish continuity between the past and the present. In accordance with the original content of Ivo Lola Ribara street, as the most important street belonging to the type of traditional trade and craft streets, through design and program proposals and scenarios, the shortcomings of the existing urban structure are overcome and it acts in accordance with the changing needs of residents and users of the space. Through the presented design solution, the reinterpretation of tradition was carried out through the field of internal architecture on the micro-level, which was placed at the service of urban design and planning on the macro-level. The considered projects of reinterpretation of tradition through the modernization of crafts, on the examples of tailor and watchmaker shops, are part of the wider picture of urban renewal of the street and consideration of the possibility of modernizing different types of crafts along the entire street, such as goldsmiths, photographers, dyers, bakers, coffee makers, potters, bag makers, barbers, and barbers, et al. The proposed solution on the macro-level, as the first stage of urban renewal, focuses on the methods of tactical urbanism due to the possibility of a quick, active examination of the zone's transformation possibilities in accordance with the proposed strategies of pedagogical and educational research.

References

Анђелковић. Бож. Ст. (1925): *Путовођа кроз Крагујевац*, Крагујевац: Штампарија А. Јовановића. (online), pg. 64. https://issuu.com/nbkg/docs/putovodja_1925
Bishop, P., Williams, L. (2012). The temporary city London. New York, NY: Routledge.
Bogdanović, N., Pašajlić, B. (2022) *Urban regeneration of Ivo Lole Ribara street in Kragujevac as a structure that shapes urbanity of modern city - Teaching-educational research*, Beograd: 336-351.
Dorfles, Đ. (1994) *Uvod u dizajn,* Novi Sad: Svetovi.
Драгићевић, Б. В. (1938) *Воћ кроз Крагујевац*.
Дробац-Крстић, Л. (2021): *Кад је занат био златан – стари занати у Аранђеловцу*, Аранђеловац: Народни музеј Аранђеловац.
Lydon, M. (2012) *Tactical Urbanism*, vol.1. The Street Plan Colaborative - NEXTGEN
Macura, V. (1984) *Čaršija i gradski centar. Razvoj središta varoši i grada Srbije XIX i prve polovine XX veka*, Niš: IRO "Gradina", Kragujevac: NRIO "Svetlost".
McFarlane, C. (2011). *Encountering, describing and transforming urbanism*. City, 15(6), 731–739.
Mohankumar, V. (2020) *A Tactical Urbanism Guidebook New Delhi*: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
Вучо, Н. (1954) *Распадање еснафа у Србији*, књ. прва, Београд: САНУ
Пашајлић, Б., Богдановић, Н. (2022): *Трговачки и занатски објекти са прелаза из XIX у XX век као структуре обликовности савременог градског урбанитета – случај језгра града Крагујевца – наставно едукативно истраживање* – Српски језик, књижевност, уметност, Зборник радова са XVI међународног научног скупа, Књига III, Роман и град у музичкој уметности & Град (29–30. X 2021), Крагујевац: Филолошко-уметнички факултет, 153-155.
Поповић, Р., Вулетић, А. и Илић, П. (2019) *Престони Крагујевац*, Друштво историчара Шумадије: Крагујевац.
Радовановић, Б. (1996): *Стари Крагујевац*. Крагујевац: ПИП ,,Круг''.
Радовановић, Б. (2012) *Кафане старог Крагујевца*, Крагујевац: Интерпринт.
Stevens, Q., Dovey, K. (2023): *Temporary and Tactical Urbanism. (Re)Assembling Urban Space*, Routledge.
Стефановић, М. (2013) *Крагујевачки лексикон*, Град Крагујевац, Београд: ЈП Службени гласник.
Webb, D. (2018): *Tactical Urbanism: Delineating a Critical Praxis*, Planning Theory & Practice, 19:1, 58-73.

Јавно мњење, 1937. no. 9, pg. 2.
Нова задруга, no. 5, 1900, pg. 4
Шумадијска демократија, no. 26, 1920, pg. 4.
Шумадијска демократија, no. 141, 1923, pg. 4.
Шумадијаска демократија, no. 10, 1924, pg. 4.
Шумадијска демократија, no. 6, 1927, pg. 4.

Delta – Rijeka Central Park

Denis Ambruš [1], Vlatko Dusparić [2]
[1] PhD. Assistant Professor, Arch. Eng. University of Rijeka
[2] MSc. Arch. Eng. Osijek
denis.ambrus@gradri.uniri.hr

Abstract: The area called „Delta“ in the center of Rijeka, between the Rječina and the canal, has for a long time been the subjekt of development attempts based on several spatial plans that offer the construction of various fecilities on the Delta. Nothing that was planned was realized and Delta is still an unorganized area. Ante Marinović-Uzelac opposed the construction on the Delta by asserting that the construction of the Delta is a fallacy and a myth: „The Delta is the least buildable area in Rijeka.„ The identity of the city, the author reminds, is preserved not only in the built evironments but also in the topographical elements of its location, which represent the cradle of its creation and development, the Delta should, the author concludes, remain undeveloped and a landscaped area – a large central park, which is particularly scarce in Rijeka. Through the analysis of the existential space that determined the origin and development of the place, with the subsequent filling of the Delta, a plateau was created on which the realization of the central park would represent a reminiscence of the natural component of the original source of identity (greenery instead of water). With an open view of the remaining components: the Trsat slope, the Rječina, the Kvarner Bay. A number of world cities made similar decisions, consciously abandoning construction in areas with the land rent, leaving the space to urban nature.

Keywords: Rječine Delta, original source of identity, urban nature

“Return to the locality is the fountainhead of identity”
Živojin Kara-Pešić

Introduction

Formerly a monofunctional city, Rijeka is a regional metropolis today, whose status is based on a number of functions. The concentration of port and industrial buildings in much of the urban coastal area is a part of the historical heritage of Rijeka’s urban structure that has defined the city’s recent identity. An analysis of the characteristics and specific features of Rijeka’s urban identity indicates the following components:

- Longitudinality of the urban structure unit lying between the Kvarner Gulf coastal area and the mountains in the hinterlands;
- Port and industrial buildings occupying most of the coastal area;
- Convergence of nature and built environment where the Rječina flows into the sea, along the edge of the historical city centre;
- Valuable urban spaces, ensembles and individual buildings.

All the key components of Rijeka’s urban identity were present in the early 20th century, but they were not underpinned by any kind of an urban development plan before 1904, when the Rijeka Expansion and Regulation Plan was drafted. Despite the lack of a plan, the scheme of Rijeka’s urban structure was very similar to Leon Jaussely’s famous 1903 Project for Barcelona[1] (Figure 1). Both cities are nestled between the sea and the mountains, their industrial areas are located right along the coast, the residential area above is separated by railway infrastructure, and the central city functions occupy a minor portion of the coastal area. The plan belongs to the progressist model of urbanism, just like Tony Garnier’s 1901 Cite industrielle plan, which positioned the industrial zone outside of the city, thus giving the city direct contact with the coast (Figure 2).

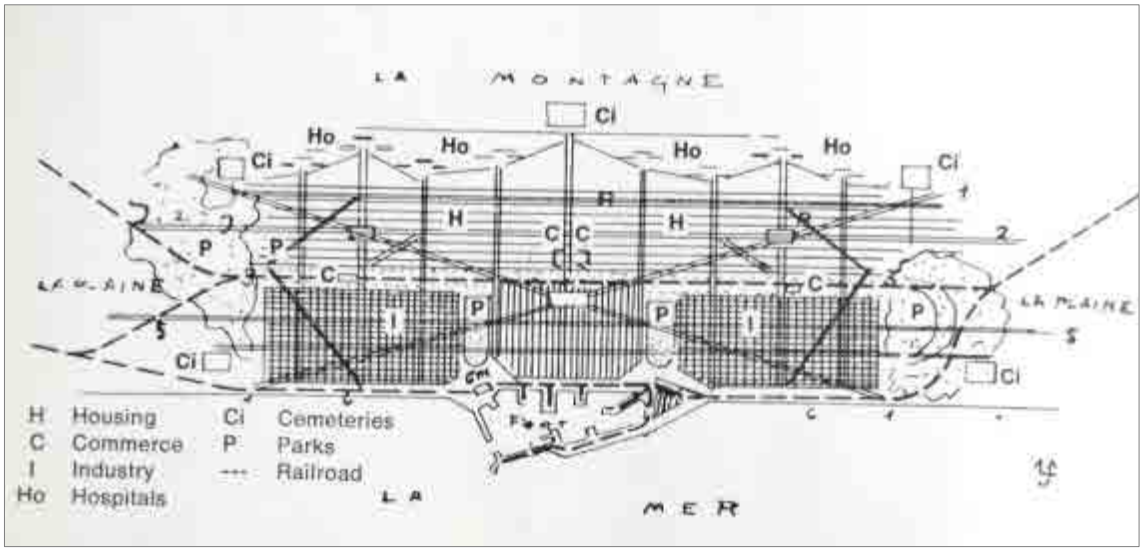


Figure 1. Urban project for Barcelona – Leon Jaussely, 1903. (Izvor: Garnier, T., 1969. The Cite Industrielle. Braziller, New York.)

The configuration of the terrain impeded Rijeka's expansion to its immediate urban hinterlands and directed it to the coastal area instead, with the port and industrial buildings occupying the most valuable urban positions, and the residential areas pushed to the background. This resulted in "Rijeka's identity as an atypical coastal city whose urban space is primarily labour-oriented"[2]. Instead of the "city at the coast" concept, Rijeka applied the "city by the coast" concept. Under the zoning plans from the 1980s, the port was supposed to be moved to the island Krk, and the Delta and Brajdica were separated from the port area. The plan to relocate the port was abandoned in the meantime, and the opportunity to change Rijeka's urban identity was missed. However, a new opportunity is opening up in the Delta area.

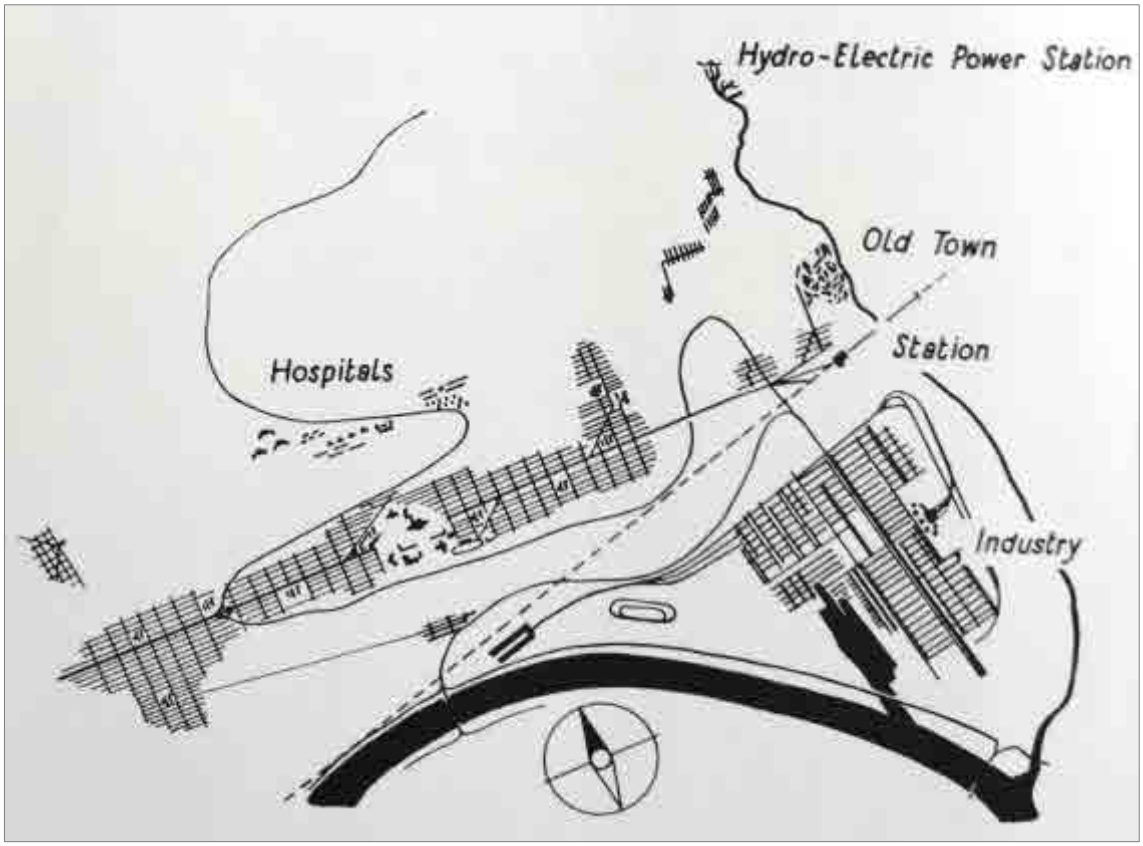


Figure 2. Une Cite Industrielle, plan – Tony Garnier, 1917. (Izvor: Garnier, T., 1969. The Cite Industrielle. Braziller, New York.)

Figure 3. Rijeka, Delta, panorama (Izvor: https://www.google.com/maps)

Delta

The development of the area known as the Delta in downtown Rijeka, in between the Rječina and the Canal (Figure 3), has been included in several zoning plans over time: the 1949 Directional Regulative Basis of the City of Sušak-Rijeka by Antun Urlich and Branko Vasiljević, the 1949 Delta Sports and Recreation Centre Plan by architect Vladimir Turina, and the 1985 and 2013 competition designs (Figures 4 and 5). Ulrich and Vasiljević planned extensive green areas in the Delta and Brajdica areas, but their plans were never materialised, because the port needed large operational areas.[3] The other proposed and award-winning designs offered construction in the Delta, differing in terms of structure and capacity of facilities. None of these plans have been realised, and the Delta area remains undeveloped. Ante Marinović Uzelac disagrees, maintaining that the development of the Delta is a misconception and a myth: "The Delta is the least constructible space in Rijeka".[4] Assuming that an urban planner must also feel and know where there should be no construction, the author offers comprehensive arguments, which could be summed up as:

- The identity and the history of a city are preserved not only in built environments, but also in its geographical location, and the topographic elements of its environment that represent the source it grew and developed from. They shape the original conditions that the city was formed and later developed from.
- A free, unconstructed area, if adequately developed, can be a point of connection simply because an (empty) space connects by virtue of its physical properties, while volume (mass) can only separate.
- The principle of a good and cultural urbanistic composition requires an unconstructed Delta that will give continuity to the free, green, landscape and visual values linking it with the natural ident of the Rječina Canyon, the source of the watercourse that the city's name is derived from, and the natural and historical opening that used to be the old and at one time the only connection with the hinterlands.

Figure 4. Kombinirano plivalište Rijeka-Sušak 'Centar za vodene športove' situacija - V. Turina, 1949. (Izvor: Turina, V. (1950.a), Kombinirano plivalište Rijeka-Sušak 1949., „Arhitektura", 3 (78): 3745, Zagreb.)

Figure 5. Delta i luka Baroš, natječajni rad - autori Studio 3LHD d.o.o., iz Zagreba, 2013. (http://www.d-a-z.hr/hr/vijesti/rezultati-natjecaja-za-deltu-u-rijeci,2223.html)

The author concludes that the Delta should remain an unconstructed, but landscaped area in the form of a large central park, whose lack is particularly acute in Rijeka. The author's reply to the complaint that a park on the Delta would "interrupt" the continuity of the urban structure is that it would in fact represent a continuity of differentiation between constructed and unconstructed areas. In the author's opinion, the "interruption" is not a part of the city that needs to be populated, but a value that needs to be developed as a green area in the heart of the agglomeration. Jean Nouvel takes a similar view of interventions in the urban tissue: "The future of a city is decided based on what came before it... Its emergence offers all opportunities for a well-founded and inspirational conceptual and contextual expression."[5] Both authors advocate a zoning approach relying on the inspiration that may come from the analysis of the fountainhead of identity as "the image of decisive (strategic) decisions made by our ancestors, choosing the place where they will found the city".[6]

The fountainhead of identity

An analysis of existential space, defined by C.N.-S.[7] as a relatively stable system of "images" of the environment, comprising different levels (landscape, urban) and containing different components (place, path, domain), gives us a way to trace the urban identity of Rijeka from the first beginnings of settlement to the present. The landscape level comprises the "land" where the configuration of existential space develops through the interaction of human activity on the one hand and topography, vegetation and climate on the other. It provides areas suitable for the development of the place, and provides the identifications for the development of paths and the formation of domains. Describing the landscape level of existential space, C.N.-S. underlines that cities have always been formed in places where the human need for a place possessing security and identity (characteristic genus loci) found an appropriate natural environment. The urban level comprises structures that have mostly been defined by human activity and interaction with their environment. Places, paths and domains are the elementary components of an existential space. In the observational sense, the notions of closeness and surroundedness are associated with places, while paths are characterised by continuity. Paths divide the human environment into surfaces (domains), which, unlike places, have no destination function.

The landscape level, decided by a conscious choice of the place where to build, explained on the example of Rijeka, has the characteristic genus loci that inspires an attempt at physical and psychological appropriation: the slope of Trsat over the Kvarner and the adjacent canyon channelling the Rječina into the sea and the estuary constitute the alluvial Delta, flanked by green areas on the slopes. We can assume that the scenery must have been remarkably beautiful, which is partly attested by recent components. The first intervention on the path from the landscape to the urban level of existential space is found in old Tarsatica (oppidum), which had the character of a fort in Roman times, and was situated in the location of present-day Trsat.[8] The Roman urbs (Tarsatica), an emporium with a port at the Rječina estuary, was located a short distance away, on the even ground on the western side of the river, as a planned city and a community and municipia centre. The area of ancient Tarsatica in the historical centre of present-day Rijeka has a recognisable orthogonal system of communication with the insulae, with an almost square basis. The main longitudinal axis (Decumanus) led from the centre of the town to the docks. When the new settlement was built, rather than being abandoned, the fort continued to coexist permanently with the urbis below.[8] The configuration of the urban level of the existential space in the process of the town's development continued toward the peripheral areas outside of the historical town centre, gradually occupying the natural areas, and risking their destruction. This process, as Dražić[9] recalls, can constitute a painless transformation of the natural landscape into an artificial structure, provided that awareness of the landscape is incorporated into the perception of the living environment. In this case, valuable urban elements replace the natural elements, or the natural elements are transformed into a landscape with urban characteristics, into urban nature. According to the analysis, the alluvial delta of the Rječina (riverbed, shallow ford) forms a part of the landscape level of the existential space, which has defined the formation and the development of the city. The Delta was later filled to form a plateau, where the realisation of a central park would represent a reminiscence of the natural component of the fountainhead of identity (greenery in place of water), with an open view of the remaining components: the slope of Trsat, the Rječina, and the Kvarner Gulf. The modification of urban topography elements into urban nature, Marinović-Uzelac reminds, would leave intact not the form, but the memory of the original form of the natural conditions: "The new form must have its genesis in the former natural conditions in order to preserve the identity."[4, 11] The society's expectations regarding the return of leisure to the city centre would be fulfilled at the same time.[2, 10] A number of cities[12] across the world did a similar thing, purposefully deciding not to build in highest ground rent areas, and abandoning this space to urban nature instead. (Figure 6)

Figure 6. Valencija, panorama Turia Garden. (Izvor:https://vivevalencia.net/en/turia-garden-in-valencia/)

Conclusion

The development of the area known as the Delta in downtown Rijeka, in between the Rječina and the Canal, was included in several zoning plans over time that proposed the construction of different facilities. None of the proposed plans have been materialised, and the Delta area remains undeveloped. Marinović-Uzelac opposed construction in the Delta, denouncing it as a misconception and a myth: "The Delta is the least constructible space in Rijeka."[11] The identity of the city, as the author reminds, is preserved not only in the built environments, but also in the topographic elements of its location, which shape the original conditions of the city's formation and the conditions of its later development. The author concludes that the Delta should remain an unconstructed, but landscaped area in the form of a large central park. An analysis of the fountainhead of identity

shows that the alluvial delta of the Rječina forms a part of the landscape level of the existential space, which has defined the formation and the development of the city. The realisation of the park in the Delta would represent a memory of the spatial component of the fountainhead of identity, with an open view of the remaining components: the slope of Trsat, the Rječina, and the Kvarner Gulf. Until the "cultural urban composition"[11] is materialised, we remain hopeful that the genus loci of the Delta will continue to successfully resist construction, as it had thus far.

References

1 Garnier, T., 1969. The Cite Industrielle. Braziller, New York.
2 Mrduljaš, M., Mimica, V., Turato, I. (ur.), 2021. Fiume Fantastika, Phenomena of the City. Rijeka, Sveučilište u Rijeci, Umjetnička organizacija Oaza.
3 Kolacio, Z. 1984/85. Iz davnih dana urbanizma u nas. Arhitektura br. 189-195, Zagreb.
4 Marinović - Uzelac, A. 1986. Naselja, gradovi, prostori. Gradski centar i tri uporne urbanističke zablude. Zagreb, Tehnička knjiga, str.170-180.
5 Baudrillard, J., Nouvel, J., 2008. Singularni objekti: arhitektura i filozofija, AGM, Zagreb.
6 Kara-Pešić, Ž, 2019. Vraćanje grada, predgovor, Grid studio: Strand - asocijacija za razvoj održive urbane zajednice, Beograd.
7 Norberg-Šulc, K., 1975. Egzistencija, prostor i arhitektura, Građevinska knjiga, Beograd.
8 Suić, M., 1976. Antički grad na istočnom Jadranu, Liber, Zagreb.
9 Dražić, Đ, 1984/85. Skica za opću sliku - utjecaj prirodnog okoliša, Arhitektura br. 189-195, Zagreb.
10 Randić, S. 2013. Natječaj uspio, Delta nije oživjela, https://pogledaj.to/drugestvari/natjecaj-uspio-delta-nije-ozivjela/ (12 prosinca, 2013).
11 Marinović – Uzelac, A., 1986. Naselja,gradovi,prostori, Tehnička knjiga, Zagreb.
12 Mrak, I., Ambruš, D., Marović, I. 2022. A Holistic Approach to Strategic Sustainable Development of Urban Voids as Historic Urban Landscapes from the Perspective of Urban Resilience. Buildings, 12 (11), 12111852, 34

Ephemeral spaces and water: Urban Green Hall of Faculty of Music Arts – Methodological experiment in the urban design of the new building of Faculty of Music Arts (FMA) in Belgrade in the Belgrade Linear Park

Miloš Stojković Minić, Jelena Ilić Gajić
University of Belgrade, Faculty of Architecture, Serbia
milos.stojkovic@arh.bg.ac.rs,
j.ilic@arh.bg.ac.rs

Abstract: Previous research and work on projects have given us the opportunity to look at space and life in the city in a new and complex way. Such experience has shaped us and encouraged us to think about the choices that we as architects make when making decisions in planning and design and what effects. Through the competition project for the new building of the Faculty of Music Arts in Belgrade (FMA), we examined the relationship between architecture and the city environment, with a special focus on how people experience urban space and how that space affects them through a variable installations that form the space of the Grand Green City Hall, as well as other internal spaces of the FMA building that are created inside.
In the context of this research, ephemeral architecture refers to a certain temporary, transient, short-term constructual phenomenon that is initiated and enables certain events to take place in existential space and time while also having an impact on urban environment and as space users in it. Establishing an active relations with constant physical, functional, social and technological changes of life in the city, ephemeral spatial phenomena – in this particular case study, experimental unfinished forms are an essential support in understanding the changing role of architecture, from a monumental building to ever changing subject in relation to the city and its visitors. The Urban Green Hall of the FMA building offers freedom in function and form, so that time, water, nature and users all act in it and make changes in its environment. The subjective feeling of success of such architecture, on which its duration in thought and memory that gives it legitimacy depends, is the user feedback of a given space, that is, meeting the needs and expectations of people for whom the objects and structures are designed.
The focus of this research was on the analysis of temporary architecture as a spatial framework of urban events, which are present today and are increasingly important factors in urban development and quality of life. It includes research on forms, changes in function and application of mechanisms (elements of nature – water and sustainable technologies), by which ephemeral architecture contributes to positive change in urban space, through reviewing and improving the meaning, use and experience of the space (of water and music).

Keywords: ephemeral architecture, water, Urban Green Hall, Faculty of Music Arts, Belgrade Linear park, Musi-Tecture & Aqua-Tecture

1 Ephemeral spaces and water – introduction and background of the research

The main goals of the research would be to determine the function and importance of ephemeral architecture in urban design, to explain importance and significance – why and what is important for urban development and the quality of the life in the city, as well as to enable the application of acquired knowledge in arranging and directing the development of Serbian cities. The importance of this topic and the desired direction of its development in the future is shown through an integral framework – a case study: Urban Green Hall of Faculty of Music Arts (FMA).
The work interprets, explores and clarifies ephemeral architecture and the context in which (and how) it's created. The work also shows the possibility and a way of applying this architecture and the limitations given through the four basic aspects – spatial, economic, ecological and socio-cultural. The authors' wish is that by studying, acquiring and applying (new) methodological approaches, which contribute to a better understanding of the problem of the quality of knowledge and reduce the possibility of making bad assumptions when creating strategies for the future development of ephemeral structures in open city spaces.

1.1 Introduction of the research

Over the last decades, urban spaces have been forgotten, abandoned and degraded through the decision-making process in urban city planning, and further more through the undefinedness of whether they belong to architecture, urbanism, and/or landscape architecture. They are actually part of the culture, natural or created artificiality of the city. Due to its crisis, worldwide architectural practice is turning to the construction of temporary structures – changing and impermanent objects (such as the Blur building, more at link: Blur-Building 2022). More precisely, everything that constructs the term of "ephemeral" (Chappel, 2006; Kronenburg, 1998). These structures, related to the time-limited beauty of nature or art, leave a mark in the landscape, regardless of whether they point to a landscape or transform it and become an integral part of its architecture. This paper interprets and shows the possibilities, but also examines how ephemeral architecture explains and valorizes the

different urban environment that we have inherited and which we are a part of – the cityscape of the industrial zone, as constructed and protected urban area of the city. The main goal of this paper is to examine how ephemeral architecture, by acting in (open) city spaces, can become a social indicator by bringing closer, indicating and/or enabling people to perceive and experience certain urban events and create an individual image of the space and the place. To show proper way and to give a glance into how we can crate and (a)live an ambience inspired by nature, water and music in the city, by structuring a unique aquatecture ambiences in the city (Barker and Coutts 2016). Understood like this, ephemeral architecture tries to establish a relationship between continuity, stability and permanence on the one hand and mobility, freedom and flexibility on the other (a kind of interpretation of Vitruvius: *firmitas/utilitas/venustas*). Ephemeral architecture means structures designed in such a way that they are characterized by transience, a willingness to physically leave the place, that is, they can be interpreted as structures that leave or only bring the impression of lightness (Chappel, 2006). Ephemeral structures enable change, leave freedom, in function and form, for time and people (users of the space) to act on them and bring changes to their space – (ambiental) environment. If the users of a space can act on the environment, then ephemeral architecture can also act on the ambiental environment by becoming a social indicator of change (at the place and in space) – the unique space-changer able to create the place (and the open space) in the city.

1.1.1 Background of the research: Location of the FMA building – Line and point (the linear point)

The location in question is favorably characterized by linear flows, i.e. the proximity of the Belgrade river coast, the Danube River, as well as the newly planned city park, called "Belgrade Linear Park" with the residential and business complex "Marina Dorćol", i.e. Dunavska Street itself with its street front and the old city center of Dorćol, which is one of the pearls of the industrial heritage and the buildings of the former thermal power plant "Snaga i svelost", whose revitalization and improvement of the Linear Park, together with the newly designed FMA building, forms a highly specific and above all new and unique ambiental area in the city, which contributes to the improvement and preservation of architectural and cultural heritage in a broader city context (Nikolić et al., 2020; Stojković Minić, 2022). By such positioning of the FMA building in the immediate surroundings, it becomes a point of sustenance, i.e. a focal point of culture in the city (Photo 1 & 2). A point that collects and gathers the linearity of all movement flows from the immediate context and environment, especially when it draws in and binds the park's green line in the middle of which it originates (Stojković Minić and Ilić, 2022:2).

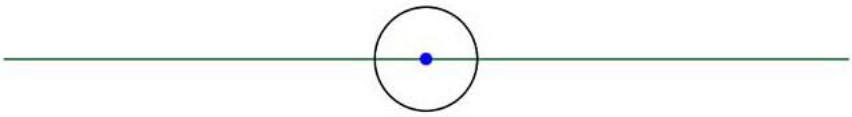


Photo 1. Conceptual diagram: Green line and blue point – *the linear point* /
City + Nature (Green) + Water (Blue) >> circle > point > line = music [Music Academy / FMA], author: Miloš Stojković Minić, 2022.

The conceptual design of competition project for the new building of the FMA in Belgrade aims to show the synergy of music and architecture and thus fulfill the main goal of creating an internationally significant higher education institution, and the way to show this was found in aquatecture, that is, ephemeral architecture that arises as a spatial framework for this building. Aquatecture is interpreted in the work as a part of architecture that studies the application of water as a methodological tool in the design process, in this case that process is complemented by synergy with nature, thus creating a completely new identity and relationship with Belgrade Linear Park and the immediate environment (nature from The Linear Park enters the object and facade structure of the building itself through the grandiose green hall that dominates the space and creates an epochal ambiance of music and water in the cityscape). The FMA building is interpreted as the house of music, that is, the *House of Water* (Stojković, 2019; Stojković Minić, 2022). The house where the music is studied and created, and where music and all its sounds are essentially stuck in time in the form of one of a kind spatial frame, i.e. the form (facade membrane) of the object and the details on the facade that arise as a direct consequence of the author's methodology of structuring the space using water (Young et al., 1993; Stojković Minić, 2022). The sound is in the

conceptual design, and according to the inputs from the competition (UAS, 2021), it is planned to be contained within the framework of the House (FMA building) – with various design effects and ways that have a relationship with the sound in such a way that it is directed, restrained and displayed – but also much better shown. In those processes, compliance with the acoustic requirements was respected, including the appropriate integration of the proposed constructive and technical concepts and systems in the proposed spatial solution. In such process, the FMA building is created – as a multifunctional complex – as a place of synergy of music and water. A place shaped by the ephemeral architecture of water. Architecture that, during its lifetime, will develop natural, social and semantic processes and contribute to the betterment of this part of the city, positioning this location as a significant point in the city, as the city's new epicenter of culture and art (Stojković, 2019).
The spatial area to which the lot of the FMA building belongs to is located in the very middle of Linear Park, and is interpreted as a point on that (green) city line – *the linear point* (Photo 1 & 2). The conceptual design of our comeptition project positions the FMA building as a logical continuation of the park, by creating a raised plateau towards Linear Park, from which the main access for users is planned, especially when there are spectacle and concerts held in the Grand Hall of the symphony orchestra. The FMA building has significant spatial capacities for everything according to the program requirements of the competition, it is created in such way that establishes a logical sequence and attracts (draws in, infuses) all flows (sounds, people, plants, animals and water) from the environment its planned in, thus establishing a constructive relationship with an exceptional industrial heritage that is present in the city's built context (Nikolić et al., 2020). The *House of Music* (FMA) was designed in such manner in which it would not be inconspicuous in its surroundings, but rather dominate it, on the pedestal that has rightfully belonged to it for a long time. The object structure determined in that way aims to provide a new quality to the entireties of its context and ambience – that is suitable for the the present circumstances, the scientific-research and creative development of society, following current technological achievements and enabling the application of new methods and accomplishments in the future, within its framework (Stojković Minić and Ilić, 2022:3).

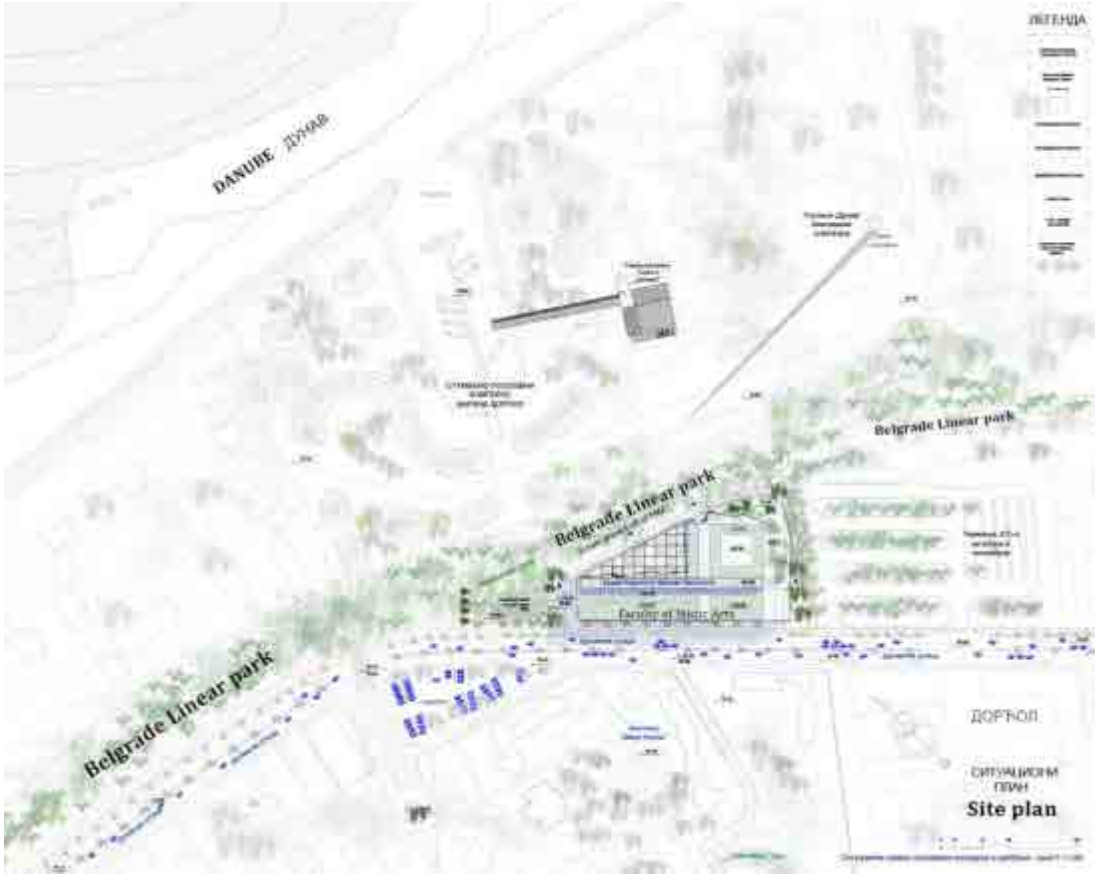


Photo 2. Water that leads - flows of the people and water in the city / connection of the Location with the wider city context –Site plan, drawing from comeptition project (Stojković Minić and Ilić 2022).

2 Objectives & Methods of the research: The fusion of music and architecture and the importance of the active pause in the city's open spaces

The idea of the Urban Green Hall of of Faculty of Music Arts and the formation of that (open city) space is determined by two key aspects[1]: (1) *The ephemerality of the structural facade that forms the membrane of the Urban's Green Hall – the methodology of structuring space with water*[2] *and* (2) *The ephemerality of the inner (open) space of the Urban Green Hall, where different events, ambiences and atmosphere are created*.

2.1 The ephemerality of the structural facade that forms the membrane of the Urban's Green Hall – the methodology of structuring (open city) space with water (1)

In terms of architectural design, the planned building and structures represents a mature (post)modernist solution, it combines related types and structural systems that are in the service of planned functions, and as such represents an achievement that bears the spirit of its time of creation, forming a distinct harmony with the environment (Photo 3). Taking into account the spatial disposition of the planned building and its consideration during design, special attention was paid to the treatment of the facade, i.e. the architectural articulation of the facade details, i.e. to its materialization shape and colour treatment. During the design process, the author's team used an experimental method that treats water as a methodological tool for designing and structuring the space. A sample of water (in the aggregate state of snow) was taken from the site, then analyzed as droplets of water under a microscope (photo 4, 13 & 14). During the analysis, shapes and colours were obtained and were later used in shaping the building's facade details, as well as the ground floor openings to the green underground level. Also, the obtained structural motif was applied in the raised ground level – the floor level of the Urban Green Hall, as well as on the hall canopy – the roof of this public city space (Photo 3). The motif of the circle, dominant in the architectural design of the object, directly originated from the conducted analysis of the observation of water under a microscope (Photo 4) and is the result of the author's earlier research (Stojković, 2020; Stojković Minić, 2022). With this addition to the architectural design process, another modern architectural expression was applied in the shaping of today's ephemeral architecture, which can be turned into the aquatecture of the public city space (Stojković Minić and Ilić, 2022:7).

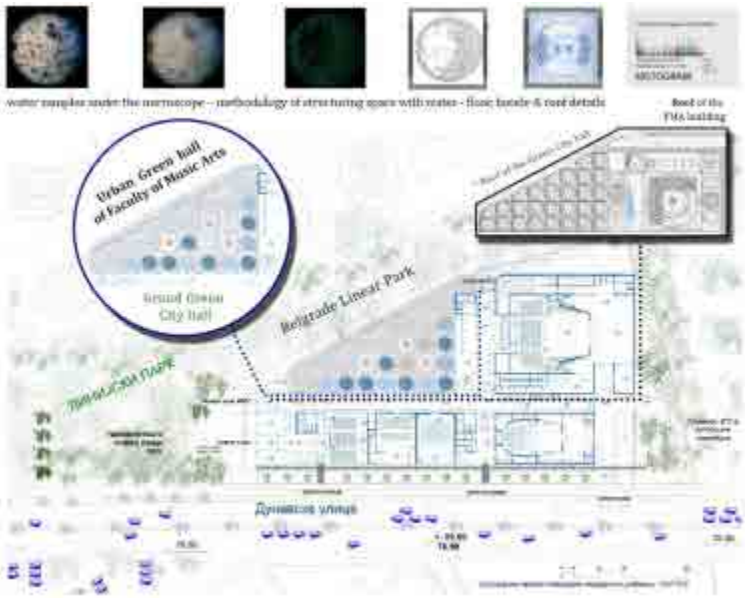


Photo 3. Architectural concept & design – fusion of music, water and architecture (Musi-Tecture/Aqua-tecture): the importance of an active pause - Ground level plan (details of the ground floor and roof of the FMA building), drawings from comeptition project (Stojković Minić and Ilić 2022).

[1] The mentioned two key aspects in the our work are interpreted from the point of view of ephemerality and analyzed primarily through the spatial and socio-cultural aspect, and whose subcategories, or accompanying categories could be (determined – observed in the work) ecological, i.e. economic aspects, relevant to the presented topic of the paper.

[2] The author's method is based on the interpretation and analysis of the sampled water from the location – by observing a drop of water under a microscope. This method provides spatial information such as shape and colour, which as such complements the design process and the creation of possible ephemeral spatial ambiences and structures (more in: Stojković Minić, 2022).

Photo 4. The seven-part *Tableau*: minimized display of the methodological procedure applied to structuring the space using water, author: Miloš Stojković Minić, 2022.

With the building's facade membrane and structured details on the facade and accented spaces, and through the author's methodology that uses water as an inspiration in architectural design process, a way was found to display music in architectural elements – as *Musi-Tecture*, the useful correlations between Music and Architecture (Young et al. 1993). In this particular case study, water is also used as the main generator of the modern cultural economy, by planning the installation of facilities in the underground floors that would essentially be thermal pumps, which would use thermal (hot) water for the needs of the FMA building and throughout its entire life cycle. The FMA building will use water to grow and develop, and during that time it could obtain new technological solutions that will enable its constant growth and development over time. For this reason, we named our project *Aquarelius* – the House of Music and Water, of which facade reflects shaped music and where shaped music is perceivable on the facade (Photo 5+6&7). Our competition project uses water, not only as a motif on the façade, but also as an exceptional resource that can significantly contribute to the economic development of the building over time, along with all the accompanying contents, uncovering new interpretations for understanding the author's concept of *H2OUSE* (Stojković Minić, 2021:102). Even if at first glance it seemed that music and water could not be connected, this competition project (conceptual design) ultimately succeeded, and the effect that the applied systems and methodology can have in the future is far-'reaching and exceptional (Stojković Minić and Ilić, 2022: 11).

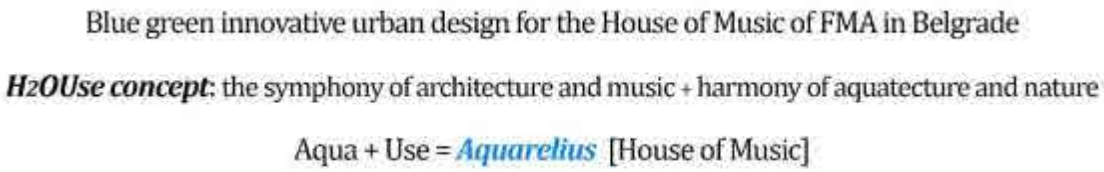


Photo 5+6. *Aquarelius* – the House of Music and Water, words diagrams, author: Miloš Stojković Minić, 2022.

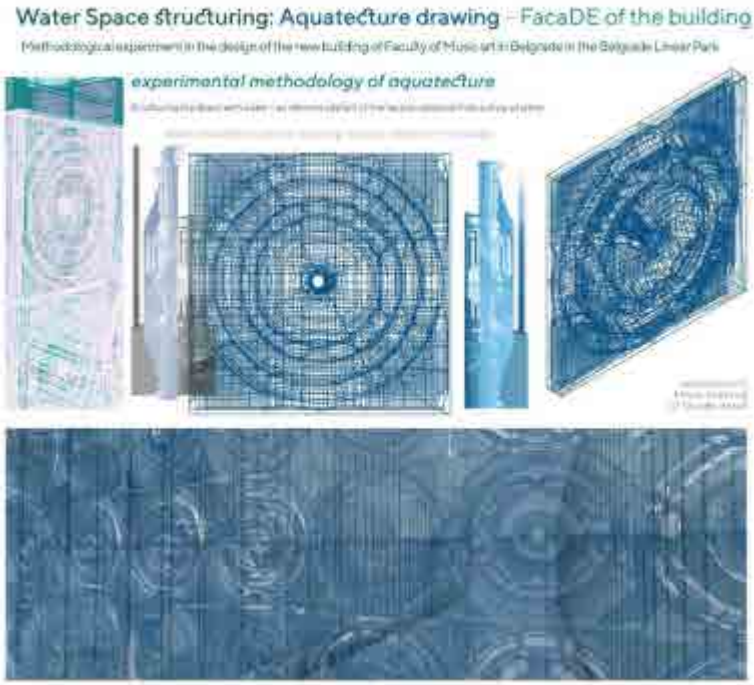


Photo 7. Water space structuring: Aquatecture drawing – Facade of the building, facade motif – details, author: Miloš Stojković Minić, 2022.

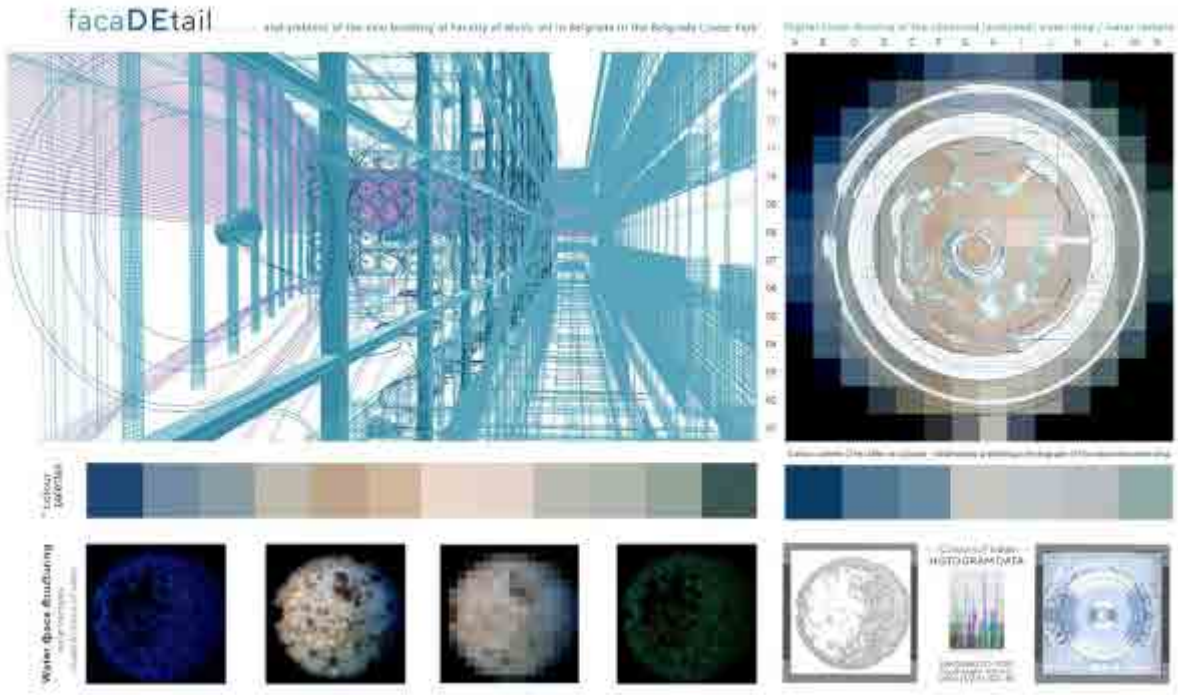


Photo 8. Water space structuring: Aquatecture drawing – Facade of the building, facade motif – details, author: Miloš Stojković Minić, 2022.

Architecture has always operated within limitations, but the paradox of contemporary practice refers to the technology development, both in design and realization. By using the façade as a membrane around the structure we produce a space of certain dimensions. Through that space we identify the limits of visual and structural in architecture, but we study the possible application of water as a methodological tool in the segment of omnipresent architecture which we interpret as *Aquatecture* (Wylson, 1986; Barker and Coutts, 2016). We use changeability and fluidity, that is, the elusive form (shape and colour) of water as a tool for structuring the space and by that we achieve transparency through the barely visible structure of the building's membrane – façade (detail) itself (Photo 7&8). Spatial appearance of the seemingly chaotic formation of the façade, which is a building space-structuring frame of the Urban Green Hall and all its spaces of the FMA building. The façade is structured as a membrane of ambivalent character, appearance and disappearance, thus overcoming perceptual transparency and dematerializing the spaces of the exterior and interior, through the sound effects created in the fragment, emphasizing the importance of an active pause – both in music and in architecture.

A significant feature of the architecture created in the described way is the idea of ephemerality, that is, the flow and fluidity of space. This kind of applied concept and methodology in use of the design process allows us variable understanding of the motif rather than the formulation of the overall object. The content of the architectural space is given as indirect, through a motif made up of repetition, so it is difficult to define what actually constitutes the space (Photo 7,8 & 9). The façade, therefore, is not just a membrane, but becomes an interactive structure through which it is possible to see something that is not or is really "behind", or else inside and "in front". Through this kind of façade we can hear (and see) the building and what's happening inside it. The complexity of the given concept goes beyond the architectural object, placing it in a temporary context and changing its character creates a series of relationships between the actually present, visual, audible and experienced, as well as historical, industrial and, above all, contemporary ephemeral space in the city.

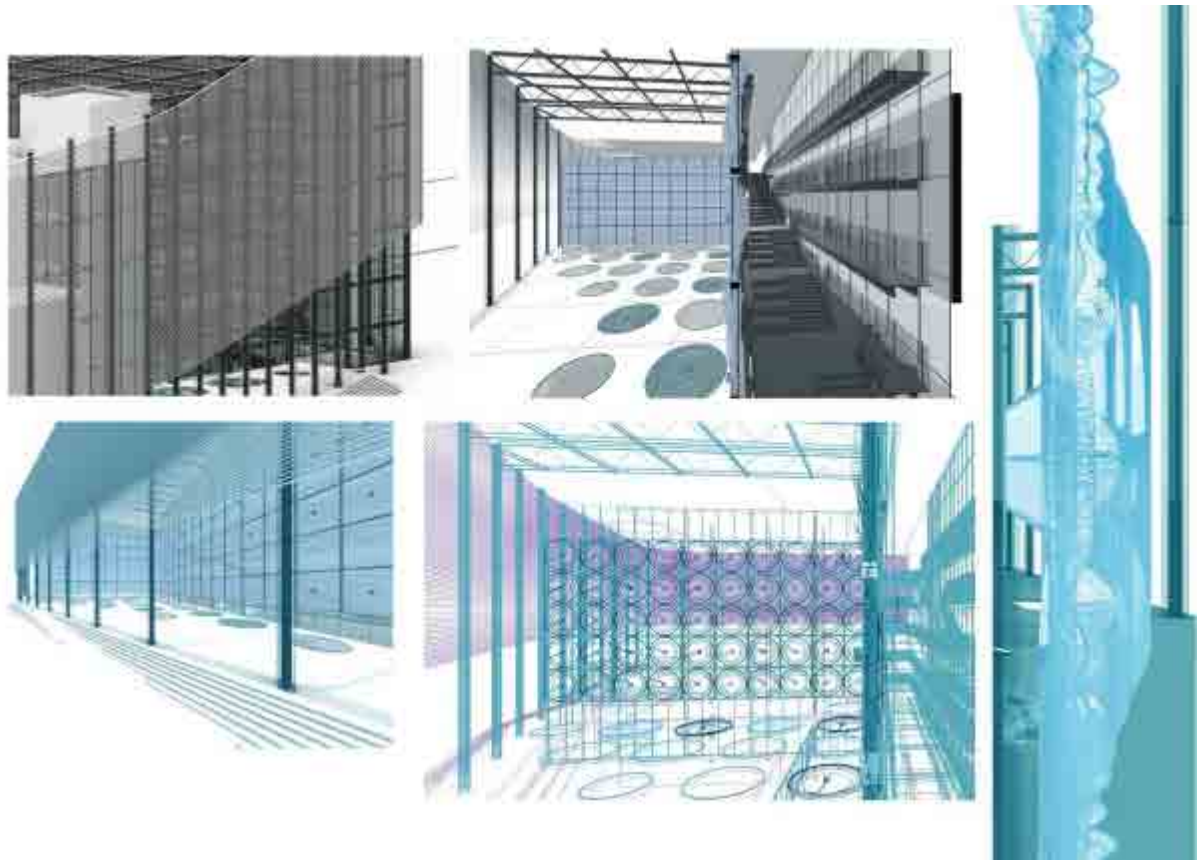


Photo 9. Face (facade) of the Building: Texture and Shape– details, authors: Miloš Stojković Minić & Jelena Ilić Gajić, 2022.

The tendency to blur or completely erase the dimensions of form, transposing it into fluid, impermanent or completely absent, focuses the architectural idea on metaphors of the immaterial, flowing and ephemeral. The facade is conceived as a membrane that "clothes" the FMA building and bases its narrative on the phenomenon of translation and fusion of apparently incompatible factors such as nature, water and music (shape/colour, sound and light). The tendency to design the ephemeral is actually materialized by the use of the statement that music is (liquid) architecture, thinking about how architecture can also be (liquid or petrified) music in the space, i.e. a way was invented for architecture to be frozen music as Goethe states in his essays (Spingarn, 1921:267). In such a motivated (author's) intention, where a place is given to a dynamic transparency, through the use of a layered fragmentary structure, music is translated into architecture using a motif obtained from an observed sample of water (Photo 7,8 & 17), in different planes, both horizontally, on the ground floor and on the roof and vertically, on the façade itself (Photo 4&9), i.e. on the frozen music membrane of the FMA building (Photo 7). In some ways and to some extent literal, and in some points only apparent, the façade in the form of a membrane remains consistent with its intention: appearing over a space that has the possibility of multi-functionality during use – fluidity of volume and the space. Observed from a distance, such a façade remains in a slight flicker in the eye, the ear and thoughts of the spectator (Bašlar, 1969; Bašlar, 1998). Inside of the FMA's facade a fluid space is formed, where the (spatial) image of both the exterior and the interior are always different due to changes in the rhythm within the structure and the penetration of "light" (sounds) through the structure, viewed from a distance, makes its "flickering" (sound) and close to disappearing as well as listening to the surrounding nature of the park, the inner spaces of the music and the very context of the city in which it is created (Young et al., 1993). Observing the phenomenon of ephemerality in architecture through the immaterial (elements of music and water): abstraction and perception are search for an answer to the question, whether architecture changes at all and can it change over time through the users' actions, through the development of an intuitive and authorial understanding of architecture. Architecture today, even in its most solid form, can no longer exist for us as a solid house with a distinct purpose, ordinary in its existence, it must be improved by contemporary principles of spatial structuring. In the specific case study, and through the competition project for the FMA building, in the design process of which the experiment and research were carried out, ephemerality refers primarily to the phenomenon that occurs as part of the dynamic complex of form and function – the façade and

the space between green and blue. Thus, the ephemerality of the water element is contained in the subjective part of perception and spatial analysis, and assumed in the design process as an illusion of form and as a carrier of dynamic spatial elements of architecture – aquatecture (Photo 3,4 & 9). It is precisely in the subjective perception of spatial relationships that the basic characteristic of the ephemeral is found: the sensuality of the water element and its application in architecture. Perception in such designed architecture (the aquatecture of the FMA building) is not only its effect, but also its essence.

It can be argued that the planned urban design obtained through the competition project is extremely economical if the proposed method of structuring the space with water and the application of the H2OUSE system, which implies the circulation of water in the building during the lifetime of the building itself, is applied, interpreted as a type of environmental design (Pelsmakers, 2012). The object is structured in such a way that, with its proportions, the ratio of full and empty, the use of contemporary materials, but also the harmony of architectural elements and the logical extension of the existing flows in the location, it has a pleasant effect on students, but also on all other possible users and enables them to have a normal and contemporary cultural and artistic experience. An educational and scientific-research of the spectacle through exercise, work and stage performance (Photo 3)(Young et al., 1993).

2.2 The ephemerality of the inner (open) space of the Urban Green Hall, where different events, ambiences and atmosphere are created (2)

The observation of ephemeral architecture can be realized from different aspects, and the special focus of this research would be on the analysis of temporary, ephemeral architecture as a spatial framework of urban events that today represent increasingly important factors of urban development and quality of life in the city, as an integral part of the FMA. It includes the research of forms and mechanisms (systems) by which ephemeral architecture contributes to positive change in open, urban space, through questioning and improvement of meaning, use and experience. Public city spaces are important hubs, areas and places of the city, full of different identities for which it is necessary to find a way, content and form to revive and indicate their socio-cultural importance.

The idea is that all the accompanying flows from the environment, as well as the natural environment itself, flow into the new FMA building, so that the new purpose of the space can easily be followed up on the planned spatial logic of Linear Park and that it can be upgraded very efficiently – to create the green linear point in the city. Taking into account the planned matrix of the urban solution, we consider the FMA building as an integral part of the Linear Park, where a new "green hall" is formed, a public city space that can accommodate different functions and form different spatial ambiences inspired by nature, water and music (Photo 10).

Photo 10. The ephemerality of the inner (open) space of the Urban Green Hall, where different events, ambiences and atmosphere, authors: Miloš Stojković Minić & Jelena Ilić Gajić, 2022. Source for greenery: https://urbannext.net/mfo-park/; https://www.ignant.com/2020/02/13/mfo-park-zurich-switzerland/; https://archidose.blogspot.com/2007/08/mfo-park.html

Urban Green Hall is formed and conceived as a multifunctional plateau (amphitheater) of an ephemeral character, which has a very significant dimension and position (suitable for exhibitions, music festivals, or in winter for ice skating, for dance and theater events, film projections, and similar purposes during seasonal changes), it can accommodate several different functions simultaneously, but also separately, depending on the

program and the time of day or year in which a certain program takes place in it (Photo 10&11). Such a grand, but essentially empty (open) space – The Urban Green Hall with its diverse possible ambiences creates an active pause in the context of the city, represents a covered public city space that is ready to invite one to enter it and actively act (Stojković Minić and Ilić, 2022:8).

In the design process, it was extremely important for the author's team to include possible new methodological, technical, and technological solutions in their design with the aim of more energy-efficient construction and exploitation of the building. The goal of applying such solutions enables the ephemerality of the inner space of the Urban Green Hall, in which different events, ambiences and atmosphere are created – which can enable the creation of various events during the lifetime of the building (photo 10). The way this topic was approached in this paper can be divided into two parts: the Green Part and the Blue Part.

Photo 11. Urban Green Hall, ambiences triptych, authors: Miloš Stojković Minić & Jelena Ilić Gajić, 2022. Source for greenery: https://urbannext.net/mfo-park/; https://www.ignant.com/2020/02/13/mfo-park-zurich-switzerland/; https://archidose.blogspot.com/2007/08/mfo-park.html

The Green Part – refers to nature (greenery) and implies the greening of the formed Urban Green Hall as well as the building's membrane according to the principle of forming ground-level greenery that climbs along the construction and creates an ever-changing structure (Photo 11&12) (MFO Park, 2002) .

The green part is also a kind of author's response to the Linear Park's proximity and importance, due to its shape and position, along with the role it has as part of the system of green areas of Belgrade, it is observed and interpreted as a green "route" that finds its direction in the blue-green House of music, which will unite and connect the differently arranged segments of the park into a single entity (Stojković Minić, 2022:99). Supporting this idea, the Urban Green Hall was formed, as a kind of demonstrative pavilion of the effect of artificial systems of green public areas, that ensured the multifunctionality of the purpose. The established Urban Green Hall also aims to raise environmental awareness and the importance of the environmental quality in the relevant urban area, specifically: regulating air quality and temperature, mitigating climate extremes, reducing noise, improving biodiversity of the city, achieving a positive effect on the conditions of passive and active stimulation of the space, but also effects of the dweller's influence during use. Of course, the goal was also to raise the aesthetic and ambient values of the area (Photo 12) – for these reasons, a demonstrative, respectable precedent of this kind of application in the world was given – MFO Park, Zurich, Switzerland (Matthews and Winter, 2010). The competition project for the new FMA building is created by following the conceptual design of all 10 parts of the Belgrade Linear Park, so our competition project also initiates the application of *Nature-based Solutions* (IUCN, 2015), and through the application of models such as: ecological habitats for birds and other animals, "islands of freshness", eco-urban furniture, green sound barriers, green walls and roofs – where they all together reach their finale in the Urban Green Hall at the entrance of the FMA building. During the finalization of the Urban Green Hall, special attention must be devoted to the planting of new and autochthonous vegetation, which should be chosen with serious consultation and respect for the input of experts (botanists, landscape architects, etc.), in order to apply the most resistant plantings, as ecologically and climatically adapted species that will form the main urban furniture of this (perhaps only one in a row) Urban Green Hall (Stojković Minić, 2022:90; Stojković Minić and Ilić, 2022:9).

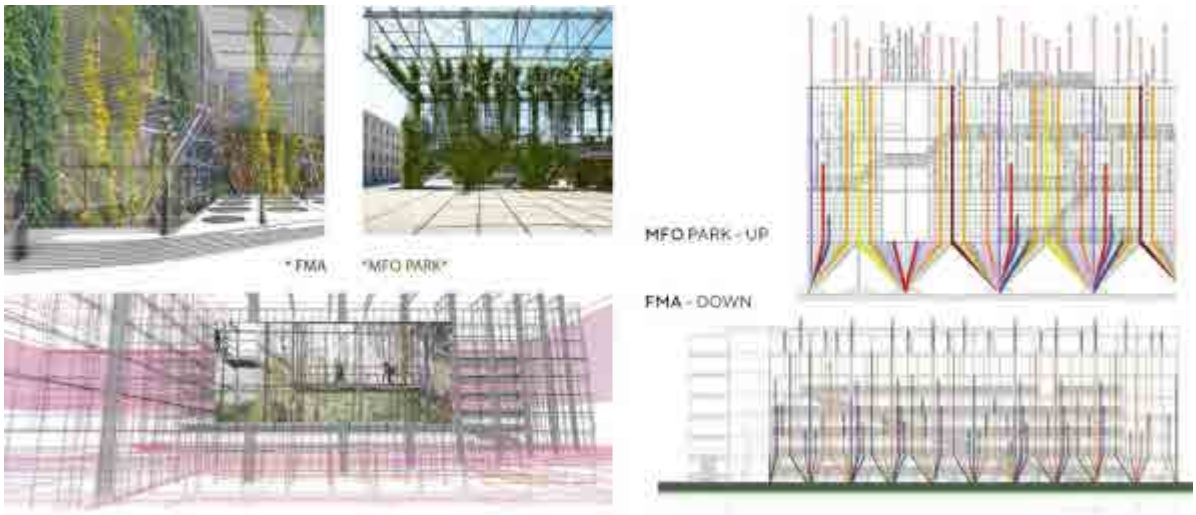


Photo 12. FMA Urban green Hall compared with an example of good practice – MFO Park, Zürich, source: https://urbannext.net/mfo-park/; https://www.ignant.com/2020/02/13/mfo-park-zurich-switzerland/; https://archidose.blogspot.com/2007/08/mfo-park.html

The continuity of greenery inside and outside represents a new reflection of man and nature (in the city) as well as nature in architecture and can be interpreted through the concepts of the *Blue Green Dream* (Blue Green Dream, 2015; Božović *et al.,* 2017; E-kapija, 2015), i.e. the use and application of *Nature Based Solutions* (IUCN, 2015; Stojković Minić 2022:90). In response to such starting points, the idea of a sensory extension of the (natural) environment, a Linear Park in the form of an infinite landscape – the Urban Green Hall in other words, and intended possible multifunctional ambience and environment inside the FMA building. With the clear aim of possibly encouraging the ephemeral creation of various events, ambiences and atmosphere within the variable membrane. Here the focus is on an event that signifies the dynamics and flow of a given function and its complex development, to the point where it can become something else entirely. The variability of the function opens up new possibilities of multifunction in designed spaces and ambiences, but also reveals the development potential of future (unexpected) events, which can often be classified as spontaneous, everyday, life spectacles of the present moment. The realization of architecture in the contemporary context no longer represents the end point of the design process, but is a generator of continuously new spatial and programmatic relationships within it, a kind of turn that amplifies the importance of an active pause in the space. Therein lies the key to abandoning concrete function as the goal of its basic usability of space. The value of the designed space (and the ambiences created in it) is reflected in the relationship and the changing needs of the users themselves. The meaning of the architectural structure as an active pause (in the city), begins to depend equally on the intention of the architect and on the intention of the user. The space is imagined as a complex system of sequences that create and produce events for each of the users who find themselves in it. It is important to note that the user himself, almost always, with his presence in such a space, influences its structuring and fullness. Therefore, the spatial sequence implies the movement of the spectator, where this movement can be objectively mapped and recorded, and the sequence of events, purposes, activities – program sequences are always added to the spatial sequence (Photo 10).

In the reality of the ephemeral spaces of the Urban Green Hall and society, ephemeral architecture was observed and interpreted as a possible alternative concept of urban planning, adapted to many cities around the world. Therefore, this architecture is presented in the paper through a set of guidelines that should be viewed as a potential tool for further research of the open public space and urban events within it.

In terms of the social aspect, ephemeral structures can change and develop urban life, through the activation of people and communities. Aspects of urban life such as movement, sound, shape, colour, attraction and use, being indicators of spatial and social integration, can be explored in terms of temporary architecture. This part of the work is focused on the social life and social aspects, in which the Urban Green Hall, that is "Grand Green City Hall", is defined as the spatial framework of urban events (Photo 10&11). Users participate in the creation of a place through interaction with the spatial structure and its adaptation depending on their own needs. Used that way, that space – the place that/which they feel as something as their own, as an integral part of their life. Ephemeral architecture reflects an artistic way of thinking, seeking innovations in the process of experimentation in the space that can cause emotions and experience.

A concept offered by Edward Soja should enable the understanding of the influence and globalization in ways

of the shaping of the space, including development, social relations, but also the architecture and cities' aesthetics. Space is not just a physical unit, a void to be filled, but is produced in the interplay of various social and economic forces, cultural imagination and emotional experience and is therefore full of meaning. He points to the relationship between the necessity of freedom, real and imaginary (Soja, 1996). The human body is in constant interaction with space. Therefore, movement is inseparable from spatial and temporal determinants, by movement we explore, occupy and appropriate the space in which we are.

The Blue part – refers to water (blueness) and implies the use of the already mentioned *H2OUSE concept* as an independent system of water exploitation during the building's entire life cycle, but also the application of the described author's methodology of structuring the space by using water. Thus implying the emergence of certain spatial frameworks - as spatial, physical elements of ephemeral structures (details created by the water analysis) with the aim of infrastructural, but also spatial-conceptual support, during the formation of specific aquatecture ambiences, for them encouraging of various spatial events of ephemeral architecture (Stojković Minić, 2021). It is important to note that the process of obtaining shapes and colours from water is illustrated by the creation of a seven-part *Tableau* (Photo 4). The *Tableau* consists of seven parts, as series of graphic displays that illustrate the process that begins with sampling the water from the location where we intervened (first part – Photo 13). This is followed by a part of the water analysis under the microscope (second part– Photo 14), then by parts where the obtaining of the shape is displayed (parts third and fourth – Photo 15), as well as the extracting of the tone map – the colour palette of the water (parts fifth and sixth – Photo 16), so that in the seventh, final part (Photo 17), the culmination is shown through the Aquatecture drawing (the resulting shape obtained from water that is applied in the design, but also the accompanying unique tone map of water's colours, which complements the entire solution (Photo 7). The *H2OUSE concept* application for the long-term exploitation of water, during the entire life cycle of the FMA building, gives additional support to the author's unique methodology that was carried out during the design process, and with the accompanying inspiration of sound and music, it is best read through the displayed, possible ambiances and details of the building's façade (Photos 7,8, 9 &10). With this operationalization of the application of water in the structuring of space, the FMA building during its entire life cycle would achieve complete independence, both financial and infrastructural, which would completely open up the field for undisturbed art practice and the formation of diverse events in the ambiences of ephemeral architecture of water and music. Therefore, the potential for further implementation in practice, that is, the technical and financial feasibility of the proposed solution, is based on the *H2OUSE concept* and the methodological experiment performed during the design process.

All of the above were implemented in the competition solution for the structuring of the Urban Green Hall, which seems to draw the entire Linear Park into the FMA building, where it can be stated that sound and music, now in green-blue harmony (artificial naturalness in the city), come out of the building itself and spread along the green city line, creating the ephemerality of various events, ambiences and atmosphere (Photo 10&11). In such a spatial context ephemeral architecture creates situations, moments, scenes, events. Such architecture is actually the event's narrator and user is the subject and active participant of said narration, and in such a structural equation water is a possible concept, tool, method, phenomenon, resource, condition and element that achieves the desired spatial effect (Moore, 1994). The new category of space in question is precisely the category of urban - open city space, which relies on the real physical existence of the ephemeral architecture of the event at a given moment in time and complements it with the methodology of structuring the space using water in such a combination, creating completely new variable and sometimes completely unexpected ambiences and active spatial images in them. Regarding previously stated views, we believe that only ephemeral events can provide this kind of spatial architectural framework, which is structured this way in the physical, but also in the mental (imaginary) – perceptive set of its users, with its elusive, yet familiar nature.

Photo 13. The first part of the *Tableau*: Water sample ID, author: Miloš Stojković Minić, 2022

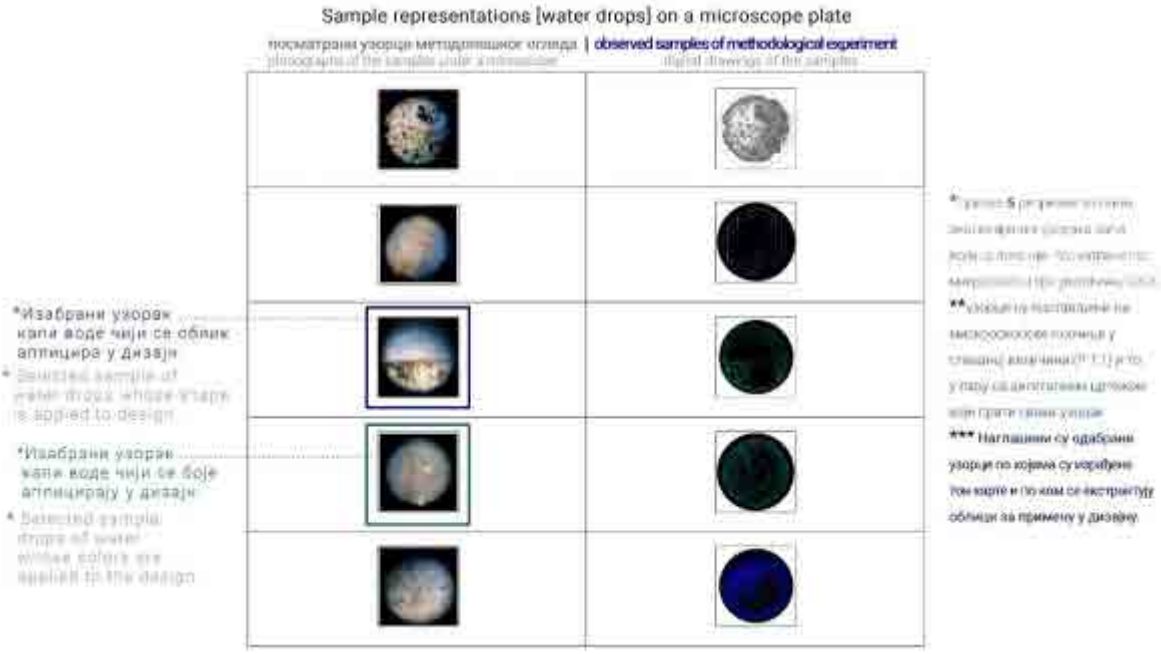


Photo 14. The second part of the *Tableau*: display of the selected samples of water analysis under the microscope, author: Miloš Stojković Minić, 2022

Photo 15. The third and fourth part of the *Tableau*, author: Miloš Stojković Minić, 2022.

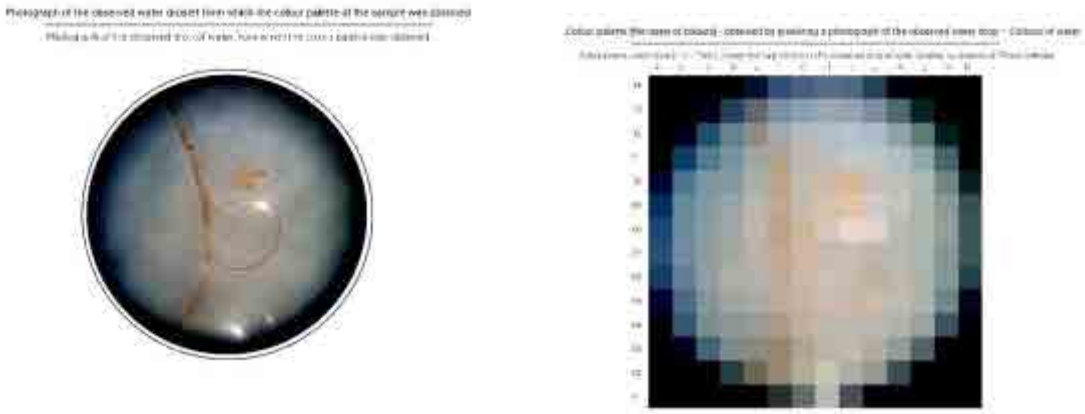


Photo 16. The fifth and sixth part of the *Tableau*, author: Miloš Stojković Minić, 2022.

Photo 17. The seven part of the *Tableau*: display of the methodological procedure applied to structuring the space using water – *Aquatecture Drawing*, author: Miloš Stojković Minić, 2022

3 Findings of the research & application to the ephemeral water spaces of architecture

Based on the analysis of the relationship between the interpretation of two key aspects of ephemeral architecture in this paper and the ephemerality in the subject case study (the ephemerality of the structural façade – 1) and the ephemerality of the inner (open) space of the Urban Green Hall of the FMA – 2), we are able to make basic assumptions and conclusions about the mutual connection between ephemeral architecture and urban events (which, as such, are able to trigger and act upon the vigilance of their users). That is, to set basic guidelines for action in the practice of urban design with the element of water that brings the desired effect of ephemerality into the space. Therefore, what is crucial for this paper is the aquatecture research project that accompanies it, that is the implementation of the accompanying experimental process (methodological experiment) of water in the design process of (public) open spaces. In that process, certain conclusions were reached in earlier studies (Stojković Minić, 2022:98), and by the application of the established methodology of structuring the space using water, and now, once again the same results were proven in operational practice – through the development of competition design for the new building of the FMA in the Belgrade Linear Park. Admittedly, now with another clear goal of the appearance of ephemeral architecture in the resulting spatial framework, which as such and in relation to the context and place where it is created, we can call the *Aquatecture of a City park* (Stojković Minić, 2022).

As presented in this research, ephemeral structures can be of dual nature. On one hand (spatially) they influence society, while on the other they themselves (temporally, through events – as places) represent the construct of society. Keeping this in mind, it is necessary to further analyze the way such structures are created and the effects they leave on the users' spatial perception. Here, it is important to emphasize the fact that ephemeral architecture protects both public and private interests equally, which is often neglected in the theory of planning in Serbia, most often criticized in practice. The shift from universal to individual values in contemporary society has an impact on the creation and definition of ephemeral architecture. Like individuals, cities also tend to be different. In this connection, a turn can be traced in the contemporary theory and practice of urban design, where ephemeral structures are not used to achieve universal values or standards, but as a mechanism for achieving and ensuring diversity and preserving the identity of places or cities as a whole. Ephemeral architecture produces events related to urban planning in order to raise the quality of life in the cities. In addition, it creates new cultural contours in existing contexts. In his book *The Image of the City*, Kevin Lynch took into account the influence of time on that image. He calls for paying attention to temporary phenomena that influence the shaping of our image of the city – sounds, smells, lighting, events, physical traces of changes based on time and existence. He admonishes planners, designers and citizens to pay attention to the dimensions along which the structure of time can vary and thus to the potential that comes from variations in the urban environment (Linč, 1974). The ephemeral space of the Urban Green Hall is not a physical unit, a void that (just like that) needs to be filled, it is produced in the interplay of various events, social and economic forces, cultural imagination and emotional experience and perception, and that is why it is full of meaning: it indicates on the relationship between the necessity of freedom, real and imaginary.

On the one hand, spaces can never be independent from what society has inscribed in them based on laws, customs, hierarchies, traditions or innovations, which govern them at a certain moment. On the other hand, the space is filled with emotions, the inner life of those who inhabit it, it can be projected in the imagination and always has a special value in perception and in the emotional life of groups and individuals (Stojković, 2019). The ephemeral structualization of the space affirms the culture of life in the 21st century and promotes the gathering of people, the exchange of ideas and participation in the creation of public art and (multi-functional) events in space.

Ephemeral architecture interpreted as a real indicator of space structuralization by someone or something that inhabits and uses it, where the trace (of water, nature, sound) becomes a witness of existence in the space; it marks space and time; connects events and establishes a connection between the place of departure and the place of arrival, but also between past and future movements and actions. This way ephemeral structures are a place where identity is negotiated and where one or the other already existing (currently) becomes ours, something we just perceive as our own – the new. Ephemeral architecture is used to note the place where negotiations take place, where identity is constructed, where life in its ambiguity and hybridity is played out. The emergence of ephemeral architecture is a space that opens up possibilities for new structuring of relationships and new interpretations of identity as conditional, temporary and fluid.

4 Conclusions: requestioning the role and significance of ephemeral architecture and water

Based on the conducted research and the presented case study, we can conclude that the formulation of clear goals is necessary for creating sustainable solutions. Only then would the process and implementation of the results, obtained by the research methodology, produce the desired effects, it is necessary to look at all the

problems and needs of certain target groups, understand the spatial, socio-cultural, but also ecological and economic aspects, with reference to the social organization, its functioning and the tendencies of different actors.

The creation of ephemeral structures (aquatecture) arises from the synthesis and incremental consideration of all aspects of sustainability, as well as the contextual adaptation and adjustment of general ideas of sustainability to specific places, spaces, situations and people. In this adjustment, the relations of ephemerality and setting boundaries, the implementation of power, social relevance, and rationality, that is, rationalization, which in cooperation with sustainability (application of green and blue parts in design) can produce different (ambiental) effects and places which are worthy of our attention, but nowadays hidden, therefore our focus of the research were them, especially in the domain of architecture and urban planning.

The real lightness of the building, its perceptual ephemerality and overall elusiveness, reflect the architectural imagination of water: perhaps the only factors that deserve attention in the contemporary context of spatial design are the shapes and colours of water. Where the colour and shape of water are interpreted as complete or apparent freedom that remains to us in (ephemeral) architecture, and whose stimulus of uncertainty can often flow into an unstable, barely present form – one that will continuously change (by acting during its duration). Like water that occupies the space in which it finds itself, and adapts to it in the best way and completely fills it with its presence. The fullness of the space is measured by the application use and ways of appearance of water in it, and therefore also by the presence of people who define the given space by their actions.

In order for ephemeral architecture to be a social indicator, it is necessary that it represents a flow in relation to the landscape – a flow that only water (on multiple levels and scales) can create, that it implies a change at the level of the structure or in the environment (physical change or change of view), as well the change of perception over time. Likewise people's thoughts and understanding of space, and in case of utilitarianism, the resulting spaces must become the polygons of action for the creation of a new ephemeral water architecture. Furthermore, ephemeral architecture, with the use of water application in the process of structuralization of the (open) spaces, establishes and re-examines the outside vs. inside relationship through operationalization (mainly in open space), and in relation to the way of use and the desired spatial dimension. The use of high technology within the relationship between natural and artificial and ephemeral (water) architecture is significant and almost crucial. High technology enables flexibility, mobility and new possibilities of use. Ephemeral architecture can cause changes in society, which remain either at the level of structure, or at the level of events when they bring certain contents closer to the inhabitants of modern cities, but it can also have wider impact on the environment through the improvement of economic and socio-cultural conditions at the location. Through their actions, people can change the structure or change the way some common spaces or objects are used, but ephemeral architecture should be the one that will affirm and promote the found culture and the spirit of the place where it is created and where it is expected to flourish, in such a way that it can introduce certain changes over time.

As a final thought, arises the need to create a place, that is, an ephemeral space where the event will be an everyday occurrence. Therefore, on the one hand, it is necessary to create a space that will offer different, often unexpected contents. In order for such space to be a symbol of the event, and therefore a factor in the characterization of the modern city and its open spaces. During the process of changing the structure of the city (or some part of it) it is necessary to include the active action of the users who are involved in the creation of the event. Based on all these ideas, the Urban Green Hall is created as an ambience inspired by water and nature in the city (Stojković 2020:290). While on the other hand, there must be research regarding the reuse of materials, awareness of ecology and methodology, but also rationalization when choosing a structural as well as a technological system, striving towards a sustainable future through such actions and procedures. The (urban) design of ephemeral architecture requires several systems to be harmonized and connected into one clear artistic impression, and the key factor can be water, used as an inexhaustible resource (not only as source of spatial imagination), then as a methodological tool for the *application of water principles in the process of structuralization of the open spaces* structuring of space, and also as a fulfilled element of the architectural space cration.

Architecture, as a phenomenon of the combination of the forces of emotions, various elements and materialization, affects our way of acting in space and time, and as such it is necessary that it represents a catalyst of perception and movement, but also a change of thought (perception) among its users – ephemeral architecture created by the use of water must be able to expand the horizons of spatial applicability, cooperation and utilitarianism.

References

Barker, R. and Coutts, R. (2016). Aquatecture: Buildings and cities designed to live and work with water. London: RIBA Publishing.
Bašlar, G. (1969). Poetika prostora. Beograd: Kultura.
Bašlar, G. (1998). Voda i snovi: ogled o imaginaciji materije. Sremski Karlovci, Novi Sad: Izdavačka knjižarnica Zorana Stojanovića.
Blue Green Dream (2015) . Blue Green Solutions: The Guide. Available online: http://bgd.org.uk/about/blue-green-solutions-the-guide/
Božović, R., Maksimović, Č., Mijić, Č., Smith, K.M., Suter, I. and M. Van Reeuwijk I. (2017). Blue Green Solutions. A Systems Approach to Sustainable, Resilient and Cost-Efficient Urban Development. Available online: http://hdl.handle.net/10044/1/50548
Chappel, B. (2006). Ephemeral Architecture - Towards a Definition. E-publication, available at: https://www.scribd.com/doc/44042590/
E-kapija (2015). Projekat domaćih stručnjaka "Blue green dream" dobio prestižno priznanje u Londonu. Available online: https://www.ekapija.com/news/1313949/projekat-domacih-strucnjaka-blue-green-dream-dobio-prestizno-priznanje-u-londonu
IUCN, International Union for Conservation of Nature (2015). Nature-based Solutions (2019, October 21). Available online: https://www.iucn.org/commissions/commission-ecosystem-management/our-work/nature-based-solutions
Kronenburg, R. (1998). Transportable Environments: Theory, Context, Design and Technology. London and NY: Routledge.
Linč, K. (1974). Slika jednog grada. Beograd: Građevinska knjiga.
Matthews, J. and Winter, M. (2010). Multi-Tired Vine Park: MFO Park, Zurich, Switzerland. Raderschall Landschaftsarchitekten AG + Burckhardt & Partner AG. Available online: https://courses.washington.edu/gehlstud/gehl-studio/wp-content/themes/gehlstudio/downloads/Winter2010/MFOpark.pdf
Moore, C. (1994). Water and architecture. New York: Harry N. Abrams Publishers Inc.
Nikolić, M., Drobnjak, B. and Kuletin Ćulafić, I. (2020). The Possibilities of Preservation, Regeneration and Presentation of Industrial Heritage: The Case of Old Mint "A.D." on Belgrade Riverfront. Sustainability 2020, 12(13), 5264. https://doi.org/10.3390/su12135264. Available online: https://www.mdpi.com/2071-1050/12/13/5264/html
Pelsmakers, S. (2012). The Environmental Design Pocketbook. London: RIBA Publishing.
Soja, E. (1996). Thirdspace: Expanding the Geographical Imagination. Cambridge, Mass.: Blackwell publishers.
Spingarn, J. E. (1921). Goethe 's Literary Essays. New York: Harcourt Brace and company.
Stojković M. (2019). WATER IN ARCHITECTURE: Imaginary Aquatecture space – Houses of Water. XXI International Congres of Aesthetics ICA 2019 – Possible Worlds Of Contemporary Aesthetics: Aesthetics Between History, Geography And Media (Belgrade, 22−26 july 2019). Belgrade: University of Belgrade, Faculty of Architecture, 1924-1935. ISBN: 978-2-9601363-5-7.
Stojković Minić, M. (2021) Fenomen vode u arhitekturi – istraživanje kroz idejne projekte [The phenomenon of water in architecure – resarch through conceptual projects]. Zbornik radova sa osmog naučno-stručnog skupa sa međunarodnim učešćem Instalacije & Arhitektura 2021/ Building services & Architecture (2. decembar 2021), urednici Tatjana Jurenić, Damjana Nedeljković i Aleksandra Čabarkapa. Beograd: Univerzitet u Beogradu – Arhitektonski fakultet, 94-103. ISBN 978-86-7924-277-8.
Stojković Minić, M. (2022). Akvatektura parka: prikaz metodološkog ogleda u procesu projektovanja Linijskog parka u Beogradu / Aquatecture of a city park: a methodological experiment in the design process for Belgrade Linear Park. Arhitektura i urbanizam, [online] (54), pp. 87-101. https://doi.org/10.5937/a-u0-32303. Available at: https://aseestant.ceon.rs/index.php/a-u/article/view/32303/19362
Stojković Minić, M. and Ilić, J. (2022). Nova zgrada Fakulteta muzičke umetnosti u Beogradu, arhitektonsko-urbanistički konkurs – idejno rešenje [tekstualni opis konkursnog rešenja]. Beograd: Udruženje arhitekata Srbije (UAS) / Vlada Republike Srbije, Ministarstvo prosvete, nauke i tehnološkog razvoja, neobjavljena studija.
Udruženje arhitekata Srbije (UAS) / Vlada Republike Srbije, Ministarstvo prosvete, nauke i tehnološkog razvoja, United Nations Development Programme (2021). PROGRAM za javni otvoreni jednostepeni arhitektonski konkurs za idejno rešenje nove zgrade Fakulteta muzičke umetnosti u Beogradu, dostupno na: https://www.fmu.konkurs.rs/downloads/RASPIS%20I%20PROGRAM%2015.09.%20LATINICA.pdf / http://www.u-a-s.rs/konkursi/item/427-konkurs-fakultet-muzi%C4%8Dke-umetnosti-beograd.html
Vitruvije [Bojić, Z. prevod, predgovor i komentari] (2009). O arhitekturi. Beograd: Zavod za Udžbenike, Dositej studio.

Wylson, A. (1986). Aquatecture: architecture and water. London: The Architectural Press Ltd.
Young, G, Bancroft, J. and Sanderson, M. (1993). Musi-tecture: Seeking Useful Correlations Between Music and Architecture. Leonardo Music Journal, 1993 (3), pp. 39-43. The MIT Press. Available at: https://www.jstor.org/stable/151326
Стојковић, М. (2020). Вода као инспирација у процесу архитектонског деловања: просторне информације водене капи - методолошки оглед [Water as an inspiration in the architectural operation process: Spatial information of water drops – methodological experiment and review]. XII Научно-стручна конференција Управљање урбаним развојем, прилагодив град и заштита простора и животне средине (Београд, 2020.), уредништво: Златановић-Томашевић, В., Гајић, Р. и Стевановић, Н. (ур.). Београд: Удружење инжењера Београда, 278-292. ISBN: 978-86-915671-8-7

Internet sources
Blur-building (2002), https://dsrny.com/project/blur-building, accessed 7.11.2022.
MFO Park (2002), https://www.burckhardtpartner.com/en/projects/detail/projekte/show/Projekte/new-mfo-park-zurich/?no_cache=1&cHash=7bd9cdb8d64d4503487a9f4d345a4a33, accessed 7.11.2022
Ilustration sources and the name of authors of all the photos shown in the paper are given below the photos.

IV
ART
AND ARCHITECTURE

On Honesty in Architecture: A Historical versus a Material Approach

Mateja Kurir
Independent Researcher, Ljubljana, Slovenia
Mateja.kurir@gmail.com, ORCHID: https://orcid.org/0000-0001-5090-2318

Abstract: The question of honesty in architecture is essential for the field for several reasons. Honesty as a concept has been traditionally understood within the realm of the truth as such in architecture: to be honest meant to be able to express the truth in architecture, according to one of the most established theories, presented by John Ruskin. The aim of this paper is to approach honesty from a different standpoint, coming out from 2 different positions: the first comes out of philosophy, the other from architectural theory.
The thesis, presented in the paper dealing with a new understanding of honesty in architecture, is as follow: whenever a broad discussion about honesty in architecture has been posed, a significant break with the past in architecture has been initiated. I would like to claim that these changes were not just a matter of material honesty in architecture, which is a widely accepted argument, but that when a significant rapture appeared in architecture, this was predominantly a reflection of societal changes. Architecture changed significantly when society changed: it reflected those systematic changes within society. In the paper, the period of the Renaissance, Neoclassicism, Modernism and Contemporaneity within architecture will be taken into consideration to discuss the topic of honesty in architecture.

Keywords: honesty, history, material, philosophy, break, environmental crisis

Introducing Honesty In Architecture

The question of honesty in architecture is essential for the field for several reasons, which seems to arise from the core of the profession and has been raised by several authors since the Renaissance (Summerson, 2011). Honesty as a concept has been traditionally understood within the realm of the truth as such in architecture: to be honest meant to be able to express the truth in architecture, according to one of the most established theories, presented by John Ruskin (Ruskin, 1989). Within this theory, which was published in the renown essay *The Seven Lamps of Architecture* in the middle of the 19th century, the truth in architecture is defined as the honest display of materials and structures within a building. This theory, to which I will later refer to as the material approach to honesty in architecture, seems to be the predominant within the profession. An obvious counterpart to this understanding of honesty is an *architecture of deception*. A deception within architecture is usually understood as that architecture, that covers and disguises the materials from which it is made of.
The aim of this paper is to approach the understanding of honesty in architecture, which will be in many ways also discussed here equally to the meaning of honest architecture, from a contemporary viewpoint, which starts from the conceptual core of architecture as such. I will try to approach and understand the question of honesty in architecture from 2 different positions. The first comes out of philosophy, the other from architectural theory. I will try to show a correlation between the two at the end of this discussion.

1. Methods

The thesis about honesty in architecture, presented in this paper, is as follow: whenever a broad discussion about honesty in architecture has been posed, a significant break with the past in architecture has been initiated. With this thesis, I would like to also propose a new approach to honesty in architecture, starting from these conceptual breaks in architecture, rather than from the material approach to honest architecture. I would like to claim that these changes, which brought a decisive change in how architecture was understood and presented, were not just a matter of material honesty in architecture, but that when a significant rapture appeared in architecture, this was a reflection, a response to the societal changes. Architecture changed significantly when society changed: it reflected those systematic changes within society. I will name this entry point to honesty in architecture a historical approach, that I am introducing here as a counterpart to the material approach. The historical approach to honesty in architecture literally means, that honest, true architecture is actually the manifestation of the social, economic, and cultural achievements of a specific period; that if an architecture is honest, that it presents the Zeitgeist and the challenges of a certain period. When architecture can answer the core and essential challenges of a certain era, then it can be called *honest*. In this paper, the period of the Renaissance, Neoclassicism, Modernism and Contemporaneity within architecture will be taken into consideration to discuss the topic of honesty in architecture. A previous detour to philosophy, and its definition of honesty, will be taken in the paper as the starting point of discussion.

2. Honesty Within Philosophy

If we are to be asked, what is the main aim of philosophy, that would be to define the truth. The truth is always given and understood in philosophy *within and through language* (Agamben, 2021). We do not understand truth (and any of the other binding terms) as such, but we can understand it only as it expresses itself within language. Language is the tool and meaning of philosophy. For this reason, I am starting this detour of what honesty means in philosophy with a sketch of the possible understandings of the term.

It is rather interesting that such widely used mundane terms like honest and honesty are rarely present in philosophical discussions. Nevertheless, I would say that when we talk about honesty, we are asking ourselves, what is to be honest and with whom should we be honest. The dictionary definition of 'honest' (Merriam Webster, 2023) involves being truthful and legitimate, as well as genuine and real, humble and plain. Honest can also significate respectable and reputable, worth of praise, marked by integrity. To be honest is closely connected with the par of legality and legitimacy, which is a much broader presented theme in philosophy. What is certain, is that when we talk about honesty, when we talk about honesty, we do so from the very centre of ethics. Explicitly, honesty and the question of how to be honest is always connected with moral, ethical questions that arise when an individual, a group, an organisation is active in creating and exposing any subject within the framework of society.

The Scottish philosopher, economist and historian David Hume, who lived during the Enlightenment period of the 18th century, is one of the few philosophers who discussed honesty in his work. He connected honesty with justice and injustice, and further on with equity. Hume wondered where honesty comes from – is it something given to human on a natural basis or is it acquired? In other words, is honesty something we are born with, or do we become honest through time?

He wrote: "*the sense of justice and injustice is not deriv'd from nature, but arises artificially … from education, and human conventions*" (Cohon, 2018). For Hume justice, as well as equity, is therefore an artificial, not a natural virtue. For him, the same is true for honesty: honesty is a human-made virtue. When Hume explains the origin of honesty, he writes that a social convention created honesty with respect to property at the very beginning of all human communities. As humans, we are inclined to give and to obtain property for ourselves and our loved ones. Hence, there has been a need for honesty to appear at the very founding of any community, which represents a concept that is crucial for human's survival from the mere beginning. Namely, if people were forced to be honest and to keep to their own property and not to steal from others, a large group of people could live together in peace. For Hume, it is only when people behave honestly that a community can flourish in symbioses, as one's property is preserved within a group of other honest individuals. The same community, which abides by honesty, can then form a more complex society. This might be a first, very traditional definition of honesty: people need to be honest with respect to property in order to form a community.

Property is in many ways connected to architecture. And whenever we have property – especially in large accumulations, as it evolves within communities, or states – we are in the vicinity of the topic of power. The urge to have power over other people is one of the oldest there is: whenever we talk about a community, we talk about power. And of course, of abuses of power. I would like to bring to your attention a book *On Power in Architecture* (Kurir, 2021), which discusses the intersection between power and architecture from different philosophical perspectives. The book opens with a statement claiming that architecture has always been a decisive manifestation of power. The book explores architecture predominantly as a social art with an important social dimension, but also affects the life of an individual. Architecture is not only a battleground where power takes place, but also an open front of internal tensions, where ethics is at stake in our time of neoliberalism and perpetual crises. Namely, when we talk about architecture and power, as well as architecture and society, ethics is a crucial term to address.

3. Honesty Within Architecture and Architecture Theory

After this detour, I would like to move to the 2nd possible approach when it comes to talking about honesty in architecture, starting with the various changes within architecture expressed in architectural theory. Explicitly, I would like to present specific cases to support my thesis. My thesis is as follows: Whenever a broad discussion about honesty in architecture has been posed, a significant break with the past in architecture has been initiated. I would like to claim that these changes were not just a matter of material honesty in architecture, which is a widely accepted argument, but that when a significant rapture appeared in architecture, this was predominantly a reflection of societal changes. Architecture changed significantly when society changed: it reflected those systematic changes within society. I would like to claim this is evident on several layers within architectural theory. For this instance, I will touch briefly upon 5 architectural periods that are High Renaissance, Neoclassicism, Modernism, Postmodernism and Contemporaneity.

High Renaissance brought a major wave of change into architecture. As Fredric Jameson wrote in his book *Singular Modernity*, the main aim of the Renaissance was to *break with its past*[1], that is with the Middle Ages, and to present a new source of knowledge and culture, the Antiquity. What could then be understood as honest architecture? Explicitly, to take the knowledge of Roman architecture, its vocabulary, and define it anew, propose a new cannon of classical architecture. This was done in the books of Alberti, Serlio and Palladio and numerous others, and with architecture and its innovations in the works of Bramante, Brunaleschi, Alberti and several others. The vocabulary of classical architecture, which was researched in detail, has launched new standards, new concepts, a new architecture, that represented a new model for a different society of the time.[2] To be honest in architecture during the time of the Renaissance was to use this new cannon of classical architecture and its elements.

With the Enlightenment, this approach and vocabulary shifted significantly. The theretofore unity, which had been ensured by the Absolute and to which architecture responded with a homogenous use of classical architecture, disintegrated into several segments. Various authors doubted the elements of classical architecture and thereby triggered a small revolution. In *Nouveau Traité de Toute l'Architecture* (1706), Cordemoy developed an analysis of the orders of columns and advocated a discontinuation of their ornamental use or "architecture in relief". At the height of Rococo, he argued for architecture without ornaments and became one of the first opponent of ornament in architecture. His work strongly influenced jesuit Laugier, who published on the cover of the famous *Essei sur l'architecture* (Laugier, 1972)[3] an image of a "primitive hut", where four trunks support a rustically styled roof. For him, the primitive hut was a merger of culture and nature where humans find shelter. The French jesuit posited a rational prototype for the use of columns that was not part of the established doctrine. He even suggested the removal of all walls, which he thought should be replaced by columns. He thereby heralded architectural modernism and the construction of skeleton buildings. Architecture, applying the notion of reason during the period of the Enlightenment, changed significantly.

Prior to modernity, John Ruskin wrote in *The Seven Lamps of Architecture* that when applying a material honestly, a building becomes more beautiful, and that using a dishonest material can be misinterpreted by the people experiencing the building, and can cause misunderstanding of the architecture (Ruskin, 1986). Modernist architecture altered further on the language of classical architecture. Emphasizing abstraction, transparency and technology, this architecture influentially advocated for a "break" with classical architecture. The pioneers of modernist architecture promoted a new architecture, which would be in line with the spirit of modern times, modern cities and of a modern way of living. Adolf Loos in his essay *Ornament and Crime* (Loos, 1998) advocated that architecture and the materials used should express simplicity and honesty. Le Corbusier advocated that architecture needs to reflect the "new spirit" if it wanted to represent the society and the individual of the time. He promoted this new notion in magazines as the Espirit Noveau, or ground-breaking books as *Vers un Architecture* (Le Corbusier, 1986). In Germany, important movements, like the Deutsche Werkbund or Bauhaus, raised and devoted to the same task: to bring architecture to a fundamental change.

When Modernism came to a close in architecture half a century later and the era of Postmodernism started, books as *Learning from Las Vegas* by Venturi, Scott Brown and Izenour (Venturi et al, 1972), stressed the importance of symbolism in architecture. In a time of globalisation and multinational capital, commercial strips raised globally and were described as "The Great Proletarian Cultural Locomotive". Those urban changes anticipated in many ways the neoliberal situation we have been living in since the 70s, and once again introduced changes.

What about today? Our contemporary time is marked by a period of crises, which may result in the possible extinction of life on Earth. A long-lasting Cartesian paradigm, combined with the neoliberalism of the last 50 years, which is centered exactly on property and its excess as the added value, brought us to the explicit environmental and ecological crises. As we heard at recent conferences, such as the ECLAS and LINA conference in Ljubljana in 2022, by speakers Lučka Kajfež Bogataj (ECLAS, 2023) and Janez Potočnik, we urgently need an action for degrowth, as the neoliberal notion of constant growth has brought us where we are. While IPPC reports the need to act to diminish the impact of climate change, the study of the University of Leeds (Fanningan et al., 2022) highlights the excess of all planetary boundaries of our western society, and shows we need to look at the natural sources in a broader perspective: it is not enough to diminish CO2 level.

[1] As Fredric Jameson argues, it was with the relation of the Renaissance to the Middle Ages that the first real break with a previous period was established in history. For him, the Renaissance was constituted through its break with the Middle Ages. Ibid: Jameson, 2012, p. 26.

[2] Ibid Summerson, 2011, p. 24.

[3] Ibid Laugier, 1972. The image of the primitive hut on the cover of the book is the work of Charles Eisen.

We need a complete change, to reduce the use of natural resources significantly. As a society, we need to evolve from the neoliberal paradigm and as well as from the traditional relations to property, as understood by Hume, in order to regenerate.
Contemporary architecture and urbanism have an important role in all of this. Solutions should be applied on a micro and macro level, on the level of buildings, but also on the level of urbanism and infrastructure. The publication of ARUP, Designing for Planetary Boundary Cities (ARUP, 2021), tackles explicitly the topic of planetary boundaries and architecture. We have the measures and the tricks to change the profession, we *only* need a complete change in the attitude, which would eventually stop the all-encompassing green washing we are facing for the last 20 years and change the course of the capital to support these efforts.
We should also ask ourselves, if do we really need more infrastructure, more resources to build it? Some estimates are saying that in Europe, 50% of all cities will shrink in the next 30 years, leaving a lot of unused building behind. The scenarios of the United Nations for population growth shows a decline of some 40 million Europeans in the next 30 years, although the world population will grow. This might suggest that in Europe we already have enough buildings we will need in the future. Architecture might consider radical ideas as not to build anymore and the introduction of bans for demolishing existing buildings. An approach, that used to be drastic, but seems it will become our realty, is not to use any natural resources, to reuse, to share and adapt.

4. Conclusion

In my opinion, for it to be honest in this day and age, architecture should address the environmental crises we face and search for tangible solutions. In our society, which is traversed by hedonism and permissiveness, the Fourth Industrial Revolution, the Anthropocene and increasingly severe environmental crises and determined by neoliberalism and the fantasmagoria of media management, architecture needs to strive for degrowth.
From a historical viewpoint, honesty in architecture could be understood as a response to the urgencies and necessities of a certain time. These responses changed architecture fundamentally. Staring from the Renaissance, when the key necessity was the Break with the Middle Ages, to Neoclassicism, when the main theme was reason, to modernism and its technology, to postmodernism and its symbolism, the key question for our time is the ecological crisis. I would suggest that honest architecture is the architecture that answers to the essential, key questions of its society. In our contemporary time, without an environmental agenda, architecture cannot tackle the main issues we face and can therefore not operate honesty. Architecture needs to be honest to the planet and its inconvenient truth, not to be honest to property.

References

Agamben, G., 2021. *Moč misli: razprave in predavanja*. Ljubljana: Beletrina.
ARUP, 2021. Designing for planetary boundary cities. ARUP. Last accessed 1.10.2023 online: Designing_for_Planetary Boundary Cities.pdf
Benjamin, W. *Reflactions: Essays, Aphorism, Autobiographical Writings*, New York: Harcourt Brace Jovanovich, 1978
Benjamin, W., 2002. *The Arkades Project,* Cambridge MA: Belknap Press.
Cohon, R., 2018. "Hume's Moral Philosophy", *The Stanford Encyclopaedia of Philosophy*. Last accessed 1.10.2023: David Hume (Stanford Encyclopaedia of Philosophy)
Conrads, U., 1975. *Programs and Manifestoes on 20th-century Architecture,* Cambridge MA: The MIT Press.
ECLAS Conference, 2023. Scales of change: conference proceedings: commemorating 50 years of Landscape Architecture study programme at University of Ljubljana. Biotechnical Faculty. [video recordings of the lecture of Lučka Kajfež Bogataj on Planetary Boundaries is available here, Last accessed 1.10.2023: ECLAS 2022: SCALES OF CHANGE, University of Ljubljana, Slovenia, 12. - 14. 9. 2022 (1/3) - YouTube]
Fanning, A.L., O'Neill, D.W., Hickel, J., and Roux, N. (2022). The social shortfall and ecological overshoot of nations. *Nature Sustainability*, 5(1), 26-36. doi:10.1038/s41893-021-00799-z
Giedion, S., 2009. *Space, Time and Architecture,* Cambridge MA: Harvard University Press.
Heynen, H., 1999, *Architecture and Modernity: A Critique*, Cambridge, MA: The MIT Press.
Jameson, F., 2002. *A Singular Modernity: Essay on the Ontology of the Present*, London, New York: Verso.
Kurir, M. (ed.), 2021. *O oblasti v arhitekturi*. Ljubljana: Maska; Društvo Igor Zabel za kulturo in teorijo.
Laugier, A. [Marc-Antoine], 1972 [1755]. *Essai sur l'architecture*, Geneva: Minkoff Reprint.
Le Corbusier, 1986. *Towards a New Architecture*, New York: Dover Publications.
Loos, A., 1998. *Ornament and crime: selected essays*. Riverside: Ariadne Press.

Merriam Webster Dictionary, 2023. Last accessed on 1.10.2023: Dictionary Definition & Meaning - Merriam-Webster
Summerson, J., 1963, 2011, cop., *The classical language of architecture*, London: Thames & Hudson.
Ruskin, J. , 1989, *The seven lamps of architecture*. Dover Publications.
Tafuri, M., 2007, *Progetto e utopia, Architettura e sviluppo capitalistico*, Editori Laterza, Roma – Bari.
Venturi, R., Brown, D.S. in Izenour, S., 1972. *Learning from Las Vegas*. Cambridge (Mass.); London: The MIT Press.
Vidler, A., 2002. *Warped Space: Art, Architecture, and Anxiety in Modern Culture*, Cambridge MA: The MIT Press.
Vidler, A., 2008. *Histories of the Immediate Present: Inventing Architectural Modernism*, Cambridge MA: MIT Press.

The Essence of Place: Understanding *Genius Loci* Through Phenomenology

Iva Lokas[1], Relja Petrović[2], Ivana Rakonjac[2]
Institute of Architecture and Urban & Spatial Planning of Serbia, Serbia
University of Belgrade – Faculty of Architecture, Serbia
iva.sibalic@gmail.com, ORCID: https://orcid.org/0009-0009-1189-1148
reljapetrovic.arh@gmail.com, ORCID: https://orcid.org/0009-0005-6470-1839
i.rakonjac@arh.bg.ac.rs, ORCID: https://orcid.org/0000-0002-5246-9244

Abstract: The concept of *genius loci* is rooted in the idea that people who spend time in a particular place create its atmosphere and character. Phenomenology, a philosophical perspective that emphasizes the subjective experience of individuals, is particularly relevant in understanding and experiencing the g*enius loci*. Phenomenology emphasizes the need to acknowledge existing patterns of space usage and reflect on the spirit of the place rather than imposing a homogenous design that aims to protect the built environment. By focusing on the lived experiences and perceptions of individuals within a place, instead of enforcing predetermined values or interpretations, we can better understand and preserve its *genius loci*. Based on the presented previous research in this paper, it is clear that the current approach to understanding *genius loci* should shift its focus from signifiers of the past to the users who actively shape and experience the place in the present. The theoretical framework of this paper is defined by Husserl's and Heidegger's perspectives on phenomenology – transcendental approach and hermeneutic approach. The aim of this paper is to emphasize the importance of understanding the unique qualities and characteristics of a location and integrating them into the design process. By focusing on the subjective experiences and perceptions of individuals, designers can create spaces that are meaningful, authentic, and reflective of the community they serve. The essence and uniqueness of a place are defined by the spirit of the place, which connects the tangible and intangible components of the environment. As the intangible quality that gives a place its unique character and atmosphere, the spirit of the place encompasses the feelings, moods, and attitudes associated with a place, as well as the cultural and historical context that shapes its identity. The outcome of this research showed that the essence of a place lies in the perceptions and experiences of its inhabitants, rather than its physical structures and historical artifacts.

Keywords: spirit of the place; tangible values; intangible values; atmosphere; transcendental approach; hermeneutic approach.

Introduction

The *genius loci* concept is one that has been around for quite some time and is often referred to as the "spirit of place". It has been used in literature, history, and even in the sciences to describe the unique energy and atmosphere that certain places have (Vecco, 2020; Stepanchuk, et al., 2020).

Studied by scholars of Roman history, geography, philosophy, and architecture, this concept refers to a sense of place, the unique character or spirit of a place, and the protection of place identity. Defined as *Stimmung*, or the atmosphere of particular areas, it addresses the intimacy of a place, its significance, its deepest essence, and its quintessential elements. It is also related to spiritual sites, which act as shields for *genius loci*, and can be understood as the “spirit of a place” (Christou, 2019). It speaks through the senses and the imagination stimulated by its environment, history, culture, and myths, and it can be experienced by attending a place for a long time and expecting until it reveals itself. This spirit of the place is the intangible (Masterson et al., 2017) quality that gives a place its unique character and atmosphere. It encompasses the feelings, moods, and attitudes associated with a place, as well as the cultural and historical context that shapes its identity. It is this spirit of the place that connects the tangible and intangible components of the environment, forming the essence and uniqueness of a place.

The concept of *genius loci* is rooted in the idea that people who spend time in a particular place create its atmosphere and character. These individuals, often referred to as the genii of a place, play an active role in shaping their environment and act as caretakers who constantly transform the space. By their presence, interactions, memories, and connections, they contribute to the creation of a unique identity and spirit for that place. The influence of people on *genius loci* extends beyond mere physical presence. It encompasses the shared experiences and perceptions of the “spirit of the place”, which is defined by The International Council on Monuments and Sites (ICOMOS), as the top-down interpretation of monuments and sites as significant places that require conservation, protection, rehabilitation, or enhancement. However, when the interpretation of a place is limited to institutions, the essence of *genius loci* can be lost. The place becomes a signpost for predetermined values and loses its intrinsic meaning.

Robert Passfield (2005) defines *genius loci* as intangible heritage value and cultural resource. The author refers to the spirit of a place as an entity that makes an environment a vibrant living or working place, or inhabited landscape. Furthermore, the *genius loci* communicate the patterns, meanings, and images that bring together and arrange the setting's environmental components into a meaningful and understandable whole within conscious or felt boundaries, as Passfield stated "a gestalt that transcends the meaning of the sum of its constituent parts". By doing so, it helps the visitor to understand surroundings transmitting a sense of usefulness and continuity, and displays a traditional way of life that connects the past and the present. The *genius loci* is evoked by the physical characteristics of the cultural resource of the environment, and the activities dynamic at various levels - space usage. It communicates a strong sense of authentic place by illustrating the personality and value of the cultural resource in relation to surroundings.

Phenomenology, as a philosophical approach that focuses on understanding and describing lived experiences, perceptions, and consciousness, can be used in the interpretation of these phenomena. It seeks to uncover the essence of subjective experiences and explore the ways in which individuals interact with and make sense of the world around them. The notion of *genius loci* aligns closely with phenomenological principles by examining the relationship between a specific place and its unique identity. As mentioned above, the concept of *genius loci* delves into the tangible and intangible components that contribute to the distinctiveness of a place, including its physical characteristics such as landscapes, buildings, and natural elements, as well as the cultural and historical factors that shape its character. Phenomenology as a philosophical perspective has shed light on previously ignored phenomena of human experience, reformulated philosophical questions, and penetrated thought in almost all fields of scholarship over the last 100 years (Tymieniecka, 2002). The attempt to describe and understand phenomena such as caring, healing, and wholeness as experienced by individuals who have lived through them is at the heart of phenomenology (Draucker, 1999; Geanellos, 1998; Maggs-Rapport, 2000; Moran, 2000; Wojnar & Swanson, 2007).

This paper will present the meaning of *genius loci* by understanding how people influence their perception of the environment, emphasizing the necessity to shift the focus from signifiers of the past to the users who make the place in the present.

Phenomenology: Husserl VS. Heidegger

Phenomenology is the philosophical study of the meaning and objectivity of human experience (Wylie, 2015), used to explore the lived experiences of individuals (Neubauer, Witkop and Varpio, 2019). Developed by Edmund Husserl in the early 20th century and has since been adapted and applied in various areas of study (Wylie, 2015; Gallagher, 2022). Best characterized as a method rather than a set of doctrines (Gallagher, 2022), phenomenology involves developing an appreciation for the ontological and epistemological assumptions that underpin different approaches (Neubauer, Witkop and Varpio, 2019) and can be divided into two main approaches: transcendental and hermeneutic (Neubauer, Witkop and Varpio, 2019).

The transcendental approach is rooted in Edmund Husserl's philosophy and aims to uncover the essence of a phenomenon through the exploration of the experience of the individual (Gallagher and Brøsted Sørensen, 2006). The hermeneutic approach, on the other hand, is rooted in the philosophy of Martin Heidegger and focuses on interpreting the meaning of the individual's experience (Qutoshi, 2018). Therefore, understanding the key philosophical and methodological differences between these two approaches is essential for successfully conducting phenomenological research (Neubauer, Witkop and Varpio, 2019).

Husserl's approach to phenomenology is based on two key concepts: phenomenological reduction and the bracketing of preconceived ideas. These concepts play a central role in the process of his phenomenological research with the fundamental objective of uncovering the essence of phenomena through a process of eidetic variation and imaginative variation (Dowling, 2007). This process requires the reduction of natural attitudes and assumptions, as well as the bracketing of preconceptions in order to gain access to the phenomena in their givenness. Hence, Husserl's approach focuses on the analysis of consciousness and its intentional objects. This method emphasizes the importance of intuition and the reduction of empirical content in order to access the pure essences of phenomena. Therefore, Husserl's approach to phenomenology is characterized by a process of conscious awareness and the elimination of preconceived ideas in order to gain access to the essence of phenomena.

According to Husserl, the goal of phenomenology is to uncover the underlying structures of conscious experience (Dowling, 2007). He thus sought to make conscious experience more transparent and to reveal the essence of phenomena (Sadala and Adorno, 2002). Through a method of phenomenological reduction and bracketing, Husserl believed that the essential meaning of the phenomena could be uncovered (Reeder, 2010). To this end, he wrote extensively on the topic of phenomenology, and his work has been studied and discussed extensively (Zahavi, 2002; Pivčević, 1970; Porter, 1998; Patocka, 2018). In his book, *Husserl's Phenomenology*,

Spiegelberg (1960) provides a brief introduction to Husserl's work (as well as a thorough overview of his ideas and their implications) and presents an in-depth examination of Husserl's epistemology and approach to the scientific endeavor. Finally, Husserl's phenomenology has been used to shed light on the implicit preunderstandings of the world (Spiegelberg, 1960). This approach has been used to provide a clearer understanding of the individual's relationship to their society, as well as the implications of Husserl's phenomenology (Jennings, 1986). Furthermore, many nurse researchers have adopted Husserl's approach to phenomenology in order to study and understand the relationship between an individual and their society (Paley, 1997).

Martin Heidegger's *Being and Time* is a cornerstone of the phenomenological philosophical tradition (Mackey, 2005). Heidegger's interpretive phenomenological philosophy is encapsulated in his concept of being in the world. (Mackey, 2005; Heidegger, 2005). This concept suggests that when we are "thrown" into our world, we must interpret the world in order to make sense of it. In this interpretive process, humans relate to their world in terms of the possibilities that are available to them. Heidegger suggests that there is a distinction between the things that we encounter and the tools that we use to encounter them. For Heidegger, things are encountered as they are, and tools are used to shape our experience of them. His approach to phenomenology has sparked much debate among scholars and researchers alike. Heidegger introduces the concept of "Dasein" for which there is no English equivalent (Heidegger, 2005). It is a term used to refer to humans "existing" in the world (Heidegger, 2005). His perspective emphasizes the concept of "Dasein", which refers to the individual's unique way of being in the world (Smith, 2013). This approach to phenomenology is closely linked to hermeneutics, which involves interpreting and understanding the meaning of a text (Koch, 1995; Watson, 1971). The idea of the "lifeworld" is also an important concept in Heidegger's phenomenology (Flood, 2010). This concept stresses the idea that each individual's realities are different and that the world is experienced and interpreted differently by each individual (Flood, 2010). Heidegger never wrote explicitly of phenomenology as a research method (Johnson, 2000) and his philosophy is situated within hermeneutics and his notion of "lifeworld" which suggests that individuals' reality is constantly changing (Flood, 2010). Heidegger's phenomenology is not associated with positivist approaches to social science, which further suggests that it does not have the methodological implications usually ascribed to it (Paley, 1998).

Edmund Husserl's phenomenology, on the other hand, is a branch of philosophy that focuses on the study of experience (Dowling, 2007), and it is often used in a variety of disciplines (Sadala and Adorno, 2002). At the core of Husserl's approach lies the notion of phenomenological reduction (Reeder, 2010), which is the process of suspending the belief in the existence of the world in order to examine the experience of the world (Zahavi, 2002). This is a key concept in phenomenology that sets it apart from Heidegger's approach, as it allows Husserl to focus on the essential structures of consciousness, as opposed to Heidegger's focus on the concrete aspects of experience (Pivčević, 1970). In addition, Husserl's approach to phenomenology is largely concerned with epistemology and scientific endeavor (Porter, 1998), whereas Heidegger's approach is concerned with the individual's relationship with his or her society (Spiegelberg, 1960). Furthermore, Husserl's approach is characterized by an emphasis on clarifying our implicit preunderstandings of the world (Jennings, 1986), which differs from Heidegger's focus on interpreting the world (Patocka, 2018). Finally, Husserl's approach to phenomenology is often used in nursing research (Paley, 1997), as it allows the researcher to explore the subjective experience of the patient in a more detailed manner. To summarize, Husserl's approach to phenomenology differs significantly from Heidegger's in its focus on the essential structures of consciousness, epistemology, and the preunderstandings of the world. (Figure 1)

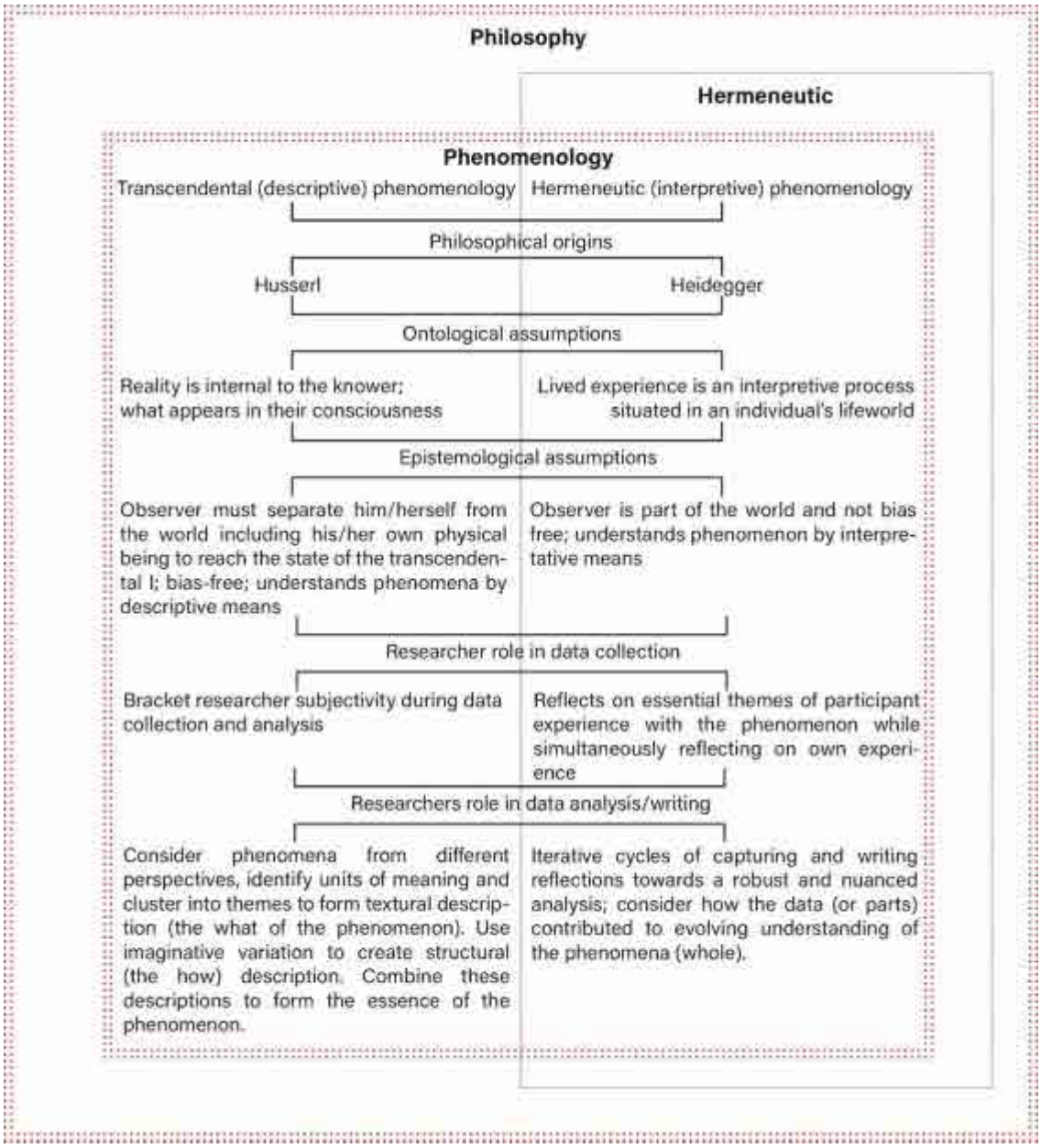


Figure 1. Comparison of transcendental and hermeneutic Phenomenology (Neubauer, Witkop and Varpio, 2019)

Heidegger's approach to phenomenology can be clearly distinguished from Husserl's in terms of their respective philosophical tones. Heidegger's phenomenology is more interpretive in nature, while Husserl's is more positivist (Paley, 1998). Husserl's phenomenology follows a more scientific approach to research, making use of experimentation and empirical methods. However, Heidegger's phenomenology takes a more interpretive approach, focusing on the individual's experience and interpretation of the world (Heidegger, 2005). Thus, Heidegger's approach to phenomenology is distinct from Husserl's in terms of its interpretive and hermeneutic nature (Johnson, 2000).

Essence of Place: Designing with *Genius Loci*

Designing with genius loci involves understanding the unique qualities and characteristics of a place and integrating them into the design process (Grazuleviciute-Vileniske et al., 2021). This approach requires a deep exploration of the history, culture, and context of the place, as well as an understanding of the needs and desires of the users (Roszczynska-Kurasinska et al., 2021; Daugelaite et al., 2021). By studying the spirit of the place, designers can develop a deep appreciation for its essence and create designs that resonate with its users.

It is undeniable that the long-standing concept of *genius loci* has been re-emerging in the literature (Strecker, 2000). Although the notion has its foundations in the ancient world, it has been re-interpreted in the modern era

(Norberg-Schulz, 1979). German thought has identified *genius loci* as "Stimmung", which translates to the atmosphere. This article discusses the concept of *genius loci*, proposing a reflection on its meaning. Additionally, it reviews the changes that have occurred in understanding the concept over the last forty years (Barnes, 2004). Pretzet spoke about *genius loci* – The Spirit of Monuments and Sites in Quebec at the 16th General Assembly of ICOMOS, Scientific Symposium (Petzet, 2008) about how the *genius loci* of destinations is not a static phenomenon, but rather a complex, living thing that is shaped by the intangible and tangible elements in its environment. The results of the study are a set of recommendations, taking into account the preservation of *genius loci* and the formation of urban environment identity (Stepanchuk, et al., 2020). Loukaki (1997) suggests an example – the Acropolis of Athens, that presents different schools of thought on *genius loci* and shows the purposefulness of the analysis of contested ideas. Hence, in order to better understand the concept of *genius loci*, it is important to consider the various schools of thought that have shaped it (Girard & Vecco, 2019; Petzet, 2008). One of these schools of thought is the instrumental value school, which views *genius loci* as something that can be used to enhance the environment and the experiences of those who inhabit it (Strecker, 2000). Another school of thought is the intrinsic value school, which views *genius loci* as something that can be experienced and appreciated on its own (Norberg-Schulz, 1979; Prokopis A. Christou, 2019). Finally, there is the German school of thought, which views *genius loci* as something that is deeply rooted in the culture and history of a place. All of these schools of thought have contributed to the modern conception of *genius loci*, which is now seen as something that shapes the way people experience places (Barnes, 2004; Loukaki, 1997).

Designing with *genius loci* (Królikowski et al., 2019) also requires a shift in focus from imposing a predetermined design onto a place to actively listening and responding to the needs and aspirations of the community. This approach requires a collaborative and participatory design process, where designers engage with the community in meaningful dialogue and co-create spaces that reflect their values to uncover the unique qualities and characteristics of a place. (Tsenova, et al., 2022, Theodora, 2020; Zaleskienė and Gražulevičiūtė-Vileniškė, 2014). Applying phenomenology to the concept of *genius loci* is a powerful tool for understanding the significance of a place (Alhazmi and Kaufmann, 2022; Randles, 2012). Phenomenology in this context can be used to explore the experiences of the people who inhabit a certain place, as well as the personal and cultural meanings that they have attributed to it (Jimenez, 2013). Through the hermeneutic approach, the researcher can gain insight into the nuances of the place and the perspectives of those who inhabit it (Randles, 2012). Through this process, designers can create spaces that are not only aesthetically pleasing but also meaningful and relevant to the people who inhabit them. For designers, it is necessary to consider the historical and cultural significance of a place, as well as its physical features and spatial organization. They can draw inspiration from local materials, architectural styles, and traditional design elements to create a sense of place and cultural identity. By involving the community in the design process, designers can gain valuable insights and perspectives that enrich their understanding of the spirit of the place. Incorporating these insights into the design process can result in spaces that foster a sense of belonging and connection, as well as promote sustainability and resilience in the community (Jayakody et al., 2018; Khemri et al., 2020). Hence, by understanding the spirit of the place, designers can identify key elements and patterns that contribute to its unique character and atmosphere. The limitation of this approach is visible in the qualitative research method that investigates subjective experiences, and while it can provide valuable insights, there are certain drawbacks associated with its use (Sheets-Johnstone, 2019). The collected data cannot lead to results generalization and the outcomes of this type of research are only applicable to the specific contexts and cases being studied. When comes to the interpretation of personal experience, there is a risk of bias and subjectivity it may not be suitable for studying large-scale social phenomena. It is important to consider the cultural and historical contexts of the subject in order to conduct meaningful research and draw valid conclusions. The designers should engage in a process of active observation, participation and immersion in the local context. All mentioned steps of the process result in designs that are in harmony with the spirit of the place and enhance existing qualities of space. The shift in focus from signifiers of the past to users of the present is a key aspect of designing with *genius loci*.

The essence of a place is a nebulous concept. There is no rigorous definition of the concept in the literature. Nonetheless, some characteristics can be considered. A place's spirit reflects the structure of interdependences among multiple components at various scales, linked in a latent order that should be interpreted using hermeneutic processes (Zeleny, 2007). Because of their nature, places express the relationship between history and present life. Despite the constant change of physical assets, this order remains a permanent element in urban dynamics. Returning to the initial value distinction, we know that hard values are tangible and reflect specific relationships and correlations in the space between multiple elements, whereas soft values are intangible (Vecco, 2020) (Figure 2).

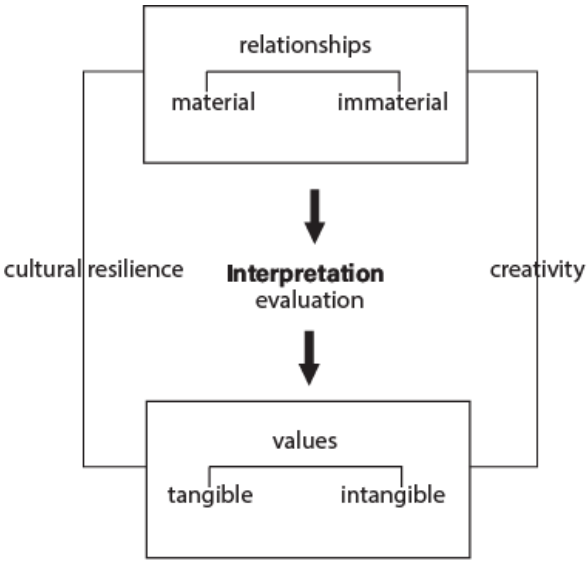


Figure 2. Interaction among relationships and values. (Vecco, 2020)

The influence of people on *genius loci* extends beyond mere physical presence. It encompasses the shared experiences and perceptions of the "spirit of the place", which is defined by The International Council on Monuments and Sites (ICOMOS), as the top-down interpretation of monuments and sites as significant places that require conservation, protection, rehabilitation, or enhancement.

This shift in interpretation recognizes that the essence of *genius loci* lies in the experiences and perceptions of the people who interact with a space. The contemporary understanding of this phenomenon is centered around the idea that a place's unique character and atmosphere are shaped by the people who have a close relationship with it. Because cultural heritage is fundamental to human development, contemporary conservation doctrine is generally open to many areas and trends of contemporary thought, attempting to absorb and integrate a wide range of theoretical notions from philosophy, cultural anthropology and sociology, human geography, political and economic sciences, humanities, and so on.

The notion of space and place has been a fundamental concept in the philosophy of humankind and is deeply rooted in the collective imagination. Space is defined as a physical area or volume that exists or is thought to exist within the universe (Murray and Rov, 1985). It is an essential element in our physical and virtual landscapes and it plays an important role in the way we perceive the world. Space allows us to make sense of our environment and to measure distances between objects. The place is the result of a specific combination of different tangible and intangible elements, ancient and newly built environments (architecture), stones and people, therefore they become fundamental elements for the resilience capacity. The concept of *genius loci* is used to capture the essence of a place by means of design (Vecco, 2020). The places are characterized by their unique and different economic, cultural, social, and emotional qualities and relations. Hence, they are considered social aggregates of communication, community, and numerous values, which become essential for their *genius loci*. Therefore, the destruction of the tangible dimension of a place does not necessarily mean the disappearance of *genius loci.* From space to place to *genius loci* and *essence of place*, the correlation between each element plays a fundamental role in creating our lived experience of the world around us. It is believed that a place emerges from an interaction of the environment and the human sensorium, in such a way that not only seeing but also the other senses, like hearing and smelling, have a role to play (Strecker, 2000). Phenomenology gives us the means to examine and analyze intangible elements of our lived realities (Figure 3).

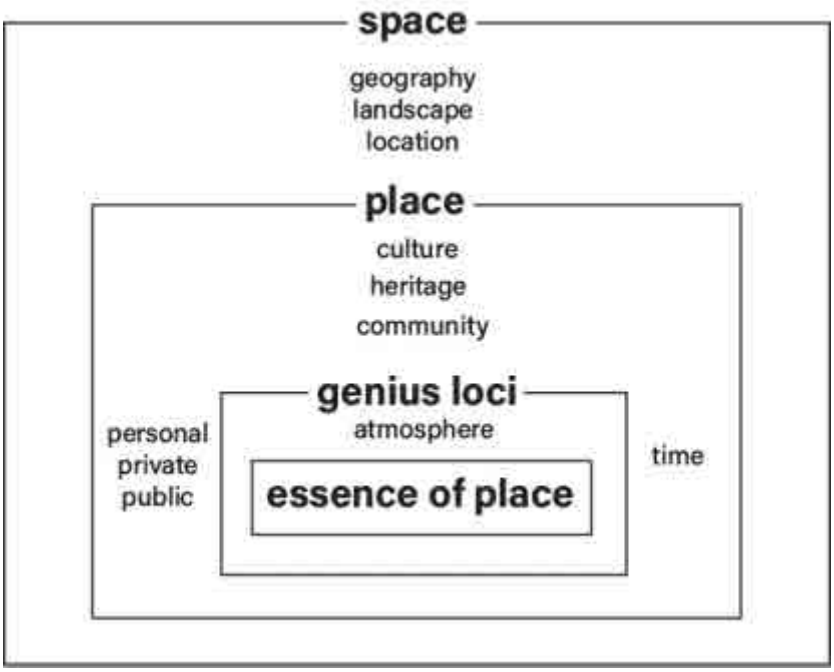


Figure 3. Interplay of Space, Place, and Genius Loci

Lived experience represents a series of events in an individual's life. The essence of identity is the ownership of these events, and metaphysical learning sees identity as a fundamental characteristic of being (Hajdeger, 1982). The perspective of Weichhart, Weiske, and Werlen in the *Place Identity and Images* (2006) focuses on users as bearers of place identity (Kalandides, 2012). The authors distinguish three types of place identity: (1) *identification* refers to the ways in which people (groups or individuals) understand and recognize places, as they do other objects, assign them characteristics and particularities; (2) *being identified as* addresses the ways people are recognized in their relations to place or origin, and (3) *identification with* is about the ways that people incorporate place into their own identity construction. In this context, place identity includes both, inseparable aspects, the external physical characteristics of an environment and the subjective perception of those characteristics. The image of the place, which represents the collective mental perceptions of a place, is inherently intertwined with place identity and should not be separated from it.

Constructing the identity of a place doesn't stem from inherited memories but rather arises from the users of the space and their events in the present moment, thus shaping the *genius loci* of their environment. This perspective recognizes that the spirit of a place is not fixed or static, but constantly evolving and shaped by the people who inhabit it.

In order to fully grasp the essence of *genius loci,* it is crucial to recognize the importance of the subjective experiences and perceptions of individuals within a place. This approach allows us to delve into the unique qualities and intangible aspects that contribute to the spirit of a place, beyond its tangible elements. People are embedded in their world, implicated in a constant process of action and response, as Arnold Berleant (2002) states continuing Yi-Fu Tuan (Tuan, 1979): *a physical interaction of body and setting, a psychological interconnection of consciousness and culture, a dynamic harmony of sensory awareness all make a person inseparable from his or her environment. Traditional dualisms, such as those that distinguish between the idea and the object, the self and others, inner consciousness and the external world, dissolve in the integration of person and place*. People who share a close relationship with a particular place also share experiences and perceptions of what is commonly referred to as “the spirit of the place” (Alyani and Herlily, 2019). Therefore, experiencing *genius loci* requires a shift in focus from the physical and historical aspects of a place to the lived experiences and subjective perspectives of its inhabitants.

Discussion and Conclusions

The conceptual framework of this paper presents the shift in focus from imposing a predetermined design, and preservation of built heritage, to emphasizing qualitative values of place. The presented research implies that experiencing *genius loci* requires a shift in focus from the physical and historical aspects of a place to the subjective perspectives of its inhabitants and lived experiences.

Phenomenology, as a theoretical starting point in research, is a philosophical approach that emphasizes the study of lived experiences. The necessity to address the active role of individuals in shaping the *genius loci* of a place is essential in contemporary interpretations. The influence of individuals, their experiences, perceptions, and interactions with a place are fundamental in shaping the spirit of the space. The unique character and atmosphere of the surroundings encompasses the feelings, moods, and attitudes associated with a place. Furthermore, the cultural and historical context shapes its identity and connects the tangible and intangible components of the environment forming the essence of the place. The true essence of a place lies, not in its physical structures or historical artifacts, but in the people who inhabit it and shape its atmosphere.

Genius loci is commonly associated with the concept of authenticity, and refers to both tangible and intangible qualities of sites, as well as fabric and human activities, associating this with inherited values. Hence, rather than imposing a homogenous design that merely aims to protect the built environment, this paper emphasizes the user's perspectives on the value of the surroundings. The research outcomes in the theoretical field of *Designing with genius loci* implied that the existing patterns of space usage play a significant role in the perception of the spirit of the space. The ways people use space and interact with elements of the environment, the activities they engage in, and the social dynamics that unfold within, all contribute to the essence and character of a place. These patterns of space usage reflect the values, preferences, and cultural practices of the community, and contribute to a sense of belonging and identity. By preserving and enhancing the existing patterns of space usage, designers can ensure that the spirit of the place is not lost in the pursuit of progress. The presented research showed that engaging in dialogue with the community and involving users of the space in the design process ensures that the design reflects the values, aspirations, and identities of the community, creating a sense of ownership and pride. Through this shift in focus, the design process becomes a means of empowerment, allowing the community to shape their environment and express their cultural identity. This approach recognizes that a place is not a static entity, but a dynamic and evolving organism shaped by the actions and interactions of its inhabitants. Therefore, the design process should be adaptable and responsive, constantly seeking feedback from the community. The goal of the process should be to adjust to an ever-changing context and space usage in an urban environment. This collaborative and participatory approach allows designers to create meaningful and relevant spaces for the people who inhabit them. The focus is to capture and represent these intangible qualities in the design, creating spaces that evoke the spirit of the place and resonate with the community.

The presented paper is limited to theoretical. In the future, research could follow the direction of improving guidelines in architectural design for the areas of great significance for the identity of the environment.

Acknowledgments

This research was funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia, grant number 451-03-68/2020-14/200090.

This research is carried out with the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, according to the contract on the realization and financing of scientific research work of the Institute of Architecture and Urban&Spatial Planning of Serbia in 2023, registration number: 451-03-1148/2023-03

Literature

Alhazmi, A.A. and Kaufmann, A. (2022). Phenomenological Qualitative Methods Applied to the Analysis of Cross-Cultural Experience in Novel Educational Social Contexts. Frontiers in Psychology, 13(1). doi:https://doi.org/10.3389/fpsyg.2022.785134.

Alyani, S, A, S. and Herlily. (2019) The Sense of Place in Community Participation Through Tactical Urbanism in Bundaran HI, Jakarta. Available at: https://scite.ai/reports/10.32783/csid-jid.v2i1.30.

Barnes, T. J., (2004). Placing ideas: genius loci, heterotopia and geography's quantitative revolution. Progress in Human Geography, 28(5), p. 565–595.

Christou, P. A., Farmaki, A., Saveriades, A., & Spanou, E. (2019). The "genius loci" of places that experience intense tourism development. *Tourism Management Perspectives*, *30*, 19-32.

Daugelaite, A. and Grazuleviciute-Vileniske, I. (2021). The Relationship between Ethics and Aesthetics in Sustainable Architecture of the Baltic Sea Region. Sustainability, 13(4), p.2259. doi:https://doi.org/10.3390/su13042259.

Dillon, M.C. (1979). Phenomenology and Literature (review). Philosophy and Literature, [online] 3(1), pp.122–124. https://muse.jhu.edu/article/415705

Dowling, M. (2007). From Husserl to van Manen. A review of different phenomenological approaches. International Journal of Nursing Studies, [online] 44(1), pp.131–142. doi:https://doi.org/10.1016/j.ijnurstu.2005.11.026.

Draucker, C., (1999). The critique of Heideggerian hermeneutical nursing research. Journal of Advanced Nursing, 30(2), p. 360–373.
Flood, A. (2010). Understanding phenomenology. Nurse Researcher, 17(2), pp.7–15. doi:https://doi.org/10.7748/nr2010.01.17.2.7.c7457.
Gallagher, S. and Brøsted Sørensen, J. (2006b). Experimenting with phenomenology. Consciousness and Cognition, 15(1), pp.119–134. doi:https://doi.org/10.1016/j.concog.2005.03.002.
Gallagher, S. (2022). What Is Phenomenology? Palgrave Philosophy Today, pp.1–10. doi:https://doi.org/10.1007/978-3-031-11586-8_1.
Geanellos, R., (1998). Hermeneutic philosophy. Part II: a nursing research example of the hermeneutic imperative to address forestructures/pre-understandings. Nursing Inquiry, Volume https://doi.org/10.1046/j.1440-1800.1998.00243.x, pp. 238-247
Girard, L. F. & Vecco, M., (2019). GENIUS LOCI: THE EVALUATION OF PLACES BETWEEN INSTRUMENTAL AND INTRINSIC VALUES. Bulletin of the Calza Bini Center, 19(2), pp. 473-495.
Hajdeger, M. (1982) Mišljenje i pevanje. Beograd: NOLIT.
Heidegger, M. (2005). Introduction to Phenomenological Research. First Edition ed. Amazon. Bloomington (Ind.): Indiana University Press.
Jayakody, C, J, R, R. et al. (2018). DESIGN FACTORS FOR A SUCCESSFUL SHARED SPACE STREET (SSS) DESIGN. https://scite.ai/reports/10.3846/ijspm.2018.3685.
Jennings, J.L. (1986). Husserl revisited: The forgotten distinction between psychology and phenomenology. American Psychologist, 41(11), pp.1231–1240. doi:https://doi.org/10.1037/0003-066x.41.11.1231.
Johnson, M.E. (2000). Heidegger and meaning: implications for phenomenological research. Nursing Philosophy, 1(2), pp.134–146. doi:https://doi.org/10.1046/j.1466-769x.2000.00027.x.
Kalandides, A. (2012). Place branding and place identity. An integrated approach. *Tafter Journal*, *43*(1), 5.
Khemri, Y, M., Melis, A. and Caputo, S. (2020) Sustaining the Liveliness of Public Spaces in El Houma through Placemaking. https://scite.ai/reports/10.32891/jps.v5i1.1254.
Koch, T. (1995). Interpretive approaches in nursing research: the influence of Husserl and Heidegger. Journal of Advanced Nursing, [online] 21(5), pp.827–836. doi:https://doi.org/10.1046/j.1365-2648.1995.21050827.x.
Królikowski, J. et al. (2019) Identification of the genius loci category in the process of recognition of the city landscape design issue. https://scite.ai/reports/10.4467/2353737xct.19.019.10155.
Loukaki, A., (1997). Whose Genius Loci?: Contrasting Interpretations of the “Sacred Rock of the Athenian Acropoli. Annals of the Association of American Geographers, 87(2), pp. 306- 329.
Mackey, S. (2005). Phenomenological nursing research: methodological insights derived from Heidegger’s interpretive phenomenology. International Journal of Nursing Studies, [online] 42(2), pp.179–186. doi:https://doi.org/10.1016/j.ijnurstu.2004.06.011.
Maggs-Rapport, F., (2000). Combining methodological approaches in research: ethnography and interpretive phenomenology. J Adv Nurs., 31(1), pp. 219-225.
Masterson, A., V. et al. (2017) The contribution of sense of place to social-ecological systems research: a review and research agenda. Available at: https://scite.ai/reports/10.5751/es-08872-220149.
Moran, D., (2000). Introduction to Phenomenology. 1st ed. London : Routledge.
Murray, M. and Rov, P. (1985). ‘GENIUS LOCI: AN INTERPRETATION OF THE IDEA OF PLACE IN CITY DESIGN’. [online] Available at: https://repository.rice.edu/server/api/core/bitstreams/2e6d7283-5877-4ed1-8480-d2118a85c0f7/content [Accessed 25 Jun. 2023].
Neubauer, B., Witkop, C. and Varpio, L. (2019). How Phenomenology Can Help Us Learn from the Experiences of Others. Perspectives on Medical Education, [online] 8(2), pp.90–97. doi:https://doi.org/10.1007/s40037-019-0509-2.
Norberg-Schulz, C., (1979). Genius loci: towards a phenomenology of architecture. New York: : Rizzoli.
Paley, J. (1997). Husserl, phenomenology and nursing. Journal of Advanced Nursing, [online] 26(1), pp.187–193. doi:https://doi.org/10.1046/j.1365-2648.1997.1997026187.x.
Paley, J. (1998). Misinterpretive phenomenology: Heidegger, ontology and nursing research. Journal of Advanced Nursing, 27(4), pp.817–824. doi:https://doi.org/10.1046/j.1365-2648.1998.00607.x.
Passfield, R. W. (2005). Evaluating Authenticity: Reconstructed Timber Swing Bridges. IA. The Journal of the Society for Industrial Archeology, 31(2), 5–26. http://www.jstor.org/stable/40968698
Patocka, J. (2018). An Introduction to Husserl’s Phenomenology. Google Books. Open Court Publishing.
Petzet, M., 30 September 2008. GENIUS LOCI – The Spirit of Monuments and Sites. Quebec: 16th General Assembly of ICOMOS, Scientific Symposium.

Pivčević, E. (1970). Husserl and Phenomenology. [online] Google Books. Hutchinson. Available at: https://books.google.rs/books/about/Husserl_and_Phenomenology.html?id=WMEYAAAAIAAJ&redir_esc=y.

Porter, E.J. (1998). On 'Being Inspired' by Husserl's Phenomenology. Advances in Nursing Science, 21(1), pp.16–28. doi:https://doi.org/10.1097/00012272-199809000-00003.

Qutoshi, Sadruddin Bahadur (2018). Phenomenology: A Philosophy and Method of Inquiry. Journal of Education and Educational Development, [online] 5(1), pp.215–222. Available at: https://eric.ed.gov/?id=EJ1180603.

Reeder, H.P. (2010). The Theory and Practice of Husserl's Phenomenology. [online] Available at: https://philpapers.org/rec/REETTA.

Roszczynska-Kurasinska, M. et al. (2021) Intrinsic Value and Perceived Essentialism of Culture Heritage Sites as Tools for Planning Interventions. https://scite.ai/reports/10.3390/su13095078.

Sadala, M.L.A. and Adorno, R. de C.F. (2002). Phenomenology as a method to investigate the experience lived: a perspective from Husserl and Merleau Ponty's thought. Journal of Advanced Nursing, 37(3), pp.282–293. doi:https://doi.org/10.1046/j.1365-2648.2002.02071.x.

Sheets-Johnstone, M. (2019). Kinesthesia: An extended critical overview and a beginning phenomenology of learning. Continental Philosophy Review, 52(2), pp.143–169. doi:https://doi.org/10.1007/s11007-018-09460-7.

Smith, D.W. (2013). Phenomenology (Stanford Encyclopedia of Philosophy). [online] Stanford.edu. Available at: https://plato.stanford.edu/entries/phenomenology/.

Spiegelberg, H. (1960). Husserl's Phenomenology and Existentialism. The Journal of Philosophy, [online] 57(2), pp.62–74. doi:https://doi.org/10.2307/2022808.

Stepanchuk, A., Gafurova, S. & Latypova, M., (2020). Genius Loci: as a resource for the development of historical areas of the city. s.l., IOP Conference Series: Materials Science and Engineering.

Strecker, I., (2000). The "Genius Loci" of Hamar. Northeast African Studies, 7(3), pp. 85 - 118.

Theodora, Y. (2020) Cultural Heritage as a Means for Local Development in Mediterranean Historic Cities—The Need for an Urban Policy. https://scite.ai/reports/10.3390/heritage3020010.

Tsenova, V., Wood, G., & Kirk, D. (2022). Designing with Genius Loci: An Approach to Polyvocality in Interactive Heritage Interpretation. *Multimodal Technologies and Interaction*, *6*(6), 41. MDPI AG. Retrieved from http://dx.doi.org/10.3390/mti6060041

Tuan, YF. (1979). Space and Place: Humanistic Perspective. In: Gale, S., Olsson, G. (eds) Philosophy in Geography. Theory and Decision Library, vol 20. Springer, Dordrecht. https://doi.org/10.1007/978-94-009-9394-5_19

Tymieniecka, AT. (2002). Introduction: Phenomenology as the Inspirational Force of Our Times. In: Tymieniecka, AT. (eds) Phenomenology World-Wide. Analecta Husserliana, vol 80. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0473-2_1

Vecco, M., (2020). Genius loci as a meta-concept. Journal of Cultural Heritage, 41 (https://doi.org/10.1016/j.culher.2019.07.001), pp. 225-231.

Strecker, I. (2000). The 'Genius Loci' of Hamar. Northeast African Studies, [online] 7(3), pp.85–118. Available at: https://www.jstor.org/stable/41931258.

Wojnar, D. & Swanson, K., (2007). Phenomenology An Exploration. Journal of Holistic Nursing: official journal of the American Holistic Nurses' Association, p. 10.1177/0898010106295172.

Wylie, J.L. (2015). Landscape and phenomenology. Routledge eBooks. doi:https://doi.org/10.4324/9780203096925.ch4.

Zahavi, D. (2002). Husserl's phenomenology. Stanford University Press.

ANESTHETIZING through the IMAGE: Between Ethics And Aesthetics In Architecture

Nikolina Sekulović, dr Milena Kordić
University of Belgrade - Faculty of Architecture, Serbia;
2022_41016@edu.arh.bg.ac.rs
milena.kordic@arh.bg.ac.rs

Absrtact: The image functions as a primary means of architectural communication, especially in the contemporary context of digital communication and social media, contributing to the way we perceive and understand architecture, and shaping the relation between aesthetics and ethics in architecture.
The domination of the image is considered a particularly significant phenomenon in the context of increasing technological development and the immense impact of global media. This paper aims to identify and recognize the present influence of the image on the development of architectural ideas. The expanding range of image impact reflects the pervasive hyperproduction of visual content, as well as how architecture is disseminated through mass media. Image has evolved from a representational technique to the primary compositional approach in the creative design process. Examining the nature of this modification generates several contemporary considerations regarding the image's contribution to the objectification of architecture and its impact on the appearance of objects. The spectator becomes anesthetized by the constant influx of visual data and the desire for aestheticization, therefore ethical concerns stay hidden by aesthetics.
In the framework of mass media marketing, the image becomes a tool that seductively erases the boundary between the real and the imaginary, simultaneously redefining and expanding the context. It becomes a limitation, but also an opportunity for the development of a common culture. The method of content analysis takes the position in a systematic study of the literature addressing the impact of an image not as a means of representation but as a means of conceiving architecture, as well as a chronological examination of the change in the role that image has in the design process.
The contribution to the research discussion is the analysis of competition entries in urban planning and architectural competitions in Montenegro, in the last ten years, using the case study as the proposed method for discussing the recognized phenomenon at the regional level.

Keywords: image, objectification of architecture, hyperproduction, aestheticization

1 Introduction

Space, as a product of sociological, political, and economic factors, represents a credible reflection of society. The synergy of mass consumerism and the digital revolution in the last century irreversibly transformed how the world functions and, consequently, the development of urban processes. It is already becoming challenging to imagine life without the constant presence of the media. The average person spends 2.30 hours on social networks and in the digital space, and the younger generation spends up to 7 hours daily. Changes in the lifestyle of people, the space in which they live, and the ubiquity of the media, McLuhan describes as the formation of an extension of the central nervous system of man that affects the expansion of his senses and, consequently, the psychological and social complex (McLuhan, 2001). The expansive technological force erases the boundaries of the real and virtual worlds through this intertwining.
The intersection of the interests of capitalism and technology can be found in their instrument for manipulation and one of the leading products: the image. The culture of social networks and hyperproduction of visual content, with a figure of 350 million images per day, provoke the reactions of 1.4 billion people. According to this information, 1074 images are uploaded to social networks per second. The question arises: how did the image gain such influence and become a victim of modern society? Their power can be explained as a consequence of society's interest in the spectacle and the vision that observers believe without questioning (Pallasmaa, 2011). “How attention is manipulated conditions how we engage the world and understand ourselves in it” (Young, 2022).
This paper examines the emergence and globalization of the "digital image" media and its impact on contemporary architectural creation. The examination elucidates the relationship between technology, ethics, and aesthetics through digital images and media. The computing infrastructure of architecture is in transition.The relationship between the software sector and architectural practice points to fundamentally different creational tenets and accepted design standards (Fok and Picon, 2016, 109). The etymological analysis of terms necessary for the research determined the origin and meaning framework for further analysis of the context of their operation in everyday practice, and the analysis of the presence of the terms provided the historical framework of the topic's popularity. A theoretical analysis of the meaning of the concept of image in the current context leads to a conclusion and the field of its influence. It is important to note that the

theoretical analysis is intertwined with the analysis of examples of award-winning solutions of the current architectural competition practice in Montenegro, chosen as practices that impact contemporary architectural creation in the country. Through relevant examples, the influence of image was analyzed through the existence of a digital, ethical, and aesthetic criteria. Following the defined research topic, a combination of several scientific methods was chosen: the analysis method (when reviewing selected theoretical material relevant literature, as well as drawing conclusions), the comparative method (for comparing the obtained research results), and the case study method (through the analysis of relevant examples). Image is inseparable from architecture and represents the language of the profession and the way of representation through which a particular parameter of architecture is evaluated, so reconstructing the history of the image in architecture would also represent the reconstruction of the entire history of architecture. This is precisely why the research bypasses the concept of chronological time and linear narrative but instead investigates the episodic stages of its influences and manipulations of fragments of reality.

2 The Power of the Image

The meaning and origin of significant words for this research provide an additional framework for analyzing its context. The origin of the word "image" is intriguing; it comes from the Latin word imāgō, which is translated as "a copy, likeness, image," and is derived from the verb imitari or "to copy, imitate". In this way, the term image is associated with both processes: copying and representation. From it, the word "imagination" is born, which, according to the Oxford Dictionary, is explained as the ability to form mental pictures of people or things or to have new ideas, and comes from the Latin verb imaginari, meaning "to picture oneself."The word "image" is placed between the words "imitation" and "imagination," which share a common etymology and are at the same time the subject of contentious relationships between ethical and aesthetic postulates of contemporary creation. The importance of visual language can be seen through the meaning of "theoria" in Ancient Greece, from the verb Theoreo, which means to see, observe, examine, and "Aletheia" i.e., the truth. According to biological analysis, which shows that 50% of the neurons in the human brain are involved in visual functions, people can be classified as visual animals. The primacy of the sense of sight over the other senses is evident because the connection between thought, visibility, and architecture can be seen as privileged (Symeonidis 2019).

An image is highly abstract and can be considered an immaterial entity, a ghostly, phantasmatic phenomenon that emerges or comes to life in a material substrate (Mitchell, 2015). Pallasmaa believes we use the term image indiscriminately, in different meanings and contexts: for pictures, paintings, perceptions, entities of imagination, dreams, and daydreams. (Pallasmaa, 2011). It can be understood as a structure through which we bring different phenomena into order (Cocchiarella, 2015) and at different levels. Images carry semantic possibilities and can become a mediating tool of human interaction, thus explaining the world we live in (Cocchiarella, 2015).

Defining the influence of images in contemporary design is inseparable from the influence of media communication and digital culture. Digital images represent complex negotiations on exchanging information at different levels, not just visual phenomena (Young, 2022). The image industry has changed the world and how we communicate and is continuously shaping our urban space, natural environments, and mental landscapes (Pallasmaa, 2011). It represents a field of experimentation that significantly influences everyday life and, therefore, a tremendous political power (May, 2019) and a primal power of evocation (Cocchiarella, 2015). The image can confuse line between interpreting the image as fact or fiction slowly shifts (May, 2019). With the development of the media, the image has become accessible to everyone and overcomes language barriers. Its power increased. McLuhan writes that the "media of the image" is the message that shapes and controls the scale and form of human association and action. (McLuhan, 2001). The transformation of society and the strengthening of the image industry can also be observed through the representation of concepts in different historical periods. With the phrase "The pictorial turn," Mitchell represents the fact that visual cultures in recent decades have taken on sets of general problems, moving from specific questions of art history to an "expanded field" that includes psychology, neuroscience, ethics, aesthetics, media theory, and politics, to an expanded field of action which he describes as "metaphysics of image" (Mitchell, 2015). To analyze its influence on architectural creation, areas, and criteria were defined in which rapid changes can be observed: media, ethics, and aesthetics.

Using the online digital platform Google Books Ngram Viewer, it was analyzed how often terms appeared in the corpus of available books, predominantly in the English language, published in any country from 1920 to the present day. The analysis shows the statistical average of popularity and representation in the literature and the world's focus on these concepts. Four main terms were investigated: image, media, ethics, and aesthetics. In the last 100 years, the term image has been consistently the most represented. However, its popularity has

grown since the 70s of the 20th century. This growth parallels the use and development of the media phenomenon. Based on this, images and media have progressed together, increasing their popularity four times in the last 100 years. The focus on the word aesthetics has historically grown, but to a 10-fold lesser extent compared to previous terms, while the term ethics is the least represented in the literature. Based on this diagram, we can conclude in which direction of development, concerning the selected concepts, the world went in the last century and what are the most valuable spheres that, as a society, we primarily develop. In this way, we shape the world as a virtual reality filled with images with little focus on aesthetics and even less on ethical values. The disadvantage of this type of research is the limitation to the English-speaking area and the literature available in the database.

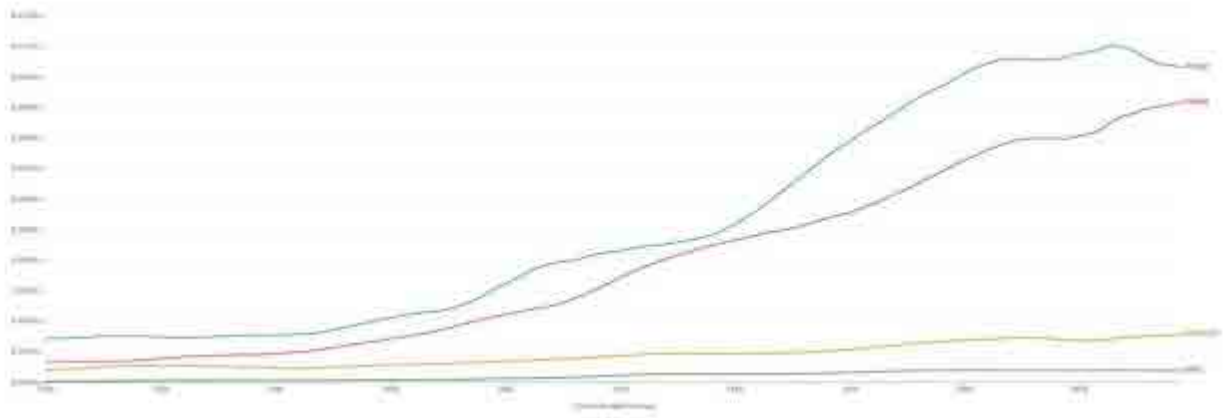


Figure 1: Ngram Viewer chart results

In his critique of 20th-century culture and the text "The Conquest of Ubiquity," Paul Virilio describes when "works of art" will appear and disappear with a simple hand movement and acquire a kind of ubiquity. A time in which people "will be provided with visual and auditory images with minimal effort" (Friedberg, 2006). We are living that very moment. Technology directs the orientation of society, and through technological development, the media form different ways of behavior, political allegiances, and new ways of acting, reshaping society and creating new criteria of social aesthetics (Holland et al., 2009). The developed media machines represented excellent scenography for directing human perception and channelling capital through spectacle and popular entertainment. It is precisely in this influence that the ethical dilemmas of political influence open up as these machines "structure attention through aesthetics" (Young, 2022). In "The Perfect Crime" by Baudrillard, in the third category/line of simulation, "reality itself is stolen." (Fok & Picon, 2016, 119). Through the current popularity of the digital image and its representation, an "anonymous system" of evaluation and formation of standards and criteria has been formed, which needs to be investigated. A kind of "open source architecture" has been formed through the digital world as a freely available system (Fok & Picon, 2016, 119).
In addition to losing the compass in space, new media technologies cause people to get lost in time: the "real-time" effect replaces historicity (May, 2019), and burdened by the future, we lose the sense of the present (Pallasmaa, 2011), ubiquity merges with immediacy, (Friedberg, 2006), and reality and fantasy, past and future, facts and fiction merge into one whole. Guided by the (mis)adjustment of people in these living conditions," it can be concluded that, although "the digital age is the age of calculation, control, and programming," it must be equally recognized as "the age of irrationality, loss of control and unprogramming" (Mitchell, 2015).

3 The Lost Dimension of Architecture

The growth of digital technologies has led to numerous formats for transmitting project information. Since the 90s of the 20th century, various architectural representation software have been created, due to which manual 2D drawings have grown into requirements for comprehensive modeling of objects. This software, which progressed and changed over time, influenced the language of architects and design principles. At that intersection, a tense conflict was formed between the previous theory of architecture and the directions of technological thought development. The ontology of language has become diluted and specialized and has narrowed the space for ambiguity suitable for the conceptual stages of design (Fok & Picon, 2016). However, although computers made a massive difference in particular segments of architectural design, architects still

introduced new possibilities into the spheres of their discipline and created new methodological approaches. The standard set of architectural presentations is complemented by a 3D representation that provides a sense of continuity and consistency in architectural practice and the transition to the digital field (Young, 2022). In today's era, with the digital and visual sphere of the Internet as an active or extended play space, the architecture industry is moving into the "Internet of Things" as a means of work. (Fok & Picon, 2016, 119). Virilio claims that architecture will occur in real space (material architecture) and virtual space (transmission of electromagnetic signals). This system of understanding the world through the formation of architectural language forms architects and their way of perceiving the world. The principle of digital can be represented by the culmination of Freidberg's thoughts on the transmission of three-dimensional space and its translation into the two dimensions of the screen/canvas. It is precisely this loss that he calls the lost third dimension that brings us to the zero degree of architecture, i.e., its physical cancellation (Friedberg, 2006). In this dematerialization of architecture and the loss of its spatial dimensions, the polis, agora, and forum are replaced by a screen. Through the rapid virtualization process, many of our experiences have been deterritorialized, losing the spatio-temporal coordinates necessary for the depth to be maintained. "Hasn't architecture always been a hybrid, mixed medium, and hasn't it now gone completely virtual, existing as much in speculative, notional, and graphic or modular form as it does in the actual building? And do not the buildings reflect this virtualization and liquidation, with the seemingly absolute malleability of shapes, materials, surfaces, and spaces?" (Mitchell, 2015, 87). Architecture represents a constant project of imagining a different world, which implies a constant actualization of the idea (Choi & Trotter, 2015).

The alternative axis of the digital deviates from the usual understanding of digital technology as primarily visual logic but emphasizes the specificity of the disciplinary potential. Although computers are immediately associated with forming fluid and curved lines and examining visual surfaces, today, it implies analyzing the ubiquitous cultural situation. This approach represents a critical and mediating space that can engage a new aesthetic based on structural relations. The second prize-winning project at the International competition for the conceptual architectural solution of the sports facility - the hall in Cetinje- can be the principle of digital can be analyzed in it. The committee recognized a light pavilion building in a park environment with a refined form that enables flexible and multipurpose use of the space. The project is powerfully arranged around the concepts of ungrounding, anticipating an unprecedented building virtualization to undo its current position of dominance through individual and spatial deterritorialization. In this case, architecture is not about defining the overall super-form but the relationships between the structural segments. As a new range of digital materialization erases the object, the entire building can be seen as a tension between reduced resolution and erasure. The structure of the building is set in such a way that it has one repeated element, thus building a monolithic structure in the park environment. A reduced form of the box is obtained by assembling all these elements. This structure is obtained through a clear image and intention, and it can be seen as a diffuse structure in which the space will be filled with the environment and internal users. As digital can be explained as representing the state of an object through two different states, this project represents the tension between on and off, existing (steel structure) and non-existent (wall elements, confinement). The structural grid can be loaded as a matrix, a graphics card that reads the image. The construction is coded, and the reality of the situation can be read through it. The image of the object can be seen as deleted.

Figure 2: The second prize-winning project at the international competition in Cetinje, Façade

Figure 3: The second prize-winning project at the international competition in Cetinje, Entrance
Figure 4: The second prize-winning project at the International competition in Cetinje, Interior view

4 Architecture as a Thinking Tool

The digital world mirrors globalization, world economies, and accelerated communication, and we are constantly bombarded with visual images (Pallasmaa, 2011). Like all other types of media and information, works of art have reached a moment of ubiquity. The digital image represents the relationship between fiction and reality, and the characteristics of that relationship and its effects represent a political issue that causes social and cultural change. The image can be recognized as a social issue of greater importance concerning architecture's "internal disciplinary battles" (Young, 2022). The large amount of information circulating in the digital world forms "open source architecture" and represents only the tip of the iceberg that affects the current possibilities of architectural practice (Fok & Picon, 2016, 119). Capital took advantage of human perception and caused a numbing effect by intensifying the stimulus of the sense of sight (McLuhan, 2001). Man functions with a range of information for which he does not have a suitable body apparatus (May 2019). Young defines this state as a world of "decontextualized fragments" that roam freely and in which the mind wanders non-linearly. Pallasma calls this situation "a kind of suffocation in the endless Sargasso Sea of Images" (Pallasmaa, 2011). It is questionable whether the human central nervous system can withstand a superstimulated social experience (McLuhan, 2001). Constant hyperproduction, distraction, and obscuring with visual content change the sensory attention of the observer and directly affect the destruction of people's ability to "critically perceive and perceive important entities in the appearance of reality" (Young, 2022). Young describes this unfocused state from which we operate as a state of "hyperattention," Neil Leach as a blase outlook, and Beatriz Colomina describes it as "overload" and wandering through a multimedia space that exceeds people's capacity to absorb it (Young, 2022). A person "scrolls" pictures and stories in seconds and cannot understand, remember, or analyze the displayed content. The excessive flow of information through images leads to the experience of a discontinuous and displaced world of "interrupted and discontinuous

narratives" (Pallasmaa, 2011, 15). Separate pieces of knowledge wander freely through space at such a high speed that it is impossible to tie them into a meaningful whole and reach immersion and depth of meaning. Fascination with images turns into unconscious drunkenness, deadening, and blocking of perception because the body naturally tries to fight and acts as a protection against severe threats of pressure and stimulation of the nervous system (McLuhan, 2001).

The influence of digital images on the ethical action of architectural thought is reflected precisely in the blocking of perception and critical approach due to the speed of arrival of a large amount of data. The starting point of the analysis of ethical thought in architecture is related to design as its essential activity. As the etymological meaning of the word ethics relates to moral principles and character, ethical activity and conditional ideas in architecture can be connected with the phrase "being good at designing" (Wasserman, Sullivan, and Palermo, 2000). The essence of architecture cannot be reflected only in its practical existence but in a much deeper spiritual need to shape the habitat and, therefore, a great responsibility towards the society in which it operates. The ethical approach is reflected in defining the value of the impact of digital images on the architectural process in correlation to the circumstances in which all these objects affect other people. Architects have become obsessed with creating images that slowly erase the social and political consciousness of the individual and, through the image, separate themselves from the experience of real life (Leach 1999). In a much smaller percentage, in the competition solutions, some examples review the adopted starting parameters and historical heritage and adapt it to the modern needs of users. Most solutions arise superficially, although the scope of architecture is more comprehensive and can be seen as a tool of aesthetic and political thought (Symeonidis 2019). The third prize-winning solution at the Competition for the conceptual architectural solution of the administrative building for the needs of the Municipality of Zeta represents an interesting combination of the influence of digital images and the political thinking of the design team. The proposal of a precise movement through the administrative facility provides flow, transparency, and space for new opportunities for user interaction. A simple and specific solution of a typical office is a way to direct and open up possibilities for the system of functioning and employees' work. The solution represents an example that the architectural approach can contribute to "positive effects" when the liberating intentions of the architect coincide with the actual practice of people in realizing their freedom" (Leach 1999). It is through the plans of this object that architecture can be understood as the "supreme art of directing" and establishing a hierarchy of what can be seen and experienced (Symeonidis 2019). The concept of designed space redefines established administrative organization and connections between employees. The influence of the digital image can be loaded into the proposal for the facade of the building itself, which, in the commission's opinion, is an inadequate choice for the climatic conditions in which it was proposed and, at the same time, can be seen as a solution that, in this matter, gives priority to the image of the building and the aesthetic category of the object rather than its usefulness.

Figure 5: The third prize-winning project at the Competition for the conceptual architectural solution of the administrative building for the needs of the Municipality of Zeta, Facade

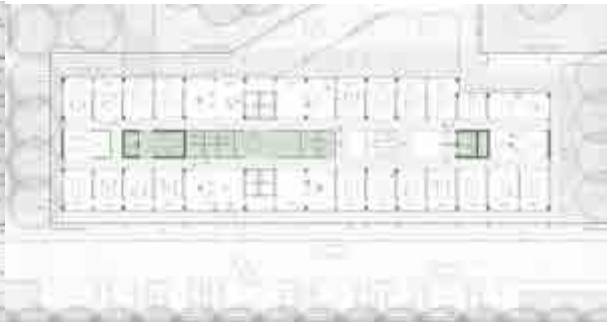


Figure 6: The third prize-winning project at the Competition for the conceptual architectural solution of the administrative building for the needs of the Municipality of Zeta, Ground floor
Figure 7: The third prize-winning project at the Competition for the conceptual architectural solution of the administrative building for the needs of the Municipality of Zeta, 1st-floor plan

5 The Image Between the Architect and the User

One of the greatest paradoxes of contemporary culture is that when the image dominates, the notion of creative imagination seems under increasing threat (Pallasmaa, 2011). As a science of the senses, aesthetics represents locating something in the human mind (Scruton 1979). The meaning of the term aesthetics, from the ancient Greek word "aesthetic," refers to human sensory perceptions and is the opposite of the term anesthetizing, numbing the senses. Excessive stimulation of the senses has the effect of anesthetizing them. Thus, the aestheticization that emerges from every corner of existence completely paralyzes the architect. In analyzing the contemporary aesthetic regime, the world is simultaneously aestheticized and anesthetized (Leach 1999).

Architecture is an expressive medium. As architects begin to read the object as a mere image, its first meaning is lost. The unconscious immersion in the world of images is more profound, and its direct influence remains unexplained and unconscious. Due to the dominance of digital images, the world has become burdened by aestheticization. Decontextualization separates the object from what is ethical about it. Objects are judged by their appearance without further and deeper reading; thus, architecture is objectified. Neil Leach describes it as "a gaze which sweeps over objects without seeing in them anything other than their objectiveness" (Leach 1999,6). Through this approach, aesthetic judgment is replaced by an obsession with fascination and seduction by the spectacle. Walter Benjamin's radical theory, in which he tried to make a principled difference between art and advertising in this situation, was unsuccessful (Benjamin & Rice, 2009). Replication dominates as the primary approach to existence through media. The original becomes less valuable and necessary than the information on how many times it has been repeated and imitated (Fok & Picon, 2016). In the current digital existence, the focus is on creating an image of architecture. Therefore, the image represents a danger in terms of authenticity. The archive must be made more explicit as a systematic data storage from which architecture is learned and understood. There is no time for laborious interpretations. Architecture has not become precisely fake but a profound source of inauthenticity (May, 2019). In the growth of this phenomenon, the speed of its acceptance and non-examination is interesting. Architects increasingly create and learn architecture through digital, aestheticized images. Through this process, they separate themselves from real life and reality. The fetishization of the image can lead to the fetishization of space. The image forms the style and taste of the architect, which begins to distance him from the space users. Such architecture does not respond to the population's needs and is beginning to be replicated worldwide. Is architecture trapped in this state of empty and unreal representations (Leach 1999).

The influence of digital images on the design process can be observed through the first-prized project at the International competition for the conceptual urban-architectural solution of Independent Square in Podgorica. The main city square has shrunk with the historical development while the city has grown. This tender has not fulfilled aspirations for the expansion of the square dating back to 1964. The held competition, where 39 solutions were received, can already be seen as an inadequate interpretation of urban planning parameters and analyses, and architectural solutions as a failure to recognize the contextual problem and viewing the square as a picture with its closed borders. Solving the square was a painting process, beautifying and aestheticizing the given space. The first-prized solution rounded off the whole by creating aestheticized fragments that do not meet the needs of the residents of Podgorica. This multi-layered urban infrastructure creates an aestheticized urban identity. Fragmentary parts of the solution have architectural and urbanistic qualities but viewed as a whole, they additionally narrow and limit the square. The first prize-winning design of the square caused stormy reactions from the public. In response to the anesthetized competition attention,

most non-critical opinions and anesthetized solutions were offered, and ethical connects were replaced by aesthetic ones. The entire solution can be seen as a single picture not connected to the city's needs.

Figure 8: The first prize-winning solution of Independent Square in Podgorica, situation

Figure 9: The first prize-winning solution of Independent Square in Podgorica
Figure 10: The first prize-winning solution of Independent Square in Podgorica, fragment

6 Conclusion

“No more drawings, only images. No more orthography, only telemetry. No more points, only addresses. No more geometry, only associations. No more syntax, only commands. No more tectonics, only management. No more machines, only apparatuses. No more stasis, only animation. No more research, only search. No more subjects, only users. No more contemplation, only transmission. No more representation, only presentation. No more perception, only sensation. No more ethics, only statistics. No more aesthetics, only physiology. No more archives, only caches. No more history, only retrieval. No more future, only probabilities. No more signification, only signalization” (May, 2019).

The interweaving of expansive technological forces and capitalist orientations have influenced significant changes in man's way of life. The medium of digital images represents a phenomenon whose influence is inevitable in many directions of action of architectural thought. In the serene world of images, aesthetic and ethical dilemmas spread through the digital field and redirect the architect's engagement. The image has a double impact on architectural practice: on the one hand, it has a negative effect, diverting the architect's focus from analysis and critical thinking, and on the other hand, it has a positive effect as a vast spectrum of knowledge that reaches all people. This expansion reflects the democratic position of the digital image. It is up to architects to form filters through which they will perceive, critically analyze, and filter this knowledge. The "Time of the Image" evokes the political questions facing architecture and urbanism, as they occupy a central place in the "era of the new look". The relationship between society and space is reversible: just as society and social circumstances influence the creation of space, space also influences social relations. By refusing practice to recognize the importance of new phenomena, one can continue to wander in an ocean of simulations

without a compass. In this regard, do we know or are we, as architects, aware of what kind of social relations and space we will create anesthetized by the influence of the image?
However, no matter how much the circumstances of people's functioning change, the desire for better and better quality will always exist. Given that the digital image represents a real danger to the critical thinking and imagination of the individual, it is necessary to improve the connection between the architect and the experience of the real. In a world where architecture is alluring and seductive, the task of a responsible architect is to create and strengthen a chosen sense of the real in the spheres of perception and experience, as well as in cultural and social interaction (Pallasmaa, 2011). The position of the image can be seen only as a neutral background of our potential that can be used as an ideal mechanism for "involving a public in critical discussion, to send the architect back to the drawing board" (Mitchell, 2015). The assumption that architecture has a critical political and social mission often conflicts with the design process. However, it is possible to observe that good design has a social and political impact. Architecture has to form a mechanism that can defend the authenticity of human experience, which means that the future depends on the architect's capacity for imagination (Pallasmaa, 2011). Although this turn to the media implies a lot of illegibility and clutter, it can also produce a new transparency of thought. Pallasma is convinced that we can free and sensitize ourselves through a re-poetized understanding of the world if the human imagination were autonomous, self-generative, and unlimited. (Pallasmaa, 2011)
Is it possible to see the digital image as an opportunity, and are we finally aware to imagine better and use the possibilities of such forms of communication to shape new and more vital understandings with them?

References

Benjamin, A.E. (2009). *Walter Benjamin and the architecture of modernity*. Melbourne: Re.Press.
Choi, E. and Marrikka Trotter (2017). *Architecture is all over*. New York, Ny: Columbia Books On Architecture And The City.
Cocchiarella, L. and Springerlink (Online Service (2015). *The Visual Language of Technique : Volume 1 - History and Epistemology*. Cham: Springer International Publishing.
Fok, W.W. and Picon, A. (2017). *Digital Property*. John Wiley & Sons.
Friedberg, A. (2009). *The virtual window : from Alberti to Microsoft*. Cambridge, Mass.: Mit Press.
Holland, E.W., Smith, D.W. and Stivale, C.J. (2009). *Gilles Deleuze image and text*. London Continuum.
Leach, N. (2000). *The Anaesthetics of Architecture.* Cambridge U.A.: Mit-Pr.
Lorenzo-Eiroa, P. and Sprecher, A. (2013). *Architecture in Formation*. Hoboken: Taylor and Francis.
May, J. (2019). *Signal. Image. Architecture. : (Everything is already an image)*. New York, Ny: Columbia Books On Architecture And The City.
Mcluhan, M. (1997). *Understanding media : the extensions of man*. Cambridge , Ma ; London: The Mit Press.
Mitchell, W.J.T. (2018). *Image science : iconology, visual culture, and media aesthetics*. Chicago ; London: The University Of Chicago Press.
Juhani Pallasmaa (2011). *The embodied image : imagination and imagery in architecture*. Chichester: Wiley.
Scruton, R. (2013). *The aesthetics of architecture*. Princeton, N.J. Princeton University Press.
Symeonidis, T. (2019). ARCHITECTURE AS A TOOL FOR AESTHETIC AND POLITICAL THOUGHT. *Serbian Architectural Journal*, [online] 11(03). Available at: https://scindeks-clanci.ceon.rs/data/pdf/1821-3952/2019/1821-39521903397S.pdf.
Wasserman, B.L., Sullivan, P. and Palermo, G. (2000). *Ethics and the practice of architecture*. New York: Wiley.
Young, M. (2021). *Reality Modeled After Images*. Routledge.

The use of Architectural Decorative Elements from the end of the 19th and the beginning of the 20th Century as a Determinant in the Service of Defining Style

PhD Bojana Pašajlić[1]
Assistant professor, Univesity of Kragujevac, Faculty of Philology and Arts, Kragujevac, Serbia
bojana.pasajlic@filum.kg.ac.rs

Abstract: The text problematizes the role of decorative architectural elements as important segments of visual identity and determinants that define the style of buildings created at the end of the 19th and beginning of the 20th century in Kragujevac.
The appearance of reliefs, profiled elements and sculptures on the facades of the buildings had the greatest influence on the decorativeness of the building and thus marks the style of the building. The beginning of the 20th century in Kragujevac is marked by the construction of a large number of administrative and educational buildings, but also shops and stores, which, as the most widespread type of building, give character to the core of the city and reflect the spirit of the civic style of Kragujevac from the turn of the two centuries. The primary goal of the work is the analysis of the shape and function of decorative elements on representative examples of buildings within the core of the city of Kragujevac. The goal of the work is the application of theoretical conclusions defined through analyzed examples in the practical part of the research, which shows the examination of the use of decorative plastic in contemporary architectural practice.
The results of the research are of particular importance for the development of current architectural practice because through research and practical work they provide an answer to the importance of the use of decorative plastic in the recognition and formation of architectural style.

Keywords: features of style; facade plastic; stilistic architecture; secession and Kragujevac.

1 Introduction

The intensive urbanization of the city of Kragujevac began in the seventies of the 19th century, when Kragujevac grew from a rural town into an urban environment. The increase in popularization made Kragujevac one of the first cities to receive a regulation plan (1891) at the end of the century, which has not been preserved, and was the work of engineer Luka Ivanović, while a copy of this plan from 1897 is known as Kanic's plan, this is how the planned construction of the city began.
The complex urban core of the city emerges from the traditional linear bazaar structure, so by respecting the old parcelization, new interventions and regulation of the streets in the inherited part of the city are created. The architecture of Kragujevac, created in the period from the half of the 19th to the half of the 20th century is marked by a strong penetration of cultural influences from the West. The architectural heritage of the city of Kragujevac has been dominated by eclecticism since the mid-19th century. This era did not respond to the new era, so at the end of the century there was a desire for something new. As a response to this aspiration, at the turn of the century, the Secession appeared in architecture, which was named differently depending on the geographical region (Jugendstil/Germany, Art Nouveau/France, Secessionsstil/Austria, Stile floreale/Italy). The mentioned style left its mark especially in the facade decoration.
The buildings that were built by artisans and merchants in the late 19th and early 20th centuries within the central core "belong to the attribute of the bearers of the civic urbanity of Kragujevac". (Трифуновић 2008) The architecture of Kragujevac from the beginning of the 20th century is marked by the construction of The District Headquarters Building (Zgrada Okružnog načelstva), which was designed in 1903 by the Serbian architect Nikola Nestorović. According to the stylistic regulations, the building belongs to the eclectic styles of the 19th century, and it can be considered a top achievement of Serbian architecture. With its position northeast of the main city bazaar, this building becomes a benchmark of the urban center of the city of Kragujevac, whose direction of development is followed by all urban plans in the 20th century. (Трифуновић 2008)
The beginning of the 20th century represents a new period in the construction of the city of Kragujevac. Secession represents the dominant architectural style that gives its stamp to the core of the city of Kragujevac. The influence that the Secession left in Kragujevac was brought to this ground by Belgrade architects, to whom the Secession reached in Vienna, Paris and Munich. The investors of these buildings were wealthy merchants who could use their finances to hire the best craftsmen who successfully adapted the plans to difficult locations using significant urban land. In accordance with this, we can also characterize the Secession as an image of the city's economic boom before the Balkan wars. (Трифуновић 2008)
As the investors of the buildings were people who had the opportunity to see the architectural tendencies in other parts of Europe, it can be considered that they were the initiators of bringing innovations as well as the

formation of stylistic heterogeneity in the direction of the design of buildings. This observation also coincides with the fact that although Serbian architects accepted academism as a European legacy of proven value, they also accepted Secession with great ease, and then embarked on the search for a national style, which indicates that they are more than conviction and devotion to one style interested in business results. (Кадијевић 2005)
Secession as an architectural style did not completely reject the decorative elements of previous architectural styles, in addition it creates new and original decorations by which it becomes recognizable. The most recognizable ornaments are naturalistic motifs, plants, animals as well as geometric patterns executed in plaster and metal. In addition to the mentioned buildings where these motifs dominate, it is also important to mention the decorations on the bridge in front of the Military Technical Institute built in the 20^{s} of the 20th century. (Трифуновић 2008)
The tendencies towards the influence of other cultures and countries that manifested themselves in the aesthetics of the facade of the building followed the contents that the buildings marketed. Fashion shops sold textile goods and manufactured footwear, which mostly came from France and England. It is interesting to note the decorative nature of newspaper advertisements of certain commercial and craft establishments, where the influence of Secession can be seen in the framing of typographical advertisements with floral and geometric motifs that belong to the aforementioned style. Such examples can be found in the newspaper ads of Miloš Stevanović, a coppersmith from Kragujevac, published in "Narodna sloboda"[1] on September 29, 1991, in issue 11 on page 4, and of the photographic studio of the artistic painter Avg. Černea from Kragujevac published in "Javno mnjenje"[2] on January 21, 1934 in number 3 on page 4. (Fig. 1 and 2)

Figure 1. Advertisement by Miloš Stevanović, coppersmith from Kragujevac
(Anonymous, Narodna sloboda, Kragujevac, 1911, 4.)

Figure 2. Advertisement for Photo Studio and Art Painter Aug. Černea from Kragujevac
(Anonymous, Public opinion, Kragujevac, 1934, 4.)

Among the most significant representatives and the most beautiful buildings of this style are the Palace of Milan Nikolić, the Palace of Moscow, as well as the building with the Atlases. These buildings are characterized by narrow plots, P+1 floors, domes and angular motifs. (Трифуновић 2008) The First World War interrupted construction activity in Kragujevac, while the city suffered great destruction. After the end of the war, the

[1] Anonymous, *Народна слобода*, Kragujevac, 1911, 4.
[2] Anonymous, *Јавно мњење*, Kragujevac, 1934, 4

reconstruction of the city followed, so as a reaction to decorative eclecticism, there was a need for rationalization and abandonment of ornamentation. "Earlier decorative styles achieved so-called artistic effects by applying excess material to wall canvases, while modern construction achieves much greater effects by means of material that has already been usefully used, and which also has its constructive function." (Добровић 1971)

2 Secession on the Territory of the Kingdom of Serbia

All recognized architects in Serbia until the First World War had a higher education obtained at renowned European polytechnics and academies. The new generation of Serbian builders showed that they were not ideologically unified, through their work and later description, traces of the conflict between different schools and the time in which they operated can be seen. According to the author Aleksandar Kadijević, he describes the aspirations and diversity of the work of Serbian architects as follows: "While some primarily followed the ideas of academicism, others did not neglect the romantic interpretations of the medieval style, nor the patriotic search for national harmony." (Кадијевић 2005: 296) There were mostly those who ran from one obstacle to another, trying to overcome their opposites. They often did this successfully, despite mixing elements of different idioms. There were also those who sincerely believed that they had created a model of nationally recognizable architecture, even though they followed the neo-Byzantine eclecticism of the Viennese school (S. Ivačković), or the Secession methodology (D. Inkiostri).''(Кадијевић 2005)

Although they easily moved from one style to another, Serbian architects relied for a long time on the proven academic principle of the form and structure of buildings due to the fear of an uncertain result in the application of insufficiently known stylistic concepts. This approach produced the appearance that academic compositional schemes were maintained on the objects of Art Nouveau, national and late romantic style, inter-war modernism and post-war socialism. The character of Serbian architects can be seen through this understanding, they accepted innovations with great delay to reject and overcome them even more slowly. (Кадијевић 2005)

The architecture of the buildings left behind by the builders of this period does not abound in ingenuity in terms of the basis or construction peculiarities because Serbian architects never paid special attention to them. According to Zoran Manević: "Serbian architects expressed their architectural talent, their artistic concept on the facades by choosing, in the spirit of European eclecticism, a certain decorative system based on elements of historical styles or by creating their own system." (Маневић 1986) Among the works that are most similar to the standards of European eclecticism are The school buildings of Dragutin Đorđević, the existing building of the Third Belgrade Gymnasium in Makedonska Street and the building of the Second Belgrade Gymnasium in Makedonska Street, which was demolished in the Second World War. The public buildings of the architect Nikola Nestorović in Kragujevac (The District Headquarters Building) and Kruševac are close to academic eclectic models. The listed objects can be considered the most significant representatives of a certain approach that remained present even where the author's wishes were emancipation from Central European standards for the introduction of innovations and the realization of a different concept within the framework of secession or the Serbian-Byzantine style. (Маневић 1986)

The first works of secession in the territory of the Kingdom of Serbia date back to the beginning of the 20th century. The facade of the Vuča building in Karađorđeva street in Belgrade by architect Dimitrije Leko is considered a national interpretation of the aforementioned style, although the building as a whole is viewed rather within the framework of eclectic academicism. The Palace of the Belgrade Cooperative (Palata Beogradske zagruge), designed in the period from 1905-1907, can also be included in the framework by the architects Nikola Nestorović and Andre Stevanović. In these and in similar works by other Serbian architects, it is difficult to determine the strict limit of the end of academic foundations and the transition to secessionist and Serbian-Byzantine architecture. The pharmacy built on the corner of Makedonska and Nušićeva streets in Belgrade, by engineer Joca Smederevac, is considered one of the first buildings realized in the secession spirit, due to the use of floral motifs used in the decoration of the facade. According to the project of Milan Antonović, in 1901, the building of the Society for the Beautification of Vračar (Društvo za ulepšavanje Vračara) was built, with a commercial and residential character, with an architectural structure that retained the traditional characteristics of academic architecture. The aforementioned building was the first in Belgrade to receive secessionist elements - a final attic, a roof fence woven from wrought iron, incorporated initials of the Society and the year of construction, as well as a central motif on the main facade that can be associated with exemplary Viennese secession. In the middle of the first decade of the 20th century, three important buildings were created that later became rappers in the recognition of the mentioned style - *Hotel Moskva, Robni magazin* and *House of merchant Stamenković*. All three buildings have dominant characteristics, the *Hotel Moskva* is recognizable by its ceramic coating on the facade, a similar principle can be seen in the *House of the*

Merchant Stamenković through the ceramic coating of recognizable green tiles and pilasters that go beyond the divided cornices (which, according to the author Manević, is considered a symbol of victory over the canons of eclectic academicism) and the third principle can be seen on the glass facade of the *Robni magazin*. (Маневић 1986)

3 Secession and its Forms in Kragujevac

The presence of secessionist elements became more massive in Kragujevac from the 20s of the 20th century. According to the available data, it is believed that the first building in the secession style was erected in 1911 in a position near The District Headquarters Building (Zgrada Okružnog načelstva), whose owner was the merchant Vlaja Nikolić brandy maker. The facility is known as "Moscow" after the name of the tavern that was located on the ground floor of the facility until 2002. (Стефановић 2013)

The ground floor of the building is intended for shops. The facade of the ground floor is more sparsely decorated with massive square portals made of wooden elements, in the upper zones of which there are floral-shaped metal masks. The angular facade, oriented towards the pedestrian zone of the city core, is vaulted with a dome and a plastic horseshoe-shaped frame that frames plant ornaments. On the corner parts of the ground-floor part of the facade, there are entrances to the premises consisting of double-winged doors with arches. The same type of entrance is located in the central part of the longer facade in the direction below the bay window of the first floor. The building has three entrances, two on the sides of the facades and one in the central part of the longer facade that leads to the first floor of the building.

Opposite the ground floor of the building, the first floor is far more representative in its decoration. The first-floor part of the facade abounds with floral and abstract motifs executed in plaster, which are mostly concentrated in the central part, which is therefore the most prominent. The number of floors is indicated by a horizontal border that extends along the entire length of the building. On the central part of the first floor, on the longest facade, there is a balcony whose railing is made of wrought iron and which includes double doors and two windows. There are bay windows to the left and right of the balcony. At the cut corners of the building, there are imitations of bay windows. At the corner facing the pedestrian zone there is a representation of a human figure made of stone sculpture in a niche bordered with horseshoe-shaped ornamentation above the top of which is a dome.

The building has a wide attic with a simple roof cornice. The windows of the upper floor are of different sizes, some of which are decorated with tympanum lintels. The side facade also has a balcony that is accessed through double doors. The railing of the balcony is made of wrought iron and rests on volute consoles. (Fig. 3)

Figure 3. Palace Moscow

In 1913, the Palace of Milan Nikolić, a merchant from Kragujevac, was built occupying the corner plot of Masarikova Street and Kralja Petra I Street. The ground floor of the building was intended for commercial activities, and the first floor of the building was of a residential character. Secessionist stylistic features seen through the rich floral motifs on the first floor part of the building as well as the dominant wrought iron fence on the balcony of the side facade of the first floor of the building. The building has a ground floor and a first floor. The facade of the building is richly decorated with secondary plastic that can be attributed to the

secession style. In the ground floor of the building there is a bar with large wooden decorated portals. The ground part of the facade is finished with plaster with an emphasized horizontal division. The building has one cut-off corner part facing the intersection where there is an arched entrance to the premises of the building. At the end of the longer part of the ground floor facade is the entrance to the residential part of the building. The first floor is separated from the ground floor by a horizontal cornice at the height of which, on the shorter part of the facade, there is a balcony whose fence is made of wrought iron. The balcony is accessed through a door with a window. The window openings are processed differently, most of them are regular octagonal shapes, while those located on the corner part as well as to the left and right of it are arched. Above the window is a heavily profiled roof cornice with openings for attic ventilation. On the corner part of the facade there is a vaulted segment in the form of a square dome. At the top of the building there are three decoratively finished attics, two of which are located along the longer facade and on which the year of construction of the building is indicated, while the facade facing the pedestrian area has a larger attic with more modest ornamentation. (Fig. 4)

Figure 4. Palace of Milan Nikolić

In the same period of time, was built building that occupies the opposite corner of the mentioned two streets, known as the "Building with Atlases". The building got its name from the two Atlas sculptures positioned on the corner part of the facade above the entrance to the building, thus supporting the reinforced concrete slab of the building's balcony. (Стефановић 2013)

The ground floor of the building is intended for shops. The first shop covers the corner of two streets and is entered through a door centrally placed on the very corner of the building. There are double doors to this place that lead to the interior part of the building. The shops continue along the entire length of Masarikova Street in the following order: a smaller shop with a shop window and a single-winged entrance door, a larger shop which in the facade part consists of four blocks, a large shop window, then a double-winged entrance door with two smaller shop windows and another two blocks of large shop windows, after of these shops, the building ends with another smaller shop consisting of a single door and a smaller window. Storefronts that have preserved their authentic appearance have wooden frames. The first-floor part of the facade is dominated by geometric motifs that are reminiscent of stained glass segments in terms of design and processing. The upper part of the building is demarcated from the ground floor by a horizontal border that extends along its entire length. The crown of the building as well as the rhizalites are similar to the same elements on the neighboring building, thus placing them in the same style group. The corner part of the facade on the first floor has a balcony whose fence is made of wrought iron, and which are held by two figures of Atlas. The corner position of the building is covered by a dome. (Fig. 5)

Figure 5. Building with "Atlases"

Dislocated in relation to the pedestrian zone of the city center is another building characterized by the stylistic segments of the secessionist style. The building dates from the beginning of the 20th century, belongs to private residential buildings and is located in Vuka Karadžića Street no. 8. Building is of an eclectic character, so we can see the characteristics of baroque architecture through closed forms, curved linear shapes, while secessionist characteristics can be found through the floral decorative plastic that frames the window openings. (Стефановић 2013) The building consists of a ground floor and a first floor and has a symmetrical character. In the central part of the ground floor there is an arched passage leading to the inner courtyard. The verticality of the building is emphasized by two pairs of pilasters each with Corinthian capitals, this rhythm was carried over to the upper floor of the building. (Fig. 6 and 7)

Figure 6 and 7. The Building in Vuka Karadžića street no. 8

4 Typology of Secessionist Style Features - From Cladding to Ornamentation

The tendency to decorate facades with reliefs and sculpture, i.e. with facade plastic in the secessionist style, was one of the main indicators of the stylistic direction. Universal themes, personifications and allegories of

traditional and contemporary aspects of life were in accordance with the object's purpose as well as the personal and professional characteristics of the owner. (Popović 2011)

4.1 Wall covering - surface treatment

Covering wall surfaces with other materials in Kragujevac architecture was not characteristic, so there are no representatives of this type of application of style determinants. As an imitation of this principle, we can recognize the tendency to choose pastel colors, which as such are associated with certain wall coverings characteristic of the secessionist direction (the above-mentioned facades covered with green facade tiles in Belgrade).

4.2 Facade plastic

The decoration of the facades was carried out by applying ornamental decorations and sculptures in the form of geometric, plant and animal motifs, but also human figures (sculptures based on ancient motifs). The above-mentioned representations mostly defined the objects to be recognized as representatives of a certain style. Through the application of different shapes of ornaments, the influences that came from several countries of Western Europe, primarily Austria and France, can be seen. The division of the secessionist ornament in Kragujevac can be divided into two categories: the one that is seen through geometric patterns[3] and fractals, and the other that is reminiscent of plant/animal specimens or forms of human representations.

We can perceive the first group of ornaments on the example of the "Building with Atlases", on the floor part of the building there is a group of geometric ornaments[4] that are positioned on the attic, such as metal masks on the ventilation openings and decorative covering of the window glass. The second group of ornaments is represented on all analyzed objects through different architectural segments. The most common positions of these ornaments are as part of the cornice, attic, on the front of the building and as elements that frame the window panes. (Fig. 8 and 9)

Photo 8 and 9. Palace of Milan Nikolić and Building with Atlases

[3] Influenced by the Arts and Crafts, particularly through the works of Charles Rennie Mackintosh, the Secessionists rejected historicism and embraced geometry and abstraction in architecture. Through the German branch of Secession, they developed the Jugendstil decorative style with curved, organic ornamental designs.
https://voices.uchicago.edu/201504arth15709-01a2/2015/11/16/vienna-secession/, accessed June 2023.

[4] We find a similar application of geometric ornament on the graphic attachment, the poster for the Exhibition of Austrian Secession artists by the Austrian painter Alfred Roller, the author of the mentioned lithograph.
https://www.alamy.com/alfred-roller-ver-sacrum-lithographic-institute-albert-berger-xii-exhibition-of-the-vereinigung-bildender-knstler-sterreichs-secession-lithography-total-height-9500-cm-width-3120-cm-exhibition-posters-geometric-ornaments-art-nouveau-image392083573.html, accessed June 2023.

After the end of the First World War, when at the same time the secessionist tendencies in architecture ended, the ornament ceased to be the leading idea of architectural design, and therefore its further use also ceased. (Трифуновић 2008)

4.3 Wrought iron elements

Architectural decorative elements made of wrought iron and other metals were part of the civil culture of housing, so their application can be seen on gates, window grills, doors, terrace and staircase railings, radiator covers, ventilation openings, etc.

One of the most reputable companies in Kragujevac that engaged in locksmith works was the ''Ironworks and Locksmith Shop of Braća S. Vuletic'' (Gvožđarska i bravarska radnja Braće S. Vuletić). In the advertisement issued on February 4, 1925, in the periodical "Нови покрет", the following is stated: "The locksmith's shop accepts all the work of the locksmith's trade, such as: iron fences, balconies, gates, all construction works, stoves and stoves in in all sizes, we specialize in sprayers for vines. The production is fast and accurate and solid, with a moderate price.''.[5] (Fig. 10, 11 and 12)

Гвожђарска — и — Браварска Радња

Браће С. Вулетића - Крагујевац

Главна ул. бр. 56

РАДЊА БРАВАРСКА

Figure 10. Advertisement of Ironworks and Locksmith Shop of Braća S. Vuletic'' from Kragujevac (Anonymous, *Нови покрет*, Kragujevac, 1925, 4.)

Figure 11. Brothers S. Vuletić in front of their shop in Glavna street no. 56, Kragujevac, personal collection of Milan A. Živaljević

[5] Anonymous, *Нови покрет*, Kragujevac, 1925, 4.

Figure 12. Example of decorative elements made of wrought iron, "Moscow" Palace in Kragujevac

5 Concluding Considerations

Through the presented research, the work examines the use of ornamentation and its role in the construction, that is, the formation of style. The proposed hypothesis of the work was reflected in the assumption that through the design, materials, dimensioning and positioning of ornaments within the facade or interior of the building, the user sees as members of a certain style or era.

We can see the space of contemporary interior as a place of exchange but also of formativeness of authentically shaped and stylized elements that contain segments taken from other civilizations and eras, and which were later implemented into specially designed interior units or architecture in general. After the Second World War, the devastation of architecture occurred at the turn of two centuries due to the lack of detailed regulations on the adaptation and rehabilitation of the mentioned typology of buildings. Although the facade has largely remained unchanged, the authenticity of the building changes due to the change of the facade woodwork, but by the replacement of authentic interior units that were part of the primary identity of the building. Examples of rare segments that are part of the interior or refer to it have remained only in traces.

As a starting point of use for an example of the transposition of facade ornamentation into contemporary segments of architecture and interior, it represents part of the authentic paving of the entrance part of a commercial building from the turn of the century located in Kralja Aleksandra Karađorđevića Street in Kragujevac. The unusualness of the shown example is reflected in the dimensioning of the tile, which is not, as one would expect, the entire image display over one element, but is divided into two units. (Fig. 13)

Figure 13. Example of paving of the entrance area, commercial building in Kragujevac, elarly 20th century

In recent years, in contemporary architectural practice, there has been a noticeable trend of using different floor and wall ceramic coverings, which represent the stylization and modernization of certain ornamental forms from other eras and styles. The presented designed example can represent a contribution to the aestheticization and development of the specified type of architectural cladding. To create the design of the newly created element, was taken the analyzed geometric ornament from "Buildings with Atlases" in Kragujevac. (Fig. 14 and 15)

Figure 14 and 15. Ceramic tile patterns, dimensions of individual element 20x20 cm
* Redesign of the project (Minna Jones, Interior Stylist and Designer, http://www.minnajones.com/2013/03/testing-testailua.html)

Another application of the same design was devised through the modernization of patterns that were once transferred to wall surfaces, as stated in the advertisement of the "Painting and dyeing shop of Rade Šuković" from Kragujevac published in "Одјек Шумадије" in 1939 in issue 8 on page 4: "Painting and dyeing shop recommends to the citizens extremely modern PATTERNS and MODELS for painting with a lot of guarantee and durability of work". [6] (Fig. 16)

Figure 16. Advertisement "Painting and dyeing shop of Rade Šuković" from Kragujevac
(Anonymous, *Одјек Шумадије*, Kragujevac, 1939, 4.)

[6] Anonymous, *Одјек Шумадије*, Kragujevac, 1939, 4.)

With the new trend of intensive construction in the old city center, adaptations and reconstructions, authentic segments that are examples of the mentioned activity are disappearing. In the process of destruction during the new construction, by removing the layers of adaptation of the building from the beginning of the 20th century in Kragujevac (Milovana Gušića Street), the described principle of decorativeness of wall surfaces was recorded. A print in the form of a strip with floral motifs in two shades is placed at the top of the wall. (Fig. 17)

Figure 17. Display of a print of a painting pattern from the beginning of the 20th century in Kragujevac

The analyzed ornament was also applied through another type of treatment of wall surfaces in the interior. The principle presented on the example of the interior of a cafe restaurant is the installation of microcement treatment with a specially designed pattern, i.e. the pattern presented in the left part of the graphic attachment below. (Fig. 18)

Figure 18. Application of the designed sample on microcement, https://www.freepik.com/free-photos-vectors/restaurant-interior-mockup accessed June 2023.

References

Anonymous, *Јавно мњење*, Kragujevac, 1934, 4.
Anonymous, *Одјек Шумадије*, К Kragujevac, 1939, 4.
Anonymous, *Народна слобода*, Kragujevac, 1911, 4.
Anonymous, *Нови покрет*, Kragujevac, 1925, 4.
Добровић, Н. (1971). *Савремена архитектура 5*, Београд: Завод за издавање уџбеника Социјалистичке Републике Србије
Кадијевић, А. (2005). *Естетика архитектуре Академизма (XIX-XX) век*, Београд: Грађевинска књига
Маневић, З. (1986). Српска архитектура XX века, у: *Уметност на тлу Југославије, Архитектура XX вијека*, ур. Наташа Танасијевић-Поповић, ИРО Просвета ООУР Издавачака делатност, Спектар и Прва књижевна комуна, Љубљана, 1986, 20.
Popović, B. (2011). *Primenjena umetnost i Beograd 1918-1941*, Beograd: Muzej primenjene umetnosti
Стефановић, М. (2013). *Крагујевачки лексикон*, *Лексикони градова Србије,* Београд: ЈП Службени гласник и Град Крагујевац
Трифуновић, В. (2008). *Грађење Крагујевца у кнежевини и краљевини Србији*, Крагујевац: Кораци доо

https://voices.uchicago.edu/201504arth15709-01a2/2015/11/16/vienna-secession/, accessed June 2023.

https://www.alamy.com/alfred-roller-ver-sacrum-lithographic-institute-albert-berger-xii-exhibition-of-the-vereinigung-bildender-knstler-sterreichs-secession-lithography-total-height-9500-cm-width-3120-cm-exhibition-posters-geometric-ornaments-art-nouveau-image392083573.html, accessed June 2023.

http://www.minnajones.com/2013/03/testing-testailua.html, accessed June 2023.

https://www.freepik.com/free-photos-vectors/restaurant-interior-mockup, accessed June 2023.

Reimagining Materiality: Circularity Potential of 3D Printed Architectural Elements with Recycled Clay

Jelena Milošević, Jelena Brajković, Andrej Josifovski, Maša Žujović, Milijana Živković
University of Belgrade – Faculty of Architecture, Belgrade, Serbia
jelena@arh.bg.ac.rs ORCID: https://orcid.org/0000-0001-7293-8194
Maša Žujović ORCID: https://orcid.org/0000-0001-6346-5102
Milijana Živković ORCID: https://orcid.org/0009-0009-7191-417X

Abstract: This paper explores the application of 3D printing with recycled clay for architectural building elements, emphasizing its potential to contribute to a circular economy. The AEC industry has traditionally been associated with high material waste and environmental impact. However, the advent of 3D printing has revolutionized architectural design and manufacturing processes. Using recycled clay as a printing material, can address two challenges: reducing waste and promoting sustainability. Recycled clay, obtained from construction and demolition waste or other sources, offers advantages such as abundance, low cost, and a low environmental footprint, making it suitable for circular economy practices. Moreover, using recycled clay in 3D printing enables architects to create complex, customizable, and structurally efficient building elements, reducing the need for labor-intensive, resource-consuming traditional manufacturing techniques. The principles of the circular economy involve diverting collecting, processing, and transforming clay waste into printable material. Resource extraction and energy-intensive manufacturing processes associated with conventional building materials could be reduced by reusing and recycling clay. The paper examines case studies and ongoing research efforts in the field of 3D printing with recycled clay, demonstrating the potential of this approach to contribute to a circular economy in the AEC industry. This approach reduces waste, preserves natural resources, reduces carbon footprint, improves energy efficiency, and creates sustainable and aesthetically pleasing architectural structures. In conclusion, integrating 3D printing technologies with recycled clay presents a promising way towards creating a sustainable closed-loop circular economy system in architecture. By reimagining the construction process, designers and builders can contribute to an environmentally friendly and resource-efficient future while pushing the boundaries of architectural innovation.

Keywords: 3D printing, sustainable construction, circular economy, clay materials

1. Introduction

It has become apparent that the construction industry is responsible for a significant portion of global environmental concerns. In 2020, the architecture, engineering and construction (AEC) industry accounted for 37% of global greenhouse emissions (Renewables 2022 Global Status Report 2022). One of the major sources of CO_2 is the production and use of cementitious materials, as concrete is still the most used construction material, contributing to about 6-8% of emissions (Al-Noaimat et al. 2023; UNCCN 2017). Additionally, AEC is one of the main solid waste generators, producing around 25% of global solid waste (Benachio et al. 2020). Another important factor contributing to the environmental footprint of the building sector is resource consumption, and AEC is solely responsible for consuming around 32% of natural resources used annually (UNEP 2009). All of this shows that minimizing the carbon footprint of the construction industry is crucial in the present context. One of the ways to achieve this is to address all phases of the building process: construction, operation, and demolition through the use of novel building techniques, materials, or the recycling of construction-related wastes.

Additive manufacturing, or 3D printing (3DP) technology, has recently shown great potential for improving the sustainability and efficiency of the construction industry by reducing waste output, construction time, and material consumption (Ning et al. 2021). From the architectural standpoint, 3DP also enables the fabrication of geometrically complex bespoke elements that cannot be efficiently produced using traditional building methods. Due to the growing need for decarbonatization, most research is currently focused on the concrete 3DP in order to reduce its consumption (Buswell et al. 2018). However, 3DP technology can be used with a variety of different materials, including sand, metal, plastic, or clay. The clay and other earth-based materials can be printed using adapted extrusion-based printers that form objects by depositing layers of paste material. The main benefit of the use of clay and other earth materials for printing is that they are abundant, natural materials that can be recycled (Alonso Madrid et al. 2023). Also, clay is traditionally used in the construction industry for brick manufacturing, thus attributing to construction waste. Such waste can be recycled and reused as 3DP material, creating a closed-loop consistent with the circular economy practices.

For this reason, the main goal of this study is to discuss the use of clay and other earth materials in 3DP of architectural elements and their potential for reducing the environmental footprint of the industry. To achieve this, the case study methodology is used to examine ongoing research efforts in the field of 3D printing with recycled clay, demonstrating the potential of this approach to contribute to a circular economy in the AEC

industry. Finally, based on the case study results, this paper provides an overview of the challenges and potentials for future research.

2. Circularity potential of clay 3D printing

Traditionally, construction industry is based on a linear economic model (i.e., make-use-dispose) that is closely associated with growing environmental concerns, especially with growing resource consumption and waste generation. For this reason, another economic model has gained significant attention in recent years (Hossain et al. 2020). The circular economy model aims to preserve and enhance natural resources by creating a closed-loop system through maintenance, long-lasting design, repair, reuse, or recycling (Geissdoerfer et al. 2017). The application of circular economy principles in AEC can help the industry mitigate some of the negative environmental impacts and become more sustainable by improving the use of sustainable materials, recycling and reusing construction materials, and avoiding unnecessary waste generation and disposal. Based on the study by Benachio et al (2020), this can be achieved through the implementation of several main principles of circularity, including:

- *Reuse of materials* - Salvaging and reusing materials from demolished buildings can significantly reduce the demand for new resources. Previous can be achieved by allowing the manufacturers to reuse the materials after the end of the life of the first building for new construction, reusing secondary materials in the new production cycle, reducing the need for virgin materials.
- *Prefabrication and modular construction* - Prefabrication involves assembling building components in a factory before they are transported to the construction site. This approach can reduce construction waste, improve quality control, and speed up construction, all of which align with circular economy principles.
- *Circular economy in the project design* – Implementing BIM and other digital tools at the early stages of a project can help optimize construction processes, reduce errors, and enhance resource efficiency. It also allows simulations of disassembly processes and material reusability.
- *Life Cycle Assessment (LCA)* - Conducting an LCA analysis of construction materials and techniques helps identify their environmental impact throughout the entire life cycle. Also, including practices such as design for disassembly can help guide decisions to choose more sustainable options and reduce embodied carbon and energy in buildings.

The use of 3DP in the construction industry can have a significant impact on promoting all of these principles. First, 3DP enables the customization of building elements and allows for the creation of complex and optimized geometries, reducing material consumption and improving cost-effectiveness. Most research on 3DP in the construction industry focuses on 3D printing concrete (3DPC) as an alternative to standard in-situ concrete casting. Traditionally, concrete casting requires formworks, which can account for about 50% of total fabrication time and cost, as well as considerable amounts of waste if non-reusable formworks are used (Hurd 2005). As an answer to this problem, 3DPC can be used as a structural material for printing architectural elements, as explored in a study by Anton et al. (2021) or more commonly for printing formworks (Hack et al. 2020). Using 3DP technology coupled with optimized design strategies for prefabricated construction can lead to a significant reduction in material consumption (Mata-Falcón et al. 2022). For example, when comparing a 3DP prefabricated bathroom element with a traditionally fabricated one, Weng et al. (2020) found that a digitally fabricated one had 85.9% lower CO_2 emissions during construction, mostly due to the reduced need for material and formworks. Additionally, 3DP can help reduce production chains by localizing production and, therefore, reducing the need for long-distance transportation of construction materials and components, leading to lower carbon emissions and reduced environmental impact (Khan et al. 2023).

Although 3DP shows considerable potential in terms of circular practices, there are still some concerns regarding 3DP in AEC. Printable cement-based materials tend to be more expensive and have higher levels of cement content and additives harmful to the environment compared to regular concrete mixes in order to achieve the necessary structural properties for large-scale construction (Faleschini et al. 2023). As a response, there is a considerable amount of research focusing on improving material properties for 3DP either by formulating new mixes (Bedarf et al. 2021) or by replacing their parts with recycled materials (Pasupathy et al. 2023; Sangiorgio et al. 2022). As construction and demolition waste (CDW) is an important environmental factor in the building industry, its use for 3DP can contribute to increased sustainability of construction and the creation of a closed-loop system (Ponis et al. 2021). Masonry waste consisting of brick, tile, and other clay-based waste represents a significant portion of CDW. These materials are often researched for their natural composition and recyclability, which makes them suitable partial substitution for cement (Pasupathy et al. 2023). There are multiple examples of research into more sustainable material mixes for 3DP using brick, ceramic, and porcelain waste that

demonstrate the potential of recycled geopolymer mixes for construction (Christen et al. 2022; Faleschini et al. 2023). However, even though this approach can reduce the use of virgin resources, the production processes of these mixes tend to be energy-intensive, and it is still unclear how they compare to traditional methods regarding sustainability (Khan et al. 2023).

Another alternative to cement-based 3DP is using other more sustainable materials, such as clay and earth-based mixes, as they naturally have high adaptability to different climates, a low carbon footprint, and renewability. Earth-based materials have a long history in the construction industry, but the traditional method of building using earth, such as cob (earth, water, and straw mix), usually lacks the structural properties needed for large-scale construction. As a wet building technique, cob is actually similar in logic to 3DP – the object is created by depositing material paste. However, the mixture has to be reformulated to fit 3DP technology requirements and to improve structural properties. Several research projects are exploring the potential of 3DP with earth-based materials for both in-situ fabrication and prefabrication of architectural elements, such as customized building blocks (Faleschini et al. 2023).

Aside from earth-based mixtures, clay is another natural raw material suitable for 3DP. One of the main potentials associated with it is that clay can be used for 3DP in its raw state without any additives, and it can also be reused even after drying just by adding water to achieve printable consistency. This reusability was tested on a small scale in a study by Alonso Madrid et al. (2023) and, it was concluded that this property could reduce waste generation during the production process stemming from failed or inadequate prints. The main challenge of clay 3DP is the lack of structural properties, making it difficult to scale up the application of this method. For this reason, clay is mostly suitable for fabricating discrete building elements such as building blocks, as demonstrated by Peters (2013) or Kontovourkis (2020). Another challenge regarding clay 3DP is material afterlife, as clay needs to be fired in order to gain structural properties. Baked clay cannot be directly reused but needs to be recycled the same way as any other clay-based CDW. However, despite challenges, clay and earth-based 3DP shows great alignment with circular economy principles addressing some of the most pressing issues in AEC industry, such as waste management and resource protection.

3. 3D printed clay architecture

The case study approach is used to examine built prototypes and existing research areas addressing the issues and opportunities associated with the given technology, building on the subjects mentioned in the previous section. The environmental impact of the technology was studied, along with the technical difficulties encountered during the construction process. The first case shows a dwelling prototype constructed as a large-scale building suitable for passive building function inspired by nature. The second example focuses on the phenomenon of 3DP earth architecture in scales ranging from pavilion-type structures, which test out different configurations of the 3DP earth elements, to 3DP prefabricated construction of urban furniture building blocks. The last subsection presents several cases of novel techniques and methods from recent studies, showcasing different areas of interest for future research.

3.1 3D printed TECLA house

Technology and Clay (TECLA) house by the Mario Cucinella Architects is the first full-scale 3D printed dwelling prototype built from raw earth material, which reinstitutes low-carbon building concepts (Figure 1). The sustainability-related value of the project is seen in several of its characteristics:

- *Optimized massing and self-supporting shape* – in the initial design phase, the authors identified challenges related to the chosen earth material, such as its null bending resistance. The final dome-like shape of the building was produced through a from-finding process, resulting in a structure that withstands compression forces, therefore resisting loads through its geometry. No additional support or formwork was needed, bearing in mind that the limitations of the 3DP process have also been considered.
- *Adaptive and performative building envelope* – the innovative approach is also seen in the design of the building envelope as an active contributor to the building's low carbon footprint. In its two-layer clay configuration, thermal mass, sufficient insulation, as well as, shading and infill ventilation have been included. Depending on the climate parameters, such as air temperature and relative humidity, the envelope design is reconfigured to present the optimal results in line with the specific location. Since earth-based materials cannot resist prolonged water exposure, the wave-like envelope was also created to effectively evacuate it.
- *Life cycle assessment* – the building is biodegradable, using natural materials, with a small percent of artificial materials such as additives (less than 5%), frames, plumbing, shelves, and sanitary ware, which need to fulfill various safety, mechanical, and hygienic requirements not suited for clay. The life phases

that can be measured include the printing period (about two weeks with two printers for 250 m^2), the use phase (estimated at 75 years), and the disassembly and biodegradation of the house (estimated at 50 years). The building allows for recycling and reuse of the dismantled material, which greatly reduces the amount of energy needed to excavate it from the beginning. The specific design for the disassembly method is used to reduce the waste to as low as 5% (Cucinella 2022).

Figure 1 TECLA built prototype (source: https://static.dezeen.com/uploads/2021/04/tecla-3d-printed-home-mario-cucinella-architects_dezeen_2364_hero_7.jpg, accessed: 18.09.2023)

The building process was multidisciplinary and involved several stakeholders. An Italian firm, World's Advanced Saving Project (WASP) managed the printing process through a system of hexagonally distributed printing heads held by cranes and metal braces, which allowed more movement freedom for the printers (Figure 2). The structure was fully printed on-site, reducing transportation needs and CO_2 emissions generated that way. Mixture design represents another important aspect in which the firm Mapei was involved. The engineering team from the firm tested out different mixtures, settling on the one with the optimal buildability and best mechanical properties. One of the issues that was encountered included the question of non-existent regulations when it comes to the use of natural materials such as clay for large-scale printing. The project was developed in the hopes of showcasing a new building paradigm for the housing of people seeking shelter all over the world. The building possesses adaptability, where concepts for temperate climate, cold climate, hot and humid, and hot and arid climate vary in the building skin design and the distribution of openings (Moretti 2023). In conclusion, this project demonstrates the potential of clay 3DP by implementing several circular economy practices such as waste reduction, optimized use of natural materials, and use of LCA analysis combined with optimization of the entire design process.

Figure 2 WASP technology printing process (source: https://www.3dwasp.com/en/3d-printed-house-tecla/, accessed: 18.09.2023)

3.2 Scales of 3D printed earth architecture

One of the advanced laboratories for earth-based architecture explorations is situated in Barcelona. The Institute for Advanced Architecture of Catalonia (IAAC) recently added a new prototype pavilion to its resume, created with large-scale printing WASP technology. The TOVA pavilion is Spain's first 3DP earth-based prototype, built from local materials, also aiming at nearly zero carbon emissions (Figure 3). All the material was collected within

a 50m radius of the building site, not generating any transportation-induced environmental pollution. The building's volume responds to the local climate characteristics: it is compact, protecting the users from cold winter weather, while perforations allow natural airflow through its interior, providing sufficient passive ventilation, which helps during the humid and hot weather cycles. The walls are injected with cavities for heat loss prevention and solar radiation protection, providing the needed insulating capacity. The structure's material mix was injected with organic compounds such as aloe and egg whites, which serve as surface protection from external weather conditions. The overall construction time was reduced to seven weeks, which could place this prototype among the solutions to the emerging housing crisis. The follow-up pavilion built after the TOVA was created on the same site, using the same material (IAAC 2022). The VOLTA pavilion is characterized by a more complex and curved shape, resembling a rugged shell-type structure, demonstrating the possibility of using a single material for the whole project, unlike TOVA, which had a wooden roof structure (IAAC 2023). The project was a multidisciplinary collaboration between several industrial partners and research groups, CITA from the Royal Danish Academy in Copenhagen and the Institute of Building Structures and Structural Design (ITKE) at the University of Stuttgart. These projects were built showcasing circular economy principles in practice, most notably by redirecting and localizing supply chains, thus considerably reducing energy consumption during construction.

Figure 3 TOVA pavilion in Spain (source: https://prizes.new-european-bauhaus.eu/application/9773, accessed: 18.09.2023)

3DP technology using clay is also effectively researched in the domain of smaller-scale elements used for the aggregative assembly of larger structures. One novel example is a project done by the IAAC and their partners, CO-MIDA (IAAC 2020), which resulted from the competition launched by the BIT Habitat Barcelona Municipal Foundation. The restricted horizontal surfaces in densely populated metropolitan areas that could be used as gardens for growing food plants can be considered as the project's context. As a potential solution, a vertical modular garden was designed (Figure 4).
The sustainability values of the intelligent garden prototype are seen through:

- *The use of natural materials* – clay as a material itself has a low carbon footprint. The 3D-printed clay elements were additionally exposed to low temperatures to transform them into ceramic.
- *Installation on existing building walls* – the fact that building facades could be covered with additional layers of the vertical garden, which could enhance the thermal inertia of the building, leading to less energy being used for the heating.
- *Bio-Photovoltaic concept* – the soil used for growing plants is inhabited by various bacteria that transform the nutrients from the plants to hydrogen protons and electrons. These free electrons are transferred from the anode to the cathode situated in the clay elements, creating electricity that powers the vertical garden's built-in sensors.

This project demonstrates the potential of clay 3DP on a smaller-scale, enabling modular construction of elements that can be applied to further enhance the energy performance of buildings. The production process of the smaller scale elements also has fewer technical challenges, as opposed to full-scale printing logistics. The

elements are produced in a controlled environment, with the ability to adjust the printing parameters according to the design intent.

Figure 4 CO-MIDA vertical garden prototype (source: https://iaac.net/project/co-mida/, accessed: 18.09.2023)

3.3 Clay 3D printing research domains

To further explore the many challenges and potentials in the topic of clay 3DP in architecture, relevant recent studies and applications have been discussed. The goal was to scope the research field and inform future research in the 3DP of clay and earth materials.

One of the main advantages of 3DP technology is its ability to print out complex geometries created in the modeling software and directly transferred into slicing software to adjust the printing parameters. An example is the research of 3DP artificial ceramic marine habitats using eco-friendly materials and imitating the morphology of the nature-found reefs (Berman et al. 2023). The printing of complex internal geometries has been assessed regarding the challenges faced by 3D clay printing technology. The mentioned challenges include the long printing time, geometries collapsing without added supports, and the question of control of the material extrusion (Sangiorgio et al. 2022). Similar topics are explored in the context of free-form ceramic vault systems, which relate to material mechanical behavior in the drying and firing stages, purposely for use in printing large-scale structures (Figure 5). The main constraint of the paste-like printing materials is seen in their retraction in the printing process, as well as the appearance of surface cracks (Carvalho et al. 2019). Precision in the 3DP process is seen as a large contributor to the quality of the product, as highlighted in the study exploring different morphologies enabled by paste-based 3DP (Seibold et al. 2018). A parametric-integrated design method is explored in the design domain, which highly relates to the geometrical and morphological characteristics of the 3DP structures (Kontovourkis and Tryfonos 2020).

Figure 5 Ceramic 3D printed shading vault prototype (source: (Carvalho et al. 2019)

The main identified research areas in the field at the moment with the prospect for further development include:

- **Material properties research** - Research by (Faleschini et al. 2023) aims to explore different components in the material mix, their role in the final material compressive strength, and embodied carbon to analyze the environmental impact. Materials such as cob have been researched in the domain of their 3DP parameters adjustment, such as extrusion rate, continuity, consistency, and mobility (Gomaa et al. 2021). Another paper deals with the application of mycelial growth within 3DP clay structures, with the goal of enabling fiber connections on a microscopic scale, increasing the material's tensile strength (Jauk et al. 2022). Different sets of additions to the earth-based mortar have also been considered, such as natural textile material for reinforcement purposes (Tarhan and Perrot 2023).
- **Clay recycling** – This type of research mostly focuses on mixing concrete 3DP technologies and recycled clay materials to create a more sustainable system with better mechanical properties (Chen et al. 2021; Christen et al. 2022; Faldessai et al. 2023; Zhao et al. 2023). A comparative analysis of the environmental impact of different circular materials and construction techniques showcases that the CDW-based geopolymer materials for 3DP have the lowest global warming potential compared to ordinary Portland cement-based 3DP construction processes or conventional masonry construction of the equivalent structure. The only downside to this type of material production is the amount of electrical energy needed for the mechanical processing of waste materials (Khan et al. 2023). Another experimental study concludes that the eco-friendly geopolymer containing brick waste could reduce embodied energy and carbon emissions by up to 60-80% compared to regular Portland cement concrete (Pasupathy et al. 2023). The use of recycled clay for 3DP material mixes is a current topic but it is only in the beginning stages of research with extensive potential for further development.
- **Sustainability assessment** – Despite the emerging research concerning the circularity potentials of earth-based 3DP, there is a notable lack of systematized research focusing on the sustainability aspects of this construction process. For example, presented case studies have demonstrated how different aspects of clay 3DP can promote sustainable practices in the construction industry, mainly through the reduction of the carbon footprint and changing the production chains. There was even an LCA conducted for TECLA house highlighting significant sustainability improvements compared to the industry standard (Cucinella 2022). However, these findings are still project-specific and often derived from small-scale prototyping as this type of construction is still in the early phases of development. Construction 3DP in general faces the overall lack of regulations and building codes relating to this novel construction method. This challenge is also present in the sustainability assessment of 3DP buildings. This technology demonstrates significant potential in terms of material recyclability, reduced material consumption, and waste generation, but on the other hand, it comes with additional challenges and risks that need to be addressed (El-Sayegh et al. 2020). To better understand the sustainability potentials of 3DP structures it would be beneficial to conduct more comprehensive sustainability assessments based on the building specifications of certification institutions as no such research was identified.

4. Conclusion

This paper examines the opportunities of 3D printing with clay and other earth-based materials in relation to circular economy practices. As one of the sectors with the highest environmental impact, the construction industry must reconsider traditional processes and practices. For this reason, implementation of the circular economy principles can lead to more environmentally friendly and sustainable construction. Using 3DP technology proved to be a promising way of reducing labor costs, construction time, and material consumption. However, printing materials must also be reconsidered as the most commonly used cement materials still have considerable environmental impact. To answer this problem, this study focuses on 3DP of clay and earth materials, which can be locally sourced and are renewable natural materials. Through the analysis of current research trends and industry examples, some of the main advantages of the clay 3DP are lower CO2 emission, low waste generation, and recyclability of the material. Clay can even be directly reused during printing, eliminating production waste. Another important circularity potential of clay 3DP is the localization of production, helping to create closed-loop resource paths. From the circular economy standpoint, clay 3DP has a strong potential to further circular practices in the construction industry through the recycling and reuse of materials, construction localization, and the design of modular optimized architectural elements. While 3DP offers many advantages for the circular economy, it is essential to consider its environmental impact, particularly in terms of the energy required for printing. Sustainable material choices and energy-efficient printing processes are critical to maximizing the circular economy benefits of 3DP. Additionally, issues related to intellectual property, quality control, and regulatory compliance need to be addressed in the future as the technology becomes more widespread in the industry.

Acknowledgements: This research was funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia, grant number 451-03-68/2020-14/200090. The research was done under the research lab of the University of Belgrade, Faculty of Architecture—Laboratory for Innovative Structures in Architecture (LISA).

References

Al-Noaimat, Y. A., Chougan, M., Al-kheetan, M. J., Al-Mandhari, O., Al-Saidi, W., Al-Maqbali, M., et al. (2023). 3D printing of limestone-calcined clay cement: A review of its potential implementation in the construction industry. *Results in Engineering*, *18*, 101115. https://doi.org/10.1016/j.rineng.2023.101115

Alonso Madrid, J., Sotorrío Ortega, G., Gorostiza Carabaño, J., Olsson, N. O. E., & Tenorio Ríos, J. A. (2023). 3D Claying: 3D Printing and Recycling Clay. *Crystals*, *13*(3), 375. https://doi.org/10.3390/cryst13030375

Anton, A., Reiter, L., Wangler, T., Frangez, V., Flatt, R. J., & Dillenburger, B. (2021). A 3D concrete printing prefabrication platform for bespoke columns. *Automation in Construction*, *122*, 103467. https://doi.org/10.1016/j.autcon.2020.103467

Bedarf, P., Dutto, A., Zanini, M., & Dillenburger, B. (2021). Foam 3D printing for construction: A review of applications, materials, and processes. *Automation in Construction*, *130*, 103861. https://doi.org/10.1016/j.autcon.2021.103861

Benachio, G. L. F., Freitas, M. D. C. D., & Tavares, S. F. (2020). Circular economy in the construction industry: A systematic literature review. *Journal of Cleaner Production*, *260*, 121046. https://doi.org/10.1016/j.jclepro.2020.121046

Berman, O., Weizman, M., Oren, A., Neri, R., Parnas, H., Shashar, N., & Tarazi, E. (2023). Design and application of a novel 3D printing method for bio-inspired artificial reefs. *Ecological Engineering*, *188*, 106892. https://doi.org/10.1016/j.ecoleng.2023.106892

Buswell, R. A., Leal de Silva, W. R., Jones, S. Z., & Dirrenberger, J. (2018). 3D printing using concrete extrusion: A roadmap for research. *Cement and Concrete Research*, *112*, 37–49. https://doi.org/10.1016/j.cemconres.2018.05.006

Carvalho, J., Figueiredo, B., & Cruz, P. (2019). Free-form Ceramic Vault System Taking ceramic additive manufacturing to real scale. In *Blucher Design Proceedings* (pp. 485–492). Presented at the 37 Education and Research in Computer Aided Architectural Design in Europe and XXIII Iberoamerican Society of Digital Graphics, Joint Conference (N. 1), Porto, Portugal: Editora Blucher. https://doi.org/10.5151/proceedings-ecaadesigradi2019_592

Chen, Y., He, S., Zhang, Y., Wan, Z., Çopuroğlu, O., & Schlangen, E. (2021). 3D printing of calcined clay-limestone-based cementitious materials. *Cement and Concrete Research*, *149*, 106553. https://doi.org/10.1016/j.cemconres.2021.106553

Christen, H., Van Zijl, G., & De Villiers, W. (2022). The incorporation of recycled brick aggregate in 3D printed concrete. *Cleaner Materials*, *4*, 100090. https://doi.org/10.1016/j.clema.2022.100090

Cucinella, M. (2022). TECLA Sustainability Report. Cop26 Built Environment Virtual Pavilion. https://virtualpavilion.co/assets/pdf/tecla/TECLA_Sustainability_Report.pdf. Accessed 18 September 2023

El-Sayegh, S., Romdhane, L., & Manjikian, S. (2020). A critical review of 3D printing in construction: benefits, challenges, and risks. *Archives of Civil and Mechanical Engineering*, *20*(2), 34. https://doi.org/10.1007/s43452-020-00038-w

Faldessai, K., Lawande, S., Kelekar, A., Gurav, R., & Kakodkar, S. (2023). Utilization of ceramic waste as a partial replacement for cement in concrete manufacturing. *Materials Today: Proceedings*, S2214785323038488. https://doi.org/10.1016/j.matpr.2023.06.453

Faleschini, F., Trento, D., Masoomi, M., Pellegrino, C., & Zanini, M. A. (2023). Sustainable mixes for 3D printing of earth-based constructions. *Construction and Building Materials*, *398*, 132496. https://doi.org/10.1016/j.conbuildmat.2023.132496

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

Gomaa, M., Jabi, W., Veliz Reyes, A., & Soebarto, V. (2021). 3D printing system for earth-based construction: Case study of cob. *Automation in Construction*, *124*, 103577. https://doi.org/10.1016/j.autcon.2021.103577

Hack, N., Dörfler, K., Walzer, A. N., Wangler, T., Mata-Falcón, J., Kumar, N., et al. (2020). Structural stay-in-place formwork for robotic in situ fabrication of non-standard concrete structures: A real scale architectural demonstrator. *Automation in Construction*, *115*, 103197. https://doi.org/10.1016/j.autcon.2020.103197

Hossain, Md. U., Ng, S. T., Antwi-Afari, P., & Amor, B. (2020). Circular economy and the construction industry: Existing trends, challenges and prospective framework for sustainable construction. *Renewable and Sustainable Energy Reviews*, *130*, 109948. https://doi.org/10.1016/j.rser.2020.109948

Hurd, M. K. (2005). *Formwork for Concrete*. American Concrete Institute.

IAAC. (2020). CO-MIDA : Biophotovoltaic Vertical Gardens 3D Printed With Clay. *www.iaac.net*. https://iaac.net/project/co-mida-en/. Accessed 18 September 2023

IAAC. (2022). IAAC builds TOVA: Spain's first 3D printed prototype using earth. *www.iaac.net*. https://iaac.net/project/3dpa-prototype-2022/. Accessed 18 September 2023

IAAC. (2023). IAAC Unveils VOLTA: The 'Fifth Facade' of 3D Printed Earth Architecture. *www.iaac.net*. https://iaac.net/project/iaac-presents-volta/. Accessed 18 September 2023

Jauk, J., Gosch, L., Vašatko, H., Christian, I., Klaus, A., & Stavric, M. (2022). MyCera. Application of mycelial growth within digitally manufactured clay structures. *International Journal of Architectural Computing*, *20*(1), 31–40. https://doi.org/10.1177/14780771221082248

Khan, S. A., Jassim, M., Ilcan, H., Sahin, O., Bayer, İ. R., Sahmaran, M., & Koc, M. (2023). 3D printing of circular materials: Comparative environmental analysis of materials and construction techniques. *Case Studies in Construction Materials*, *18*, e02059. https://doi.org/10.1016/j.cscm.2023.e02059

Kontovourkis, O., & Tryfonos, G. (2020). Robotic 3D clay printing of prefabricated non-conventional wall components based on a parametric-integrated design. *Automation in Construction*, *110*, 103005. https://doi.org/10.1016/j.autcon.2019.103005

Mata-Falcón, J., Bischof, P., Huber, T., Anton, A., Burger, J., Ranaudo, F., et al. (2022). Digitally fabricated ribbed concrete floor slabs: a sustainable solution for construction. *RILEM Technical Letters*, *7*, 68–78. https://doi.org/10.21809/rilemtechlett.2022.161

Moretti, M. (2023). WASP in the Edge of 3D Printing. In B. Rangel, A. S. Guimarães, J. Lino, & L. Santana (Eds.), *3D Printing for Construction with Alternative Materials* (pp. 57–65). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-09319-7_3

Ning, X., Liu, T., Wu, C., & Wang, C. (2021). 3D Printing in Construction: Current Status, Implementation Hindrances, and Development Agenda. *Advances in Civil Engineering*, *2021*, 1–12. https://doi.org/10.1155/2021/6665333

Pasupathy, K., Ramakrishnan, S., & Sanjayan, J. (2023). 3D concrete printing of eco-friendly geopolymer containing brick waste. *Cement and Concrete Composites*, *138*, 104943. https://doi.org/10.1016/j.cemconcomp.2023.104943

Peters, B. (2013). Building Bytes: 3D-Printed Bricks.

Ponis, S., Aretoulaki, E., Maroutas, T. N., Plakas, G., & Dimogiorgi, K. (2021). A Systematic Literature Review on Additive Manufacturing in the Context of Circular Economy. *Sustainability*, *13*(11), 6007. https://doi.org/10.3390/su13116007

Renewables 2022 Global Status Report. (2022). *REN21. 2022.* Paris: REN21 Secretariat.

Sangiorgio, V., Parisi, F., Fieni, F., & Parisi, N. (2022). The New Boundaries of 3D-Printed Clay Bricks Design: Printability of Complex Internal Geometries. *Sustainability*, *14*(2), 598. https://doi.org/10.3390/su14020598

Seibold, Z., Hinz, K., García Del Castillo, J. L., Martínez Alonso, N., Mhatre, S., & Bechthold, M. (2018). Ceramic Morphologies. Precision and control in paste-based additive manufacturing (pp. 350–357). Presented at the ACADIA 2018: Re/Calibration: On Imprecision and Infidelity, Mexico City, Mexico. https://doi.org/10.52842/conf.acadia.2018.350

Tarhan, Y., & Perrot, A. (2023). Reinforcement of 3D printable earth-based mortar with natural textile material. *Materials Today: Proceedings*, S2214785323043080. https://doi.org/10.1016/j.matpr.2023.08.056

UN Climate Change News. (2017, October 26). Bigger Climate Action Emerging in Cement Industry. https://unfccc.int/news/bigger-climate-action-emerging-in-cement-industry. Accessed 16 September 2023

United Nations Environment Programme. (2009). Buildings and Climate Change: Summary for Decision Makers. https://wedocs.unep.org/20.500.11822/32152

Weng, Y., Li, M., Ruan, S., Wong, T. N., Tan, M. J., Ow Yeong, K. L., & Qian, S. (2020). Comparative economic, environmental and productivity assessment of a concrete bathroom unit fabricated through 3D printing and a precast approach. *Journal of Cleaner Production*, *261*, 121245. https://doi.org/10.1016/j.jclepro.2020.121245

Zhao, Y., Gao, Y., Chen, G., Li, S., Singh, A., Luo, X., et al. (2023). Development of low-carbon materials from GGBS and clay brick powder for 3D concrete printing. *Construction and Building Materials*, *383*, 131232. https://doi.org/10.1016/j.conbuildmat.2023.131232

The depiction of velocity in art and design and its connection to Architecture

Despoina Kokkota, Giannis Tsaras
Technical University of Crete, School of Architecture
dkokkota@tuc.gr
itsaras@tuc.gr

Abstract: The world that surrounds us, even in its apparent calmness, is constantly in motion. The perception of this motion is a fundamental aspect of human experience. As humans evolved, the scientific study of motion began, leading to the creation of the concept of velocity, which defines the magnitude of motion, that is, how fast or slow an object moves. Apart from the scientific perspective, motion, as an integral part of everyday life, has engaged art since the early stages of human civilization. There are examples depicting motion and velocity in almost all periods of art, from cave paintings to the present day. Modern design, whether industrial or aesthetic, has also addressed the concept of velocity and how it can influence design. This paper explores the representation of velocity in architectural design by analyzing the way it is depicted in art and design and identifying the elements that convey it. It seeks to find the design elements that connect velocity with architecture, primarily by investigating the following questions:
Are there buildings that are associated with the concept of velocity, making it a criterion for their design?
As architecture, to some extent, follows the criteria of design, is it possible for architecture to follow its principles for representing velocity in design?

Keywords: velocity, speed, velocity in art, velocity in design, velocity in architecture

Introduction

The world that surrounds us, even in its apparent tranquility, is constantly in motion. The perception of this motion is a fundamental aspect of the human experience. The first attempt to depict motion was through art, which was and still is the mirror of human existence. The techniques for depicting motion in art remained consistent until the 18th century, and a common characteristic was that the figures in artworks, whether human or animal, appeared as if frozen in time. With the Industrial Revolution and the invention of machines, the perception of motion and speed for humans changed completely. The creation of new means of transportation and, consequently, new branches in the field of sciences for their development created gave rise to new techniques for representing motion and speed in 20th-century art. The design of new fast-paced modes of transportation also evolved with the help of technology, along with the architectural design of buildings directly connected to them.

1. Representation of Speed in Art

1.1. Early Techniques for Depicting Motion in Art

The scene of a group of prehistoric hunters chasing deer (fig. 1) in Los Caballos, Spain, is a wall painting dating back to 5,000-2,000 BCE in which human and animal forms are depicted in motion. In this scene, motion is conveyed through the form of both humans and animals. The greater the distance between their legs (for animals, front and rear legs and for humans, right and left), the greater the speed at which they are moving. The first deer from the top appears to be moving slower compared to the last one, which seems to be running towards the hunters. Additionally, the second person from the top appears to be in a stationary position compared to the last person, who appears to be directing himself towards the deer.

The same technique used in wall paintings is applied to the pottery art of Ancient Greece to depict motion. A notable example is the pottery depicting the Olympic games of the era. In the first pottery depiction, the Arcadian Olympians are shown running in the stadium. In this case as well, the way the limbs and torsos of the athletes are depicted creates the sensation that they are in motion. An important detail is the slight difference in the opening of the legs between the first and last athletes. This detail is significant from the perspective of the potter since the first athlete, being in the lead, signifies greater speed, and thus a wider leg opening, compared to the last one (fig. 2).

Figure 1: Hunters chasing deer **Figure 2**: Arcadian Olympians

1.2 Representation of Mechanical Motion and Speed:

The human experience of motion in space and time was transformed with the discovery of the automobile after the Industrial Revolution. It was during this time that artists tried to depict the sensation of motion and speed of forms, but primarily of objects, in their works of art. This marks a notable difference compared to previous periods because artists of the "technological world" sought to portray the speed of objects, particularly those driven by machines, as they became an integral part of people's everyday lives.

Repetitive figures, numerous parallel and intersecting lines, and sometimes curves were the techniques used by artists to convey the sensation of speed. A century after the Industrial Revolution, in 20th-century Italy, the Futurist movement emerged as the first artistic movement to attempt to incorporate the experience of bodily movement into the realm of art. Futurism celebrated the mechanical element, emphasized dynamism, technology, noise, and its proponents found more beauty in the industries of the 20th century than in classical art.

Giacomo Balla is one of the most well-known painters of the Futurist movement, even though his early painting style distanced itself from Futurist principles. In 1912, he created "Dynamism of a Dog on a Leash" (fig. 3). In this work, the sensation of motion is created through the multiplication of the dog's legs, as well as it’s owner’s and the leash. To convey the movement, the artist used many continuous, dynamic lines, with vanishing points in the direction the figures are moving, to intensify the notion of their speed.

From 1913 onwards, Balla fully identified with the Futurist movement, and his works focused on representing motion, with speed and automobiles as primary themes. He removed the objective reality from his paintings by designing dynamic lines and curves that fragmented and multiplied. A typical work is "The Automobile in Motion" (fig. 4), depicting the movement of cars racing down Via Veneto in Rome. Color is almost absent, and the entire intensity is created through bold monochromatic contrasts and metallic lights. Spiraling vectors and large curves spread across the entire canvas symbolizing the rate of acceleration and the movement of wheels of the car. The space is also modified and fragmented by dynamic lines and different vanishing points with the aim of fully incorporating the dynamic motion and speed.

Figure 3: Dynamism of a Dog on a Leash

Figure 4: The Automobile in Motion

Motorcycles were also a source of inspiration for the Futurists. Mario Sironi created one of the most famous paintings of the movement in 1918 (fig. 5). The painting is titled "The New Man" and depicts a rider moving at high speed on a motorcycle. A few years later, in 1923, Fortunato Depero also created a painting that depicts a rider on a motorcycle and titled it "Steadfast Motorcyclist at Speed" (fig. 6). The techniques used by Mario Sironi create the notion that the figure in his painting is moving at a higher speed than the one in Fortunato Depero's painting.

The first and most fundamental difference is observed in the posture of the body. In the first painting, the figure is depicted by the artist as slouching, which is something that all motorcyclists do in practice when moving at high speeds to reduce air resistance. The second difference is in the way the distorted shape of the motorcycle is depicted. Finally, the dynamic and parallel lines that follow the figure create the sensation that the rider and the motorcycle are "piercing" through the air.In the second painting, all three techniques are absent, and the only thing that gives the notion that the figure is in motion is the dynamic and curved lines in the background.

Figure 5: The New Man

Figure 6: Steadfast Motorcyclist at Speed

1.3 Motion in Sculpture.

One of the most globally renowned depictions of motion in sculpture is the Greek marble representation known as the Winged Victory of Samothrace (fig 7), in which the visible force of the wind appears to impart a dynamic quality of movement to the delicate yet powerful form of Nike, the Greek goddess of victory. Almost 2,000 years later, the Futurist artist Umberto Boccioni created the work "Unique Forms of Continuity in Space" (fig 8), featuring muscular shapes seemingly leaping amidst fiery waves of energy. Greek artist Kostas Varotsos crafted "Runner" (fig 9) in 1988, using metal for the sculpture's frame but prominently featuring glass. The placement of parallel layers of glass near the ground, the sculpture's call from the vertical axis, and the vague outline of the connections all create the sensation that the sculpture is in motion. As Varotsos put it, "What interested me was the figure of the person in constant motion." In all three cases, the artists aim to convey the sensation of movement within the human figure, employing different techniques based on their individual perceptions of motion and speed. The reason these three artists have different perceptions of movement lies in the fact that they lived in three entirely distinct periods. In the Nike of Samothrace, the sense of movement is emphasized through the body's posture and the depiction of the force of the wind. Umberto Boccioni takes a more abstract and dynamic approach to speed, highlighting the energy required for motion. Meanwhile, Kostas Varotsos, by using glass, creates the sense of a shifting form in motion.

Figure 7: Winged Victory of Samothrace

Figure 8: Unique Forms of Continuity in Space

Figure 9: Runner

2. Design of High-Speed Transportation.

The period of the Industrial Revolution was a time of rapid social, political, economic, and technological developments for humanity. The steam locomotive, the automobile, and the airplane were three of the most significant innovations in 20th-century transportation. Over time, the technology of these modes of transportation evolved, leading to the development of aerodynamics. Aerodynamics is a sector of fluid mechanics that studies the laws describing the flow of air (generally gases) around various bodies and, conversely, the motion of bodies within the air. Aerodynamics is a science that developed in the early 20th century, closely tied to the increase in the speed of transportation, as one of its purposes is to optimize the design of vehicles, which is related to reducing air resistance during motion.

2.1 Car Design.

The first indications of aerodynamic design began when the first racing cars were created, which had a spherical shape to minimize resistance and weight (fig. 10). The first realistic effort to incorporate aerodynamics into the design of "everyday" cars occurred with the emergence of the "Art Deco" decorative art movement in the 1920s. The key features of Art Deco cars were curved shapes and flowing lines, which added dynamism to the car's design (fig. 11). External design began to focus on simpler yet dynamic lines and the introduction of geometric and modern elements.

Technological advancements and the development of computers also had a massive impact on every aspect of car design. For the first time, car design was influenced not only by consumer or designer aesthetics but also by the science of aerodynamics. Reducing fuel consumption and saving energy, combined with increased demands for safe, comfortable, and pleasant passenger transportation, became the guiding principles in the design and construction of every new vehicle used for everyday human needs.

Figure 10: Photo from the 200-miles race, 1922

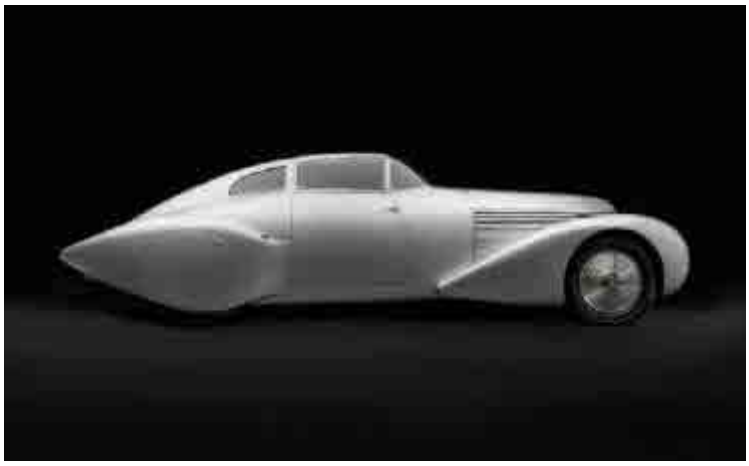


Figure 11: H6C Dubonnet Xenia 1938

The increased and diverse needs of modern society have led automotive industries to create various types of vehicles. Each category of car has a different design influenced by its intended use. For example, the design of city cars, which aim to reduce fuel consumption and save energy while providing increased safety, comfort, and pleasant passenger experiences, differs from that of 4x4 off-road vehicles (fig 12), which prioritize engine power for off-road capability.

Figure 12: 2023 Best seller city cat (left) and 4x4 (right)

However, there are car categories where the pursuit of reduced aerodynamic resistance is aimed at increasing their maximum speed—these are supercars and hyperarcs. Curved lines and oval shapes dominate their design, which are characteristics associated with high-speed performance.

Scuderia Ferrari is a historic company founded by Enzo Ferrari in 1929 as a racing team and has a rich and successful history in motorsports. The vehicles they initially created were purely racing cars until 1984 when they introduced the GTO model (fig 13), one of the early supercars of its time. As a luxury brand with global reputation their cars are instantly recognizable because of their unique and iconic design that blends aesthetics with aerodynamics.
The GTO's external design is characterized by oval shapes and curved lines, with a small exception in the squared bumpers.

Figure 13: Ferrari GTO

In 2019, Ferrari released the hybrid-hyper model SF90. The main differences in external design compared to the GTO are found in the bumpers, the rear spoiler, and the number of vents used for cooling the car's internal components (engine, brakes, etc.). The front bumper of the SF90 (fig 14) resembles an arrow with a curved tip to "pierce through the air" and features three vents: two on the edges for air passage and cooling the engine and the high-voltage battery, and one in the center for cooling the electric motor. Additionally, there are two intake vents above the rear tires that direct air to the intercooler. Finally, the rear bumper of the car has openings for air exhaust. While the external design principles of these cars have a common foundation, the differences in details are what make the SF90 appear faster.

Figure 14: Ferrari SF90 Stradale

The exterior aerodynamic design of all cars belonging to the super and hyper cars categories follows the rules mentioned above, and their design differences are purely based on aesthetics and the marketing strategies of each company.

2.1 Train Design

The exterior design of trains has undergone aerodynamic improvements aimed at reducing air resistance and conserving energy. The design of a train depends on its use and the speed at which it operates. Figure 20 shows a side view and the shape of the front of different types of trains. Shapes like f1, f2, and f3 are commonly used for trams, f2 and f3 for subways, f4 for medium-speed, and f5 for high-speed trains. It is observed that the design of medium-speed and high-speed trains (figure 15 and 16) incorporates better aerodynamic design with pointed and curved noses to "pierce" through the air and reduce resistance. The exterior design of trains also has an aesthetic character.

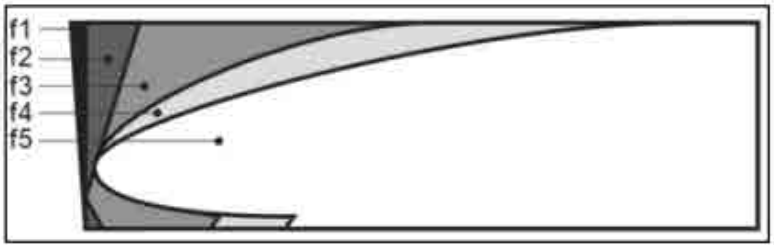


Figure 15: Comparison of side-looking silhouettes of different types of trains

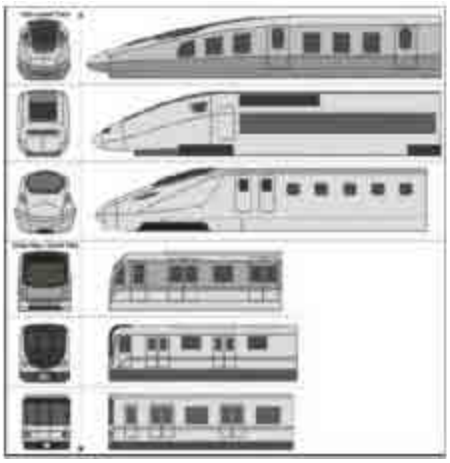


Figure 16: Comparison of front view and side view of high-speed trains and subway trains

The exterior design of trains also has an aesthetic character. Although trams are not considered fast as they do not reach high-speed velocities, their exterior design must be attractive and convey a sense of speed, encouraging people to choose them for their commutes.

3. The visualization of speed in architecture form

Modern architects draw inspiration from every aspect of human activity and incorporate elements from them into their architectural compositions. The fast-paced lifestyles of contemporary people are heavily dependent on the speeds of the transportation means they use in their daily lives. Cars and mass transit systems are the primary modes of transportation for the average person, and therefore, the design of spaces and buildings closely related to these transportation modes, such as train and bus stations and car expos, can be influenced by the design of these vehicles. The characteristics of fast design in architecture share many similarities with the design of high-speed vehicles, such as curved lines and oval shapes, which create an aerodynamic design in buildings and convey a sense of speed and velocity.

3.1 The Audi ring

The Audi ring (fig 17) at the 2011 Frankfurt Motor Show was designed by Schmidhuber + Partner and was a temporary building that hosted the Audi car exhibition on the "Market" square in Frankfurt. The building was 100 meters long, 70 meters wide, and 12 meters high, featuring an integrated 400-meter test track to allow visitors to test drive the exhibition vehicles. The track extended over two levels, affecting the circular shape of the elevation, which is why it was named the Audi ring. The architectural design is characterized by flowing shapes and curved lines both inside and outside the building. On the exterior facade of the building, architects created recesses and openings that resemble those of the SF90. Specifically, on the front of the building, where the track is visible on the second level, there is an opening that, due to its elongated oval shape and red glass, resembles a car's headlight. Although the building may be stationary, the shapes and dynamics it creates give the impression of speed and velocity.

Figure 17: Audi ring

3.2 Napoli-Afragola High-Speed Train Station

In 2017, the new railway station (fig 18) in Naples, Italy designed by Zaha Hadid Architects, was completed. It serves as a major station for southern Italy, connecting four high-speed lines, three regional lines, and one local railway lines. Architects designed the building as an urban bridge connecting areas on either side of the railway, with the primary goal of minimizing passenger distances within the station. The building's floor plan resembles an "S" shape, stretching 450 meters and ecological sustainability is the aim. Curved lines and oval shapes dominate both the exterior and interior of the building. Various large openings and recesses throughout the building, combined with dynamic curves, evoke the aerodynamic design of the Ferrari SF90, and both ends of the building resemble the front of a high-speed train. All these features give the impression that the building has flow and an aerodynamic design that makes it appear fast.

Figure 18: Napoli-Afragola High-Speed Train Station

3.3 Kinesis Honorable Mention 2013 Burnham Prize Competition:
The Kinesis project (figure 19) was designed by LC Architects for the urban design competition "Next stop" in 2013, with the theme of designing functional and sustainable bus rapid transit stations in Chicago, United States. While the project received an honorable mention in the competition, its dynamic design set it apart. According to the architects, the design of the stations is inspired by the fluidity and speed of modern urban life. The station's canopy is made of elastic membrane, which, due to its curvature, appears to flow over the station. To support it, architects used inclined metal elements that connect with a glass strip. All these elements and their interconnectedness give the station, although stationary, a sense of speed.

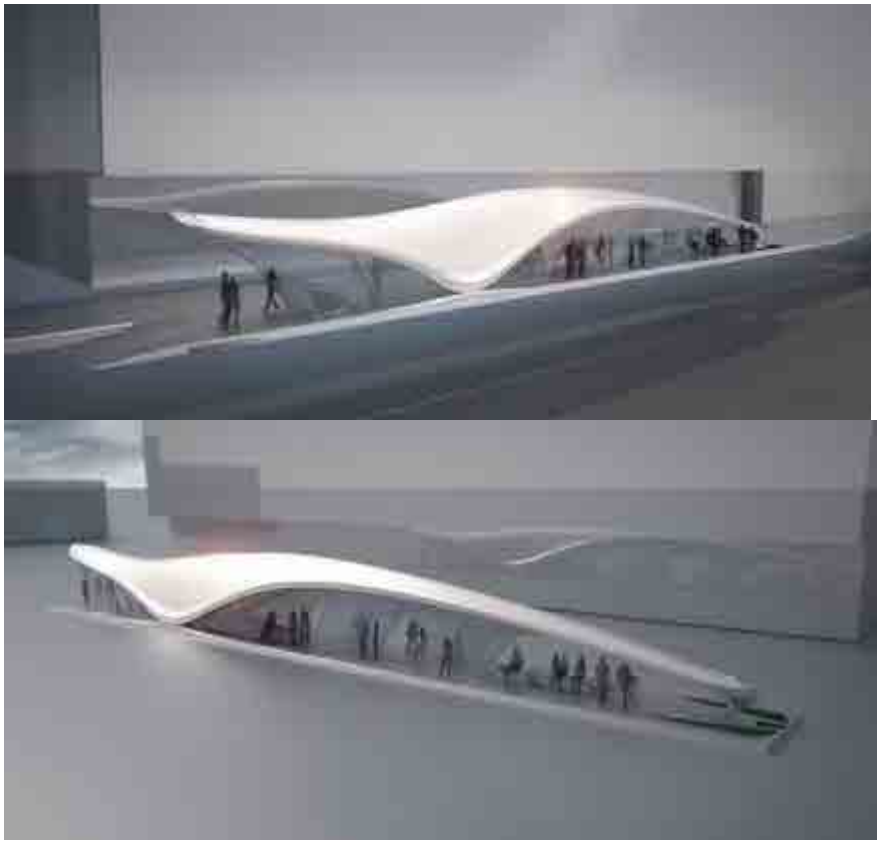


Figure 19: Kinesis

Conclusion
The techniques for depicting motion in art have evolved significantly over the centuries. Initially, artists conveyed the sense of movement in their works through depictions of humans and animals, emphasizing body postures and clothing motion. However, with the advent of the industrial revolution and the emergence of fast modes of transportation, the perception of motion underwent a radical shift. During the Futurist art movement, artists introduced innovative techniques to capture motion and speed. They utilized curves, parallel and intersecting lines to create a tangible sense of velocity in their artworks. These artistic developments mirrored society's evolving relationship with technology and the growing significance of speed in the modern world. The first interaction between automobiles and art occurred during the era of the "Art Deco" artistic movement, which significantly influenced the aerodynamic design of cars. Since then, automotive aerodynamic design has gone through various stages of evolution, aided by computers. The principles of the aerodynamic design of fast transportation, cars and trains, prioritize the reduction of aerodynamic resistance to enhance maximum speed and energy efficiency. Scuderia Ferrari, renowned for its distinctive and iconic car designs, seamlessly merges aesthetics with aerodynamic performance. The aerodynamic design of trains is primarily influenced by their top speeds; the faster they are, the more curved their design becomes. The design characteristics of aerodynamics in fast modes of transportation, are specific and clear. The curved lines, oval shapes, and the sense of fluidity they create have now become synonymous with the concept of speed. The architectural design of new buildings associated with the concept of speed, like the above-mentioned works, can follow the principles of fast design to convey a sense of speed. Designers/architects effectively utilize the design principles of fast modes of transportation, mainly on the facades of buildings, to convey in their works the sensation of speed and the illusion

to the observer that the building, although stationary, is fast. The fluid forms of the Audi ring, the dynamic curves of the Napoli-Afragola station, and the more futuristic design of Kinesis demonstrate that architectural design has the flexibility to capture the essence of speed.

References

Julian Bell, 2015, Mirror of the world: A New History of Art, Translated by George Labrakos and Eleanna Panagou, Greece, METAIXMIO, p.9, 70, 379
Yve-Alain Bois, Benjamin H. D. Buchloh, David Joselit, Hal Foster, Rosalind Krauss, 2018, Art Since 1900, Translated by Julia Tsolakidou and Dimosthenis Kouloythros, Greece, EPIKENTRO, p. 105
Attributed to the Euphiletos Painter, ca. 530 B.C, The Games in Ancient Athens: A Special Presentation to Celebrate the 2004 Olympics, The Metropolitan Museum of Art < https://www.metmuseum.org/exhibitions/listings/2004/games-in-ancient-athens/photo-gallery>
Mario Sironi's 1918 drawing 'Uomo Nuovo' (New Man) and Fortunato Depero's 1923 painting 'Motociclista Solido en Velocita' (motorcyclist solid in speed), < https://thevintagent.com/2018/05/03/art-and-the-motorcycle-2-the-futurists/>
Kostas Varotsos, 1994, The Runner II, Hilton, Athens Greece < https://costasvarotsos.com/webportfolioitem/show/20/>
Ageridis G., Bergeles G., Rossos K., 1993, Aerodynamics of the car, Athens, TEKDOTIKH SELKA EM
Sedgwick Michle (1972), Early cars, London: Octopus books, p. 86
H6C Dubonnet Xenia, 1938, Rolling Sculpture: Art Deco Cars from the 1930s and 40s, Oct 1 2016 – Jan 15 2017, North Carolina Museum of Art < https://ncartmuseum.org/exhibition/rolling-sculpture-art-deco-cars-from-the-1930s-and-40s/ >
Topgear.com, 2023, Fiat 500, Viewed August 2023, <https://www.topgear.com/car-news/top-gear-advice/top-gears-top-10-city-cars >
Landrover.com, 2023, Defender 90 HSE, Viewed August 2023, <https://www.landrover.gr/defender/models>
Ferrari.com, 2023, *Ferrari GTO,* Viewed September 2023 < https://www.ferrari.com/en-EN/auto/gto>
Ferrari.com, 2023, *Ferrari SF90,* Viewed September 2023 < https://www.ferrari.com/en-EN/auto/sf90-stradale>
Wang Zhan, Xu Gang, Yan Lei, 17-19 May 2017, Research on Train Exterior Design Oriented to Natural and Humanistic Environment-friendliness, 7th International Forum on Industrial Design, Viewed August 2023 < https://iopscience.iop.org/article/10.1088/1757-899X/573/1/012085/pdf >
Schmidhuber.de, 2023, Audi Ring, Viewed August 2023 <https://www.schmidhuber.de/audi-iaa-2011/ >
Zaha-Hadid.com, 2023, Napoli-Afragola High-Speed Train Station, Viewed August 2023 < https://www.zaha-hadid.com/architecture/napoli-afragola-high-speed-train-station/ >
lc-a.uk, 2023, Kinesis, Viewed August 2023, < https://www.lc-a.uk/kinesis/ >

V

NEW MEDIA AND NEW TOOLS IN DESIGN

Designing with AI: Early impact of developing technologies on urban and architectural design

Milos Milovanovic
Arcadis Architects (Canada) Inc. Calgary, Canada
milos.ereb@gmail.com
milos.milovanovic@arcadis.com

Abstract: In the past two years, AI development has taken a fast pace in the sphere of visualization techniques resulting in a range of different models, the most notable being Midjourney, DALL-E and Stable Diffusion. In architectural practice there were many individuals that explored the sphere of designing with AI, and in the past months this expanded to a range of companies whose practices are incorporating AI software to advance design techniques which can be seen in a wide range of Autodesk and Adobe products and add-ons. This paper explores the possibilities of controlled design and its meaning in architectural practice as well as less controlled results which have flooded the social media and imagination of many professionals and artists. Themes of meaning, repetition and semiotics in design are also beginning to emerge as dominant ones when the symbiosis of AI software with drawing methods becomes popular worldwide and they can also offer a glimpse into understanding a future role of artificial intelligence in design practice.

Keywords: Identity, artificial intelligence, design, control, semiotics

Introduction

During the end of the last year and through 2023, theme of AI influence in creative industries has been largely active, with media delivering the results of AI research as groundbreaking. It started on the wrong terms, with obscured linguistics, meaning, and a lot of media hype with misleading information and false promises (or threats) about the theme in question. Since this topic might be important in many spheres of life, media coverage has been as promising as ever for this one as for other subjects of similar significance. This may not be the best way to start the research results presentation, but it documents the current status of AI discussions in the contemporary media environment.

Yet many artists, creative industries professionals, or just tech-savvy individuals have embraced easily-accessible products and language models and started producing creative results late last year (2022). Internal developer forum discussions about the ethical use of the models were rare, but not non-existent, although the dialogues upon which the author of this text mostly stumbled upon were mostly about technical aspects of using the new AI programs. On the other hand, creative professionals' communities started actively debating the ethical approach, which also emphasized copyright issues in the use of AI. Since then, there have been discussions about the implications of artificial intelligence on the creative work and there is no end in sight to these discussions.

It can be argued that it is hard to avoid contributing to the analysis of every topic regarding this subject, but the focus of this paper is primarily regarding the potentials of improving speed and/or quality of work in architecture and other visual arts where creative industry professionals can use AI models as tools for expression. Nevertheless, some basic principles upon which AI models are represented or work will be discussed, and ethical assumptions will be presented, but only for the sake of highlighting a possible stumbling block, redirection or encouraging a new development in AI.

Rise of AI Models and its Implications

As different news of rising models based on advanced algorithms started taking place, the first differentiation was that of visual and language AI models, and while one was gaining advantage and popularity as a form of expression, many were unwary of what the models were based upon until ChatGPT became popular and the public became informed of the large amounts of data, sometimes copyrighted content, being "seen" and used by AI in training. All models undoubtably produced impressionable results, and became the talking points of the day. Until this point, artificial intelligence was used as a sort of mystic way to gain results, while dissection of the results came later. Although there are rather distinct differences between each model, most of them are used by completing text prompts, which would also obscure our understanding of the process, as the model was responding to textually expressed "wishes" of the consumer. Situation is rather different, and even topics regarding the use of the words "artificial intelligence" are now open. Question would be whether we conceive our models with us conscious of the material and inputs used, or are we drawing results based on advanced algorithmic understanding of consumer wishes, for which we draw answers from huge databases. Answer to this question will not be discussed here, as it is also not in detail understood by the author of this paper, but one fact

is that the machine learning process is complicated enough for most models that it cannot be reversed and the results are not predictable, but mostly generally directed by some basic postulates of how the model works (Geeky-gadgets, 2023[1]).

Ethically, a few questions would be of essence. If the model is using copyrighted work, “learning” from it in ways that are faster and producing results that make the original work invaluable or devolve its value, wouldn’t the copyright holder be the largest shareholder of any value that the model produces? Readers will notice that the question if the model should be used at all is skipped here, as more AI generated images were created in one year than photographs in the whole span of the technique's existence (Designboom, 2023[2]). Other questions arise from this one. What is the value of AI art? We are faced with several essential elements that it consists of. One is that it undoubtably produces results based on human imagination (as even a random train of thought can be widely assumed to be human imagination). The other is that it has unpredictable results that can very much vary in quality. That quality is tested to be significantly dropping as more and more AI generated images are being used as a database for training existing AI models (Decrypt, 2023[3]). As a defective, or limited gene pool in human, or any other species' procreation, AI art is not a good quality source producer. This statement might be disproven or argued at least, but several researches have shown otherwise (Shumailov et al, 2023 [4]). This would lead to a dramatic conclusion that, although AI generated art has undoubtably produced a high volume of results in a very short amount of time, it also shows that its productivity and value, unlike photography for example, is rather insignificant at the current moment. Author states this as being aware that photography, whichever genre it belongs to, after a certain amount of time, gains at least a value as a documentation of human life and existence, whether the technique was of artistic intentions at all. We can further argue that this will be disproven in the future by AI art, but it remains as something highly doubted.

But, even if we consider even 1% of AI generated art as something that has use, holds value, represents human creativity (which the author of this paper does not doubt), we come to many complications of copyrights that many models are based upon. In all its probabilities, it is possible that only models that are specific and clear of the content used for training, with all the royalties for the creative art used for it, will “survive” in the future. We might also hold them as the only “fair” models in existence. The last spiral of questions that arise from these statements is the actual content used, for example, a glimpse of a few kilobytes of the picture preview that is not copyrighted, and is perceived that kilobyte by an algorithm punishable if it leads to the knowledge of recreating the master strokes of the painters or light capture techniques of the photographers. In the authors' perception, this will guide the future application, legal rights, and probably direct results from the models that “survive” first legislations from the legal systems around the world.

Last thing to consider would be, if the application of the technology results in products that are required in the market, will they even be stopped by any legislation process? It seems we are the witnesses of the first interesting discussions in a field that will develop, but the path to clear answers, language terms, and forms of use is long and will take much longer than it was needed to market and sell ChatGPT.

The development of AI generators also involves addressing ethical considerations such as bias, fairness, and responsible usage. Researchers are actively working on techniques to mitigate biases and ensure that AI generators are used in a responsible and inclusive manner.

Potentials are uncovered

One of the clear advantages of creating with AI was representing ideas in architecture that launched its popularity. It was the generation of different content that seemed not so bound by technique, but only imagination. It seemed as if the first wave came with mythological subjects, with many works representing new spatial potentials, as if human beings haven’t discovered them, or they have, and forgotten them, and now we’re rediscovering the space we were missing. As per my earlier research, we can find the new space ready to be explored by artists, this time, not a physical, but digital space (Milovanović & Vasilski, 2021[5]). “Mythical spatial potentials are places that generate mythical narratives and that are also usually left out from conventional analysis of a location. They are, again, activated by artists and other cultural workers and interpreted in a specific moment in time and in their unique context, which largely depends on the psychology and emotions of the interpreter—and this mythical perspective cannot be objective or neutral (Aravot, 1995[6]).

We have seen and experienced and influx of different styles, interpretations and creativity pouring out of the AI model users, in a good and possibly bad way that it was seen as new mythical interpretations of life are arising. It would go well with broader definition of myths. “Mythology, in other words, is psychology misread as biography, history, and cosmology” (Campbell, 2004[7]). Author also dwelled into exploration of these tools and some of the first impressions were collected in the first series prompts made by Midjourney AI, and showcased in SciFi Landscapes series. They consisted of a few themes (with comments directly copied from first notes):

The Streets. Tried to see what kind of street atmosphere the AI could give and was not disappointed. A bit bloody on the first one, but I loved the details on all of them, particularly when all of the results was just one figure. It's nice to have unexpected results.

Ready for Battle. Although not my favorite theme, nice crossing of human figures and vehicles. Some strange overlaps in the results, but the raw effect is nice. Scenes are too static, guess that's on my writing part. Orbital Harvesters and Miners. Hard to choose, a lot of variation which really leads me to think that some aspects of conceptual design can be made effectively by AI. Of course, that's not all there is to it, but this theme was enjoyable. Not sure what would be the logic behind the harvesters and what they are harvesting, but still fun.

Children. One of my favorites, but also the hardest subjects to work on. Somehow AI looks at them in a different way and from different perspectives depending on the canvas. The whole sci-fi landscape doesn't look too bright for them, but as I got through the ideas, I found more variations on the subject, and will represent them also, as they were filled with much more light.

Shipwrecks and Debris. Finally started post-processing a bit, and these figures seemed like a good start. There's a lot to learn from fellow artists, but this start with Enki Bilal inspired artwork has been a real pleasure. Created scenes can create stories, especially when they are showing of process of either growth or decay.

Orbital villages. Another setup for stories and weird orbital/planet landscapes.

These subjects covered topics opened by machine learning algorithms that were able to produce very fast many visual results that were of my personal interest. This Midjourney work started to be seen as something that can be refined and made content that would be connected by a theme, story or subjects.

Technology review

There has been rapid development of AI generators, especially in the fields of natural language processing. Current focus is on developing AI generators in several areas. Text-to-image generation is being pushed to new limits by models. In terms of creative design, visual storytelling, and content creation, these models can create highly detailed and realistic images from textual prompts. Researchers are striving to make the generated images look more realistic and achieving higher quality. For creating high-resolution and diverse images that resemble real photographs, techniques such as progressive growing of GANs (Generative Adversarial Networks) and StyleGANs (Style-Transfer Generative Adversarial Networks) have been developed.

Image generation under specific conditions: The purpose of this research is to develop AI models that can generate images under specific conditions. For example, generating images of specific objects, scenes, or even images of certain styles, colors, or attributes. This allows for more controlled and targeted image synthesis.

Few-Shot and Zero-Shot Learning: Advancements are being made to enable AI generators to learn from a limited number of examples (few-shot learning) or even generate images based on descriptions without any prior examples (zero-shot learning). This helps to address the data scarcity challenge and allows for more flexible and adaptive image generation.

Controllable Generation: Researchers are exploring methods to provide users with more control over the generated output. This includes techniques like interactive conditioning, where users can modify specific attributes of the generated images in real-time, allowing for fine-grained control and customization.

It's important to note that the field of AI generators is evolving rapidly, and new techniques and advancements are being made regularly. These developments hold great potential not only in artistic and creative applications but also in various practical domains such as design, advertising, virtual reality, and more.

During April 2023, the company, Arcadis, encouraged employees to gather and sum up collective knowledge and share their work and ideas based on AI. What is summed up here is a collection of different techniques, models, styles used and collective collaboration on making a better workspace for everyone involved, or who wanted to evolve with AI work. These were the topics that dominated the scene, mostly different models and possibilities:

Stable Diffusion - Stable Diffusion is an artificial intelligence (AI) model that creates images based on text prompts. It is a deep learning, text-to-image model that generates detailed images conditioned on text descriptions. The model can also be applied to other tasks such as inpainting, outpainting, and generating image-to-image translations guided by a text prompt. Stable Diffusion is primarily used to generate images based on text prompts and to alter existing images. It can create photorealistic images that are difficult to differentiate from the real thing and images that are tough to tell apart from hand-drawn or painted artwork. The authors claim that the model was trained on many images from the internet, primarily from websites like Pinterest, DeviantArt, and Flickr. Stable Diffusion is open source, so anyone can use it. This paragraph was partially modified by Aria AI, to showcase the example of narrative being used to describe other AI models.

Stable Diffusion results are possibly the most varied and worth every effort spent. It is possible to train specialized models, like LORA, to direct its image generating capabilities, merge it with simple 3D models and if produce consistent results, as was showcased at the internal company presentation. What is being made possible is using basic models to navigate to a completed solution in renders (segmentation function, for example using Control Net).

DALL-E is a text-to-image model developed by OpenAI. It uses deep learning methodologies to generate digital images from descriptions. The model has the ability to create realistic images and art from natural language prompts. OpenAI has also released subsequent versions of DALL-E, including DALL-E 2, which further enhances the capabilities of the AI system.

Midjourney is also a text-to-image generator, recognized from its early start as an AI tool with more distinct style than other generators. It has come through five version with tools expansion. As a product, it has less maneuvering space than its competitors, which was explained by a smaller number of randomized results, a fact hard to confirm. Its tool expansion is ongoing and will start to include 3D object manipulation. Also noteworthy is that authors of Midjourney claim that their model has a distinct style from its first algorithms, something that they do not want to change in the future.

Other text-to-image generators would include Nvidia Canvas App AI powered painting, Adobe Firefly (tested), and many more. One of the text AI generators that attracted a lot of attention was OBC-Teki chatbot for Ontario building code, as it would be, in theory, of great help to professionals that have various assignments and tasks which require navigating into building codes. This is a point in which these models come close to practice, also not replacing individual consultants or designers, but helping them in the design or working drawings process.

Other AI tools were in symbiosis with image generators, mostly based on input from natural language. Stable Animation by Stable Foundation and collaboration between Midjourney and Runway are promising to be animating generators, capable of high-quality production and reduction of all undesirable effects on prompts.

Regarding architecture, two models also stand out, one is Spacemaker, made as an addition to Revit, which helps organize space, input a large number of option for the designers and help them control the results by constraints given by the user (which would be translated as something similar as embedded prompts). In 3D modeling the testing has begun on Opus.ai, a model that directly transforms and generates results in 3D space, obliging user with the capability to perceive the model and even start an animation in real-time, selecting and modifying elements by textual prompts. Our approach to narrative could be significantly influenced by the quality of those results, as AI will search, but also generate results which could one day become search engine topics for better iterations.

Security concerns

As with the question of copyright, the question of overall security in usage of AI arose as companies started probing the possibility of implementing it into the workflow of their structure. IT experts agree that any model that outsources the input results and output too is a huge security concern. One of the reasoning, under which

many emerging AI research based companies agree upon is the definition of the input databases and also capability to use them and improve them in a closed environment. Such stance on the subject can actually be seen as a new perspective of developing models that are internally used and customized. Nvidia is moving in that direction, as in the last reports and remarks from it's headquarter we hear more about AI development as a future company product, to lease their computational power to the industry, rather than announcing new generation of individual graphic cards.

As the implementation of AI models is directly connected to many industries, this concern is, among other topics, very relevant and engaging subject (Columbia Engineering, 2023[8])

Conclusion – Practical Implementation

During this overview of the subject, we referred to the many possibilities AI has to offer, but also showing the limits of its implementation. In architecture design process, capabilities are still limited to producing simple 3D models which can be trained to produce various (but not always successful) results using LARA for example. In Midjourney usage we can see the possibilities of building a small base of references, or starting points for the design and exploring some atmospheric capabilities for the rendering process. All these results would still need to be heavily modified and influenced by the designers. Some architects will see that as an advantage and many are branding their practice as AI operated, but we still do not see practice being overwhelmed by a finished product that can easily be implemented to save working hours. In future, it can most certainly be seen as a developed product that can transform the design and working drawings process. Although it seems like a technological boom, many of these aspects will take years, if not even decades to completely transform the way professionals work.

---

[1] Geeky Gadgets, 2023, *How are AI art images created?* Geeky Gadgets, viewed on 4 October 2023

[2] Designboom, 2023, *From 150 Years To 12 Months: How Ai Created 150+ Billion Images* Designboom, viewed on 7 September 2023

[3] Decrypt, 2023, *AI Learning From AI is The Beginning of the End for AI Models,* Decrypt, viewed on 25 June 2023

[4] Shumailov, I, Shumaylov, Z, Yiren, G, Yarin, P, Papernot N, Anderson, R, 2023, *The Curse Of Recursion: Training On Generated Data Makes Models Forget*, arXiv e-prints, doi: 10.48550/arXiv.2305.17493

[5] Milovanović, M, Vasilski, D, 2021. *Mythology as a Driver of Creative Economy in Waterfront Regeneration: The Case of Savamala in Belgrade, Serbia*. Space and Culture. 120633122110386. 10.1177/12063312211038688.

[6] Aravot, I. 1995, *Narrative-myth and urban design*. Journal of Architectural Education, 4(2), 79–91.

[7] Campbell, J, 1991, *The power of myth*. Anchor Books.

[8] Columbia Engineering, 2023, *Artificial Intelligence (AI) vs. Machine Learning*, Columbia Engineering, viewed on 18 September, 2023

Toward the Utility of BIM Models

Igor Svetel
University of Belgrade, Innovation Center, Faculty of Mechanical Engineering, Serbia
isvetel@mas.bg.ac.rs ORCID: https://orcid.org/0000-0001-7821-1412

Abstract: Building Information Modeling (BIM) technologies have recently reached a high level of organization and are largely based on international standards that regulate both the structures of information models and the processes of their creation and management. Numerous data formats have been developed that enable automatic checking of model quality. However, the entire development so far treats information only as a highly structured collection of data.

If we take into account that information implies communication and that information does not exist without the receiving party, we will understand that all existing BIM models represent only a source of information, and that the information itself is created based on the needs of the recipient. The current solution for determining what information is needed by those using BIM models are information requirements. Up until now, they were realized as classic documents, now they get a formalized form that is computer interpretable in the form of the Information Delivery Specification standard. The format enables specification of four prerequisites (why, when, who and how) that are specified by Level of Information Need standard as the way to ensure relevance of BIM information.

The paper explores ways of providing greater support for the needs of information recipients, which would enable more successful use of complex BIM models and enable obtaining relevant information in the process of daily use of BIM models for real events in the building during its construction or use.

Keywords: BIM; information requirement; information delivery specification, common data environment

1 Introduction

Lately, BIM technologies are experiencing a great upswing and have reached a level of maturity where many guiding principles are defined in international standards. This situation enabled intensive development, and today extremely complex BIM models are developed every day. New technologies that automatically add the necessary parameters to the model and automatically control the quality of the models are developed contributing to the efficiency of the process. In the context of all this progress, it is interesting that the concept of information is not given enough attention (Svetel 2022).

The concept of information appeared in the 1920s with the development of communication technologies. In communication participants use symbols (patterns that based on previous agreement convey a meaning). By selecting one symbol and sending it over the communication channel the sending party excludes all other available symbols that can be chosen. As symbols are added, the number of possible symbol combinations decreases and the information becomes more precise. The final mathematical theory in which symbols are free from any psychological aspects and reduced to formal patterns was presented by Claude Shannon (1948). This theory enabled the subsequent intensive development of information technologies.

Most of today ICT systems base their organization on the concept of DIKW (data, information, knowledge, and wisdom) pyramid (Ackoff 1989). According to it, data consist of raw, unorganized symbols that denote items in the real world. Information presupposes the organization of data in a structure that provides additional meaning that goes beyond basic references to objects or concepts.

The mathematical model only quantifies information, and the DIKW concept provides notion that information should have some formal structure. Both do not answer how information is created or how it becomes useful. One of the solutions to that problem dates back to classical antiquity and originates from the works of Aristotle (Sloan 2010). The principle of “Seven Elements of Circumstance” asserts that to provide valuable argument it is necessary to answer to seven questions: Why, Where, When, What, With Whom, By Whom, and How. The same concept appears in journalism as the Five Ws principle which establishes questions who, what, when, where and why as essential in gathering information.

The connection between information and communication, which was postulated in the first works on the subject of information, is often overlooked in modern ICT systems. Long before today's ubiquity of information technology Peter F. Drucker (1970) pointed out that formal and impersonal information processes will separate people and will require efforts to restore the human relationship embodied in communication. He noted that the person who receives information is the one who communicates. Without the receiving party there is no communication, no information, but only the physical process of sending signals. The communication is on the side of receiving party. In order for the information to be understood, there must be some prior agreement

about the used symbols. Information should be relevant to the recipient and must take into account the motivation (values, beliefs, aspirations) of the recipient to be valuable, otherwise it is treated as noise.
Since the beginning of the development of BIM technologies, information has been treated in accordance with the mathematical theory and concept of the DIKW pyramid. Accordingly, various data structures were developed for the representation of construction objects, among which the IFC format stands out as the basis of the entire open BIM development. The principle of open BIM development is the creation of technologies that are vendor neutral and that enable the seamless connection of all BIM tools.
Currently, BIM technologies are mostly used to create classic documents such as 2D drawings and tables, primarily because clients and regulatory bodies prefer such a representation of construction objects. However, the model-based approach to managing all information in the AECO (architecture, engineering, construction and operation) sector is becoming more and more popular. In parallel with this development, the role of information is receiving increasing attention. The ISO 19650 series of standards lays the foundation for information management throughout the life cycle of the built asset. According to ISO 19650-1 standard information is defined as "reinterpretable representation of data in a formalized manner suitable for communication, interpretation or processing" (ISO 2018). This definition treats information according to the DIKW pyramid concept. And other concepts that determine information management in the BIM environment, such as information container (named persistent collection of information) and information model (collection of structured and unstructured information containers) support seeing information as a formal data structure. The only concept that considers the issue of information usage and reminds of "Seven Elements of Circumstance" is information requirement defined as "specification for what, when, how and for whom information is to be produced" (ISO 2018).
This paper is a continuation of research on the nature of information and its use in the BIM environment (Svetel 2022). Chapter 2 shows the techniques that are currently available to users of BIM technologies for expressing information requirements, while chapter 3 describes information technologies for displaying information that have been developed recently and are based on the principles of open BIM. Chapter 4 discusses how these technologies relate to the presentation of the information presented in this chapter.

2 Information requirements

Within the BIM processes defined by the ISO 19650 standards, information requirements occupy a central place around which information management takes place. The party initiating the project should clearly specify its information requirements at the very beginning of the process by specifying organizational, asset and project information requirements. During the process of design, construction or operation of the building, a separate document, the so-called exchange information requirements (EIR), is created for each phase (milestone), and defines the information needs and their granularity in detail for actual phase. Teams that deliver information can create their own information requirements for business coordination with other teams or to create requests for information about construction products from their manufacturers. Information requirements are most often created as traditional documents or spreadsheets using templates that allow a scope and content of BIM models to be defined in advance.
The Information Delivery Manual (IDM) is the oldest method, developed to define Model View Definition (MVD), a subset of full IFC specification that fits particular AECO process, and is specified as an ISO 29481 standard (ISO 2016). To describe particular AECO workflow the IDM uses a formally structured document that defines a process and the required data. The document contains an interaction map, a process map and one or more information exchange requirements. The process map defines information boundaries, activities and their order. The interaction map lists all roles and their transactions. Exchange requirement is a document that describes in natural language specific information exchange. Recently, a computer interpretable format (idmXML) was developed (ISO 2022b). The new IDM format consist of use case, business context map (process map, interaction map), and information requirements. The scheme gives an extensive description of information requirements, but it is directed toward implementation of software solutions that support particular MVD.
Data Dictionaries is a technology that has been in development for a long time and has only recently taken shape that is beginning to be practically applied (ISO 2022a). It was developed as a method for structuring general information in the AECO sector by defining relationships between concepts. Technology presupposes existence of multiple dictionaries, where the concept belongs to one dictionary and can be linked to concepts in other data dictionaries. Each concept is specified by their properties, allowed values, units and translations. The current implementation of this technology, buildingSMART Data Dictionary (bSDD), contains interrelated concepts from Industry Foundation Classes (IFC), classifications and standards.

Product Data Templates are attempt to specify an industry agreed data structure that describes construction objects. It is a structured set of property groups and properties which describe the function and construction of a group of similar products. Previously, it was accomplished through spreadsheets. According to the ISO 23387 standard, PDT should be implemented within the data dictionary (ISO 2020b). Since PDT represents an empty structure that is subsequently filled with values, it can be used to accurately describe the requirements for materials or products.

The Level of Information Need, under development as the ISO/DIS 7817 standard (ISO 2023), was developed with the aim of specifying the content of the exchange information requirements (EIR) more precisely. The standard identifies four prerequisites that shall be considered for each information exchange: purpose of information (why), milestones (when), actors (who), and objects (what). The standard only specifies the need to consider the four prerequisites, but does not specify them. The application is not limited to milestones, but can also be applied to stage, phase, or data drop. The Level of Information Need specifies extent and granularity of geometrical information, alphanumerical information and documentation. It also provides framework for verification and validation of information content. The verification process ensures the completeness of information, while validation ensures that the ways of using information are met. One of the reasons for defining the level of information needs is to prevent the delivery of too much information. However, one should not insist on the minimum amount of information because the amount of information delivered for a specific object may be greater than that determined because it is needed for some other purpose within the same information exchange.

The Information Delivery Specification (IDS) is a buildingSMART standard under development (buildingSMART 2023b). It is a computer interpretable format developed for the specification and verification of information requirements. The IDS is an XML file that contains metadata and list of specifications. The description, purpose, and milestone are a part of the metadata and plain text is used as a representation, without a predefined structure. The description part specifies who will use the IDS, why it is created, for what projects, etc. The purpose clarifies what the IDS will achieve and the milestone explains the phase of the project to which the IDS applies. Each specification describes one entity in the model (wall, window, etc.) and contains metadata, applicability, and requirements sections. Metadata can include a description field that explains why a particular element is important to the project and instructions that define who is responsible for providing the information and how. Applicability and requirements are structured sections formatted as facets. Each facet describes information that a single entity in the model can have, using fixed parameters. If used in an applicability section, the facet defines the information required for the specification to be applicable to the entity. If used in the requirements section, the facet defines information that an entity needs to have. The first version of IDS supports basic information and relationships in IFC common to all disciplines. More advanced information requirements will be considered in future versions.

IFC property templates are new concept introduced in IFC4 (buildingSMART 2020) that enables users to define custom properties and element quantities and link them to elements in IFC model. They can be used to specify how information should be delivered in an IFC model.

It is one thing to define the information requirements, another to get that information. The next chapter outlines some of the technologies that make this possible.

3 Information fulfillments

The IFC format is oldest among IT solutions to represent information about assets in AECO sector and represents the basis around which all open BIM technologies are developed. It is conceived as both a conceptual data schema and an exchange file format. As the conceptual data schema IFC defines classes that represent concepts related to the built assets during their lifecycle. Concepts include objects, processes, actors, and controls. The IFC data schema was developed to cover all possible cases that appear within the life cycle of AECO asset, but for practical use, predefined segments of the entire specification, so-called Model View Definition (MVD), corresponding to specific AECO processes are used. The IFC standard is in constant development in order to adapt to perceived shortcomings and expand to new areas of application. It represents the basis around which all other information technologies are developed. Latest official version is IFC4.3 (buildingSMART 2023a).

The IFC format is mainly used to display the model of the whole object and the structure of the data schema is thus defined. Technically, it is possible to create a file that describes only one element of the entire object, but the file structure must contain all the classes defined by the data schema as project, site, building, building storey, etc. At the same time, both due to the limitations of BIM modeling software and the need not to overload the model with unnecessary data, the models are divided into individual AECO disciplines such as

architecture, construction, MEP, energy efficiency, etc. For the purposes of mutual cooperation and conflict control, individual profession models are related in a so-called federated model.
In order to control access to the latest and relevant information by all stakeholders, the ISO 19650 standard recommends the use of common data environment (CDE) solution and workflow. CDE workflow presupposes that all information containers (named persistent set of information retrievable from some computer based source) should be in one of four states: work in progress, shared, published and archived. Containers should have unique identification (GUID), predefined codification of the container name (filename), assigned attributes that determine their suitability (status), revision and version, and classification. The CDE must allow information containers to transition between states, provide secure access to the containers, guarantee ownership of the container, and record the name of the user and the date when a particular state transition occurred.
Since ISO 19650 gives only general recommendations, an attempt to provide more specific recommendations was made by German DIN SPEC 91391 (DIN 2019). Subject of specification are CDEs which implement the information management according to BIM-Level 2 as defined in ISO 19650-1 standard (ISO 2018). This means that the smallest unit of information for data exchange is information container, and applications built on top of CDE, like Model viewers, enables access to lower levels of models like objects and properties. The content and structure of information containers should be defined in early stages by the party that initiates project using exchange information requirements (EIR) and verified by content creators in BIM execution plans (BEP). Access to CDE functions and information exchange takes place via the Internet. The access to information containers is achieved through metadata. Metadata can be encoded as a file name through predefined naming convention or associated with a container as additional information. The method of defining and checking the functionality of CDE should be based on creating CDE use cases, preferably using IDM. Open, software-independent formats should be supported, and support for native formats can be additionally provided.
Conceived as a central repository representing the "single source of information", CDE is progressively viewed as a distributed system of interconnected local CDE solutions (Werbrouck et al. 2023). To support seamless transition of data between different CDEs, building Smart is developing OpenCDE API standard (building Smart 2022). It is a collection of API (application programming interface) standards. At the bottom is Foundation API which ensures a unique way of user authorization and authentication across all CDEs. Documents API provide a unique way to manage documents such as uploading, downloading and searching documents. BCF (BIM collaboration format) API supports consistent issue management across different CDEs. Latest addition is the Dictionaries API that provides uniform access to the buildingSMART Data Dictionary.
The ISO 19650-1 standard (ISO 2018) specifies that at the end of the project information containers in the CDE should be reviewed, the information required for operation phase should be translated into the asset information model, and the rest should be archived. The ISO 21597-1 standard (ISO 2020a) defines structure of the Information Containers for Linked Document Delivery (ICDD) which was initially intended as a container format for archiving. The container format consists of three folders packed together in ZIP file. On top of the folders is a header serialized as RDF file that relates to the container ontology and the linkset ontology. The payload folder contains actual documents. The ontology folder contains two files serialized as RDF that define the concepts of container and links that are used in header file. The payload triples folder contains files serialized as RDF that define linkset ontology which specifies links between documents or elements within documents. The container enables the storage of included or remote documents and ontologies can be extended to meet any use case.

4 Toward model utility

The insistence of the ISO 19650-1 standard (ISO 2018) that the creation of an information requirement must be the first step in the entire information management process in a BIM environment represents a significant step towards understanding the use of information. Unfortunately, a lot of people in AECO sector still do not understand the significance of that process. Analyzes show that many participants in the BIM process use existing completed information requirement templates and only change the data according to the new project, and often this work is done by consultants, and not by the party initiating the project. Also, the final stage of the process is not sufficiently supported and models are accepted without checking and are often not even used later, but new models are made instead (Ford 2020).
The Level of Information Need standard (ISO 2023) clearly specifies requirement that question why, when, who, and what shall be considered for information exchange. The recent review of techniques for information requirement specification (Tomczak et al. 2022) shows that idmXML and Level of Information Need provide full support for the description of purpose and involved actors, while IDS provide full support for description of purpose and partial for actors.

Since the IDM is oldest method to describe information requirements, when only IFC was the method to exchange information it was oriented toward developing reduced sets of IFC specification that suits particular needs (MVD) and as such was reduced to classes and properties that IFC provides. The IFC data schema contains numerous representations of actors. The ifcActor is a general concept that defines all stakeholders involved in a project. It refers to concepts of ifcPerson, ifcOrganization, and ifcPersonAndOrganization. The ifcPerson contains all formal data that identify a person, and roles that are assigned to them. The roles are related to design, construction and management tasks that occur during the life of the building, like architect, civil engineer, construction manager, manufacturer, facility operator, client, etc. The subclass of ifcActor is the concept ifcOccupant that defines the form of occupancy of a property, with the roles mostly related to the type of ownership. It is also possible to assign user defined role. Since IFC4 ways to express time resources in IFC was significantly modified. Concepts like IfcDate, IfcTime, IfcDateTime, and IfcDuration have been added and concepts from fcTimeSeriesResource were merged and now it is possible to express many time related concepts in IFC. Until recently, the ability to use all the resources provided by IFC was limited by the support provided by commercial applications for importing and exporting IFC files. With new developments such as CDE and ICDD that allow the storage and exchange of different information formats while providing open BIM principles, it is possible to use the full expressive power of IFC to provide all kinds of support for information requirements and this expands the possible use of IDM.

In contrast to IDM that is methodology to describe whole workflows, the IDS (buildingSMART 2023b) is methodology to express requirements for particular information exchange. The extent of IDS is not predefined. It can have a metadata an only one specification that defines information requirements for one particular object in the model, and it can also define information requirements for whole phase in the project. This flexibility and rich metadata content makes it perfect candidate for expressing information requirements that express why the information is needed, by whom, where and when it is applicable, how it will be applied, in addition to the “what” that is currently the only preoccupation of majority BIM users. The standard is under development and to meet the above requirements it would be practical to develop predefined classes for use in metadata instead of the current plain language.

ICDD technology, developed to support effortless access to archived documents, provides many more possibilities. As metadata provides access to components within individual documents, it is possible to use ICDD to dynamically create containers for specific use cases. Since it enables connection with external ontologies, the use of Link Data technologies can significantly expand the scope of usable information beyond the scope of data on the construction object itself. The only drawback of Link Data technology is the high effort in implementation.

From the presentation so far, it is clear that all current BIM technologies support traditional workflows based on documents just in digital format. Current IFC is optimized for file-based exchange and each file contains data about the entire structure of the construction object. Also, current CDEs support container-based federation rather than data-based federation. The shortcomings of the existing approach have been noticed and efforts are being made to overcome them. BIM Maturity Level 3 envisages distributed, web-based, interoperable, interdisciplinary exchange of information between stakeholders throughout the life cycle of buildings. Instead of monolithic data structures more flexible structures are needed allowing smaller discrete exchanges. Current efforts to develop the IFC5 version are directed in that direction (van Berlo 2021).

At the current level of BIM development, exchange of information is just exchange of information containers, not particular information that is valuable to someone, at specific time and for specific purpose. Since the development of BIM technology is moving towards a modular architecture that would allow access to specific data, the topic of information use is gaining importance.

5 Conclusion

Technologies that enable properly structured set of required data to be delivered at the right time to the right person are still under development. In the meantime, attention should be paid to defining information requirements and using all available techniques to create structures that computers can process, such as IDS or idmXML. Also, with completed models, it is not only necessary to check the presence of all the required data, but also whether the model can be used for everyday needs. In this way, the need to provide data in the models that can be used to obtain relevant information will be strengthened and it will be possible for various, now experimental, technologies to become available on the market.

Acknowledgments: The results presented in this paper are the result of research supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia under the Agreement No: 451-03-47/2023-01/200213 from 03.02.2023.

References

Ackoff, R. (1989) 'From Data to Wisdom', *Journal of Applied Systems Analysis*, 16, pp. 3–9.
buildingSMART (2020) Industry Foundation Classes 4.0.2.1 Version 4.0 Addendum 2 Technical Corrigendum 1, https://standards.buildingsmart.org/IFC/RELEASE/IFC4/ADD2_TC1/HTML/, accessed 5 September 2023.
buildingSMART (2022) OpenCDE API standards, https://github.com/buildingSMART/OpenCDE-API , accessed 5 September 2023.
buildingSMART (2023a) IFC 4.3 ADD2, https://standards.buildingsmart.org/IFC/RELEASE/IFC4_3/HTML/, accessed 5 September 2023.
buildingSMART (2023b) Information Delivery Specification standard, https://github.com/buildingSMART/IDS , accessed 5 September 2023.
DIN (2019) DIN SPEC 91391-1 Common Data Environments (CDE) for BIM projects - Function sets and open data exchange between platforms of different vendors - Part 1: Components and function sets of a CDE; with digital attachment, https://www.din.de/de/wdc-beuth:din21:302483139 , accessed 5 September 2023.
Drucker, P.F. (1970) *Technology, Management & Society.* New York: Harper & Row.
Ford, J., (2020) 'Why it's time for a BIM reboot' *BimPlus*, 28.04.20 https://www.bimplus.co.uk/why-its-time-bim-reboot/ , accessed 5 September 2023.
ISO (2016) ISO 29481-1:2016, Building information models - Information delivery manual - Part 1: Methodology and format, https://www.iso.org/standard/60553.html accessed 5 September 2023.
ISO (2018) ISO 19650-1:2018 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling — Part 1: Concepts and principles, https://www.iso.org/standard/68078.html, accessed 5 September 2023.
ISO (2020a) ISO 21597-1:2020 Information container for linked document delivery — Exchange specification — Part 1: Container, https://www.iso.org/standard/74389.html, accessed 5 September 2023.
ISO (2020b) ISO 23387:2020, Building information modelling (BIM) - Data templates for construction objects used in the life cycle of built assets - Concepts and principles, https://www.iso.org/standard/75403.html, accessed 5 September 2023.
ISO (2022a) ISO 12006-3:2022 Building construction — Organization of information about construction works — Part 3: Framework for object-oriented information, https://www.iso.org/standard/74932.html, accessed 5 September 2023.
ISO (2022b) ISO 29481-3:2022 Building information models - Information delivery manual - Part 3: Data schema, https://www.iso.org/standard/81261.html, accessed 5 September 2023.
ISO (2023) ISO/DIS 7817.2, Building information modelling — Level of information need — Concepts and principles, https://www.iso.org/standard/82914.html accessed 5 September 2023.
Shannon, C. (1948) 'A mathematical theory of communication'. *Bell System Technical Journal*, 27(3), pp. 379-423.
Sloan, M. (2010) 'Aristotle's Nicomachean Ethics as the Original Locus for the Septem Circumstantiae', *Classical Philology*, 105(3), pp. 236–51.
Svetel. I., (2022) 'Information in Architecture in the Digital Age', *in On Architecture Philosophy of Architecture Proceedings*, Belgrade: STRAND, pp. 71-78.
Tomczak, A., van Berlo, L., Krijnen, T., Borrmann, A. and Bolpagni, M. (2022) 'A review of methods to specify information requirements in digital construction projects', *IOP Conf. Ser.: Earth Environ. Sci*. 1101 092024 doi:10.1088/1755-1315/1101/9/092024
van Berlo, L., Krijnen, T., Tauscher, H., Liebich, T., van Kranenburg, A. and Paasiala, P. (2021) 'Future of the Industry Foundation Classes: towards IFC 5', *In Proc. of the 38th International Conference of* CIB W, 78, pp. 11-15.
Werbrouck, J., Schulz, O., Oraskari, J., Mannens, E., Pauwels, P. and Beetz, J. (2023) 'A generic framework for federated CDEs applied to Issue Management', *Advanced Engineering Informatics,* 58, 102136, https://doi.org/10.1016/j.aei.2023.102136.

Re-shaping the "future past" of architectural design: AI-generated details and concepts

Jovana Tošić, Ph.D.
Professor of Vocational Studies, Information Technology School – ITS, Belgrade, Serbia
jovana.tosic@its.edu.rs, ORCID: https://orcid.org/0000-0001-6779-9310

Abstract: AI-generated design, Virtual reality (VR), and Augmented reality (AR) are (still) innovative digital technology concepts and are particularly significant in translating 3D interior/architecture models into a spatial and (essentially) realistic experience. This method is increasingly used in interior and architectural design practice, concept development, and design presentation to clients. What is the significance of AI-generated design in shaping an interior design concept?

The paper presents three innovative ways of developing concepts in interior design, using AI-generated details, rendering images, etc. Three different interior design projects are analyzed: 1) *Uncanny Spaces* – A virtual apartment of a Swedish designer, Christoffer Jansson, 2) *Moco Concept Store* (*Moco Museum*) by design studio Isern Serra in Barcelona, and 3) AI-generated engravings in *Dragon Flat* by Tsuruta Architects, in London. These selected characteristic projects have a different methodology for implementing virtual, AI-generated design into interior design. The first interior design project (*Uncanny Spaces*) is a virtual design of an apartment presented as a real, built one, aiming to examine the "Instagram aesthetic" in the form of a social experiment; the second one (*Moco Museum*) is an interior design concept developed from a computer-generated image by a digital artist Six N Five, and the third one (*Dragon Flat*) is his first completed interior design project to incorporate AI in the form of a design detail as a leitmotif. Besides aesthetics, in these three (experimental) projects, the question of social context is essential to consider.

The main aim of the paper discussion is to explain how interior design concepts intertwine virtual, AI-generated design and traditional design and how their popular "Instagram aesthetics" impact space users' experience, social media users, interior designers, architects, and digital artists. What are the advantages of using AI tools in architectural design, and what is lacking in this design process? In re-shaping the "future past" of architectural design, which values does AI-generated design bring?

Keywords: interior design; AI-generated design; experiment; Instagram-aesthetics

1 AI-generated architectural design values

A general definition of an AI tool would be one that "mimics the cognitive functions associated with human beings, such as learning and problem solving" (del Campo, 2022, p. 7). AI programs that translate textual instructions into images as possible architectural concepts often offer surprising solutions, combining contemporary architecture with various references taken from historical architecture, which opens up numerous questions and challenges architectural positions. These AI-generated architectural solutions represent a global trend in 3D digital art, inspiring architects, interior designers, and industrial designers, and are often described as "familiar yet different, comprehensive yet exotic, alien yet beautiful" (del Campo, 2022, p. 13).

Figure 1 Floral bookshelf's design @ambre_ai

Another group of AI spatial designs popularised through social media are "dreamscapes" or "dream-like spaces". These spaces of poetic compositions mostly take historical architectural references from architectural styles or iconic architecture and translate them into a contemporary context in a way they become "likable" on social media platforms. (Tošić, 2022, p. 289) They are experienced primarily as a utopian, illusory, phantasmagorical space between temporary and permanent, reality and dream, built and virtual, tangible and intangible. (Tošić, 2022, p. 291) There are numerous examples of famous authors of "dreamscapes": Polish architect Monika Woźniak (Antireality), British 3D artist Peter Tarka, Argentinian digital artist Ezequiel Pini (Six N. Five), etc.

Figure 2 Dreamscape made by AI digital artist Ezequiel Pini (Six N. Five) @sixnfive

The inclusion of AI as a new tool in architectural design has several main goals: genesis of architectural (hybrid) form, developing floor plans, optimization of spatial organization, etc., and the key to all successfully achieved aims are endless iterations. The positions of interior designers and artists can be divided into three directions: two opposing positions and those in between. While some look positively at AI-generative tools, encouraging their use due to the possibility of endless variations and integrating the collective into individual imagination, others critically reflect on the lack of interactivity between AI and people and the insufficiently humane approach to design (Spiller, 2022, p. 141). However, many interior designers and architects are experimenting with their projects, including AI-generated design at various levels.
The questions raised in this paper refer to the application of AI tools in the design process of interior architecture, more precisely, to those questions related to aesthetics, sensibility, perception, and the experience of space, and the effects of transposing digital concepts into physical space.

2 Analysis of AI-generated interior design concepts
According to specific criteria, three different examples of integration of AI tools and technologies in the interior design process were analyzed: 1) *Uncanny Spaces*, 2) *Moco Concept Store (Moco Museum)*, and 3) *Dragon Flat*. Characteristic examples were selected to show three different methodologies for implementing AI-generated design into interior design. Criteria for interior design analysis are:

- Percentage and level of use of AI tools/technologies in interior design;
- Manner of implementing AI technologies into the design process;
- Impression on the (real or virtual) observer;
- Compatibility of virtual and authentic experience of the space.

1) *Uncanny Spaces* is a virtual apartment project as a multi-layered social experiment. The project of a Swedish designer, Christoffer Jansson, is presented on a private Instagram profile as a realistic interior of an apartment being renovated.
The parameters that guided Jansson during the development of the idea for the project refer to the trend of social media: "Insta-famous designs," "Instagram aesthetic," etc. With his approach, Jansson takes a critical look at the mentioned parameters and simultaneously examines the home as a status symbol and a metaphor for the

idealization of identity by presenting the perfect apartment on social networks, as well as the ultimate range of photorealism and illusory interior rendering, at the same time including Instagram followers in the design process.
Jansson modeled a 3D digital replica of his apartment in Stockholm, with the exact square footage, details on the walls (cracked wallpaper and electrical outlets) (Hahn, para. 4), as well as personal details and clothing, to make the renderings consistent and photorealistic. The part that is not a replica of his apartment is represented by iconic pieces of furniture that complete the renders by placing them in the "Instagram aesthetic" category, such as - Ettore Sottsass's wavy Ultrafragola mirror or the Lovö dining table by Axel Einar Hjorth. (Hahn, 2023, para. 10)

Figure 3 Insta-famous designs – Ultrafragola mirror and Lovö dining table

The most extreme position for looking at the degree of implementation and impact of AI technologies in the interior design process is Jansson's point of view that the parameters guide the interior design trend according to which he conceived his project. In other words, it is more important how the interior looks in a square format image on Instagram (Fisher, 2023, para. 3) than how it is experienced in real space and time.
The parameters that Jansson set in creating the rendering are intended to attract the virtual observer's attention instantly. These are precisely the design and visual characteristics of Instagram aesthetics, which, according to Jansson, "is characterized by geometric or curved shapes, distinctive color schemes, tiled floors that form graphic patterns and clear contrasts between glossy and matte" (Hahn, 2023, para. 12). The difference in perception, in this case, is that the virtual experience is only the acquisition of the "idea of a space". (Fisher, 2023, para. 1) However, the degree of illusion in imitating the actual space that Jansson achieved with renderings reached the maximum, which was confirmed by the successful involvement of followers on Instagram in the design process of the apartment renovation, such as the choice of color during furniture restoration, as well as the fact that both fellow students at Konstfack university and a major in Swedish interiors magazine thought that the interior renderings were photos of the existing apartment.
With this experimental project, Jansson contrasted the values of the interior rendering that follows Instagram aesthetics and the importance of the physical experience of the space, stating that the parameter of Instagram aesthetics ignores the spatial organization and spatial aspects of the interior and that the priority is for the elements in the image to work harmoniously, which negatively affects the experience of the same space in reality. (Hahn, 2023)
2) *Moco Concept Store* is an interior project as a physical manifestation of the digital, virtual concept of space and its transposition into a completely intoxicating experience of space. *Moco Concept Store* is a retail space for the Moco Museum in Barcelona, which exhibits collections of unique art items by modern artists - Damien Hirst, Kaws, Yayoi Kusama, Jeff Koons, Keith Haring, Jean-Michel Basquiat, etc. Argentinian digital artist Ezequiel Pini, who runs the multidisciplinary design studio Six N. Five, in collaboration with the Spanish interior design studio Isern Serra, transposed a drawing of a virtual "dreamscape" space using the CGI (computer-generated imagery) method into an authentic interior.
Therefore, in the *Moco Concept Store*, the concept was fully formed using AI design tools, and the aim was to transform the virtual experience of CGI-created dreamscapes into a tangible experience of the physical interior space. In the interior design process, no AI technologies were used. Still, the effects of the space and the

characteristics of the materials and surfaces from the rendered drawings were fully imitated using traditional methods.

In the process of integrating the digital image into the real space of a retail store, interior designer Isern Serra was guided by the idea that the impression gained by observing the rendered image is transferred through the characteristics of the material to the tactile and visual, to the haptic experience of the space of *Moco Concept Store*. To achieve the effect of uniform, ultra-smooth surfaces as in renders, for walls and other smooth surfaces in the interior using pink micro-cement. (Levy, 2023)

Figure 4 *Moco Concept Store* interior's smooth surfaces, covered in pink micro-cement

The virtual experience of digitally created spaces and architecture of Six N. Five is described as "minimal, surreal, and tranquil environments, pastel dreamscapes, and vivid, unthinkable architectures" (Gasior, 2022, para. 3). In the virtual space, this experience is built with elements of Instagram aesthetics, so exactly those elements were transferred to the *Moco Concept Store* interior design process: pastel pink walls, floors, and ceilings, curved shapes, ultra-smooth surfaces, series of large columns, as well as a few pink cylindrical plinths used to showcase products, custom spotlights and niches dramatically backlit. Also, the store's interior aimed to be compatible with the museum "to be inclusive, enlightening, inspiring, and empowering while making art accessible to all" (Dassa, 2023, para. 3).

Figure 5 Between virtual and real: Elements of "Insta-aesthetic" in *Moco Concept Store* interior

Ezequiel Pini describes the success and coherence of the integration of AI technologies in the interior design process: "I had to combine the purpose of the store with the current architecture and stay true to the dreamlike world I had built in CGI, and thanks to Isern Serra, I think we succeeded." (Dassa, 2023, para. 4) Nevertheless,

given that the interior concept originates from the virtual dreamy world, the real and the unreal, tangible and intangible, are intertwined in the physical experience of the *Moco Concept Store*. Seen from the perspective of the author - a digital artist and interior designer, this is positive because it represents consistency to the concept and idea. Still, from the perspective of the virtual observer and real visitor, this blurring of boundaries can lead to confusion.

3) *Dragon Flat* is a project of a renovated London's Notting Hill apartment by the British interior design studio Tsuruta Architects. This is the first project carried out by this studio that integrates AI into the design process, and the resulting result is produced with CNC (computer-controlled cutting machines) in the interior itself.

In the interior design process, the *Dragon Flat* concept was not entirely shaped by AI-generated design. Still, the details, which largely shape the character of the apartment space, were obtained with the AI design tool DALL-E 2 (AI program that transforms text into images).

Interior designer Taro Tsuruta, using the AI program DALL-E 2 through the process of image generation from text instructions, came up with a solution for the appearance of the wall surfaces of the living room and the tatami room (a typical space in traditional Japanese homes). In the living room is a CNC router engraved in plywood panels in front of a grid of cupboards a map of the river Thames, while in the tatami room, the floral pattern of peonies etched into wall panels of white-washed oriented strand board (OSB).

Figure 6 A map of the river Thames in the living space

In making patterns for wall surfaces, Tsuruta experimented and, as a result, got unexpected but also expected solutions. According to him, AI-generated design is a process that offers infinite options but is necessary for the designer to control and make the final decision (Frearson, 2023).

Engravings of the floral pattern of peonies produced a contrasting texture effect. They shaped the home's identity and the interior's unique character in the Japanese style with references to the *Arts and Crafts* movement. The details of the pattern are the highlights and the materialization of the surrounding elements, so Instagram users asked questions to the interior design studio like - "how you treated the OSB... soap and lye?" (Tsuruta, 2023).

Figure 7 A row of engraved peonies in the tatami room

3 AI and architecture: Genesis of architectural form

A key architectural event that emphasizes the importance of integrating AI into architectural planning and design and opens a discussion on the future of AI as new media and tools in architecture is the 'Artificial Intelligence & Architecture' exhibition, which was held at the Pavilion de l'Arsenal, Paris, from 27 February to 5 April 2020. (von Richthofen, 2020) Curators of the exhibition were French architect and AI researcher Stanislas Chaillou, Bastien Dolla, and Anders Kvåle. A primary architectural issue in this exhibition's narrative was the essence of architectural design and creativity, analyzed through the question of the genesis of architectural form through the concept of 'latent space,' which leads to the heterogeneity of architectural form (Chaillou, 2020, p. 309). The exhibition expires the advantages of using AI tools in architecture, such as - accessibility, relevance, and new opportunities for architectural design, while in the creative process of creation and cooperation between designers and machines, as a positive outcome, the exhibition emphasizes - elements of surprise. (von Richthofen, 2020) However, Aurel von Richthofen's review of the exhibition draws attention to the shortcomings of this exhibition, which is essential for further research into the use and perspective of AI tools in architecture. The setting itself, both physical and virtual exhibits, is a linear narrative, not interactive, and one of the main drawbacks is that the exhibition does not allow visitors to create or connect their social media profiles. Then, placing the popularization of AI-generated concepts in architecture against the historical references and architecture of Le Corbusier, Buckminster Fuller, and Patrick Schumacher and emphasizing the linearity of the emergence of AI tools in architectural practice is not a direction that can lead to answers to the questions of the relationship between architecture and society in the context of the emergence of AI-generated architecture. In other words, in applying AI tools in architectural practice, architectural theory and architectural criticism should acknowledge a social (and political) dimension in their discourse (von Richthofen, 2020, p. 381).

To use the potential and possibilities of AI tools in form generation, architects must be designers, creators, theorists, and architecture historians. That is, they must be able to describe architecture to influence the shaping of the desired form. Algorithms of AI programs mainly function according to the principle of semantic descriptors, which is the opposite of the creation of form in parametric architecture (Chaillou, 2020), to which hybrid forms obtained by AI tools are primarily associated. The application of AI tools is a significant turning point in architecture, to such an extent that the French architect Chaillou named *semanticism* an "alternative movement in architecture" (Chaillou, 2020, p. 313).

4 AI and architecture: Elements of aesthetics and spatial experience

The examples of interior design analyzed in the paper refer to the social dimension of integrating AI tools into the architectural design process, an aspect neglected at the “Artificial Intelligence & Architecture” exhibition held in Paris. The main aim of the virtual apartment *Uncanny Spaces* project is a social experiment of inclusivity of observers in the design process – apartment renovation. The whole process of (imagined) renovation was published on social media, on an Instagram profile, including followers in the decisions and making the process so interactive. The emphasis is on the elements of "Instagram aesthetics," which leads to the neglect of spatial organization and a confused physical experience of space. This is an example of the blurred boundaries between photorealistic renderings and the illusion of digital versus real space, resulting from mindlessly following trends and popular design and aesthetics. *Moco Concept Store* is a project of complete collaboration between a digital

artist (Six N. Five) who uses AI tools and an interior designer (Isern Serra), transposed into an executed and functional interior of a retail store. In this project, different modern and traditional surface treatment techniques and lighting and shaping effects were achieved using the CGI (computer-generated imagery) method. The result erases the border between the virtual (intangible) and physical (tangible) experience of space. Also, the *Moco Concept Store* is a respectable example of "Instagram aesthetics" - millennial pink surfaces, curved shapes, ultra-smooth surfaces, series of large columns, etc. In the renovated apartment *Dragon Fla*t project, the DALL-E 2 - AI program that transforms text into images was used as a design AI tool. The details on the wall surfaces obtained by this method determined the character of the interior, alluding to some historical references, such as *Art and Craft* (due to the floral motif). This detail was integrated into a traditional Japanese room, which brought novelty to the Japanese interior design style and the social and cultural dimension in the context of Japanese homes.

5 Results and conclusions: Towards the new "future past" of architectural design

Summarizing the previous results of applying AI tools and technologies primarily in interior design, it can be concluded that there are already successful examples of translating an AI-generated concept into a finished interior. The application of AI tools in design is not new, but it has been underexplored as an experimental design form. One of the questions that arises, which is related to the integration of AI tools in the process of architectural design, is: Does the possibility of infinite iterations shape the meaning of the concept, or does it render the genesis of the architectural form meaningless / the shaping of aesthetics? According to Baudrillard, the event itself is unique and ephemeral, and when repeated, it becomes insignificant, as in the experiments of Marcel Duchamp (Baudrillard, 2002).

Is it necessary to place AI architectural design in a historical framework, referring to the so-called *semanticism* as a "movement in architecture," or is it still redundant to set the framework and boundaries of the context of AI in architecture? It is necessary to explore first all the social aspects and then the cultural and political context through the experimental design of the transposition of AI digital art into architecture. The application of AI in interior design and architecture has already resulted in executed projects that greatly influence architectural theory and criticism. Although these projects have a lot of common features (such as the emphasis on "Insta-famous" design and "Instagram aesthetic"), the interpretations of such projects can still be directed in parallel with the research of the possibilities and results of AI-generated design. The process of shaping architectural design's "future past" is still ongoing.

References

Baudrillard, J. and Nouvel, J. (2002) *The Singular Objects of Architecture*. Minneapolis: The University of Minnesota Press.

Chaillou, S. (2020) 'Latent architecture: a semanticist's perspective', *arq: Architectural Research Quarterly*. Cambridge University Press, 24(4), pp. 309–313. doi: 10.1017/S1359135521000087.

Dassa, N. (2023) 'The Moco Museum Concept Store by Six N. Five', 4 January. Available at: https://galeriejoseph.com/en/2023/01/04/the-moco-museum-concept-store-by-six-n-five-acumen-30/ (Accessed: 13 August 2023).

del Campo, M. and Leach, N. (2022) 'Can Machines Hallucinate Architecture? AI as Design Method', *Archit. Design*, 92, pp. 6-13. doi: 10.1002/ad.2807.

Fisher, A. (2023) 'Design news: could you live in a skip? Plus Collect craft fair and a cool walking frame', *The Guardian*, 27 February. Available at: https://www.theguardian.com/artanddesign/2023/feb/27/design-news-could-you-live-in-a-skip-plus-collect-craft-fair-and-a-cool-walking-frame (Accessed: 11 August 2023).

Frearson, A. (2023) 'AI-generated engravings feature in Dragon Flat by Tsuruta Architects', *Dezeen*, 21 June. Available at: https://www.dezeen.com/2023/06/21/dragon-flat-tsuruta-architects-ai-generated-engravings/?utm_source=Newswav&utm_medium=Website (Accessed: 15 August 2023).

Gasior, Z. (2022) 'Moco Concept Store by Six N. Five', *Thisispaper*, 2 November. Available at: https://www.thisispaper.com/mag/moco-concept-store-six-n-five (Accessed: 11 August 2023).

Hahn, J. (2023) 'Christoffer Jansson passes off virtual apartment as Instagram home renovation project', *Dezeen*, 16 February. Available at: https://www.dezeen.com/2023/02/16/christoffer-jansson-passes-instagram-home-renovation/ (Accessed: 10 August 2023).

Levy, N. (2023) 'Isern Serra turns renderings into reality to form pink Moco Concept Store in Barcelona', *Dezeen*, 15 June. Available at: https://www.dezeen.com/2023/06/15/moco-concept-store-interiors-pink-barcelona-isern-serra/ (Accessed: 11 August 2023).

Spiller, N. (2022) 'Architectural Intelligence: Colloquy of Mobiles Redux', *Archit. Design*, 92, pp. 136-141. doi: 10.1002/ad.2824.

Tošić, J. (2022) 'Dream-Like Spaces as Spaces of Likes: Towards the New Research Sources', in *European Architectural History Network, EAHN 2022: 7th International Meeting. Conference Proceedings*, pp. 289-299. doi: 10.20868/UPM.book.75019.
Tsuruta, T. [@tsuruta_architects] (2023) Images from our recently completed project, Dragon Flat … [Instagram] 5 July. Available at: https://www.instagram.com/p/CuUIefEM4H8/ (Accessed: 12 August 2023).
von Richthofen, A. (2020) 'Aurel von Richthofen, on tools, technology and society around the future of AI and architecture - Artificial Intelligence & Architecture Pavilion de l'Arsenal, Paris, France 27 February – 5 April 2020', *arq: Architectural Research Quarterly*. Cambridge University Press, 24(4), pp. 379–381. doi: 10.1017/S1359135521000075.

VI
CONFERENCE POSTER SESSION

- **I** Architecture – Design Challenges in Macro and Micro Scale
- **II** Technology and Architecture
- **IV** Art and Architecture
- **V** New Media and New Tools in Designarchitecture

Rethinking Cities: Architects as Agents of Chaos
Power, Planning and the role of the Architect in the Digital Era

Erez Ella
Founding Partner, HQ Architects
Lecturer, Architecture & Urban Design (.M.URB.DES), Bezalel Academy of Art & Design, Jerusalem
erez@hqa.co.il
ivi@hqa.co.il

Abstract: In our quest for boundless cities driven by technological advancement, we find ourselves facing an unintended consequence. The amalgamation of technology and capitalism has led to a conflicting situation where our lives are increasingly monitored and predicted, denying us the freedom we sought. However, amidst this challenge lies an opportunity for architects and designers to redefine their role in the era of automation and rapid change. **How can we use technology and social mechanisms (or any other definition for Capitalism) to defy boundaries, and design for the unexpected by promoting versatility and adaptability?**
In this essay, we will explore the shifting landscape of architecture and city-making and its relationship with technology. We envision a future where automatic processes will take over many of the architects' traditional tasks, necessitating a reinvention of their purpose. Emerging technologies and data integration stimulate and empower architects to enhance the design of boundless cities. By utilizing data-driven approaches in urban planning, employing digital tools and incorporating smart city technologies we aim to enhance the overall urban experience.
In this essay we will navigate the intersection of technology, capitalism, and architecture, unveiling a future where architects become the pioneers of trans-formative urban experiences and innovative boundless cities that truly reflect the zeitgeist and the values of its inhabitants.

Keywords: *Planning, Technology, Urbanism, Capitalism, Data, Digital*

1. Context

1.1 Cities and place-making in the Digital Age – The Data Evolution

Having abandoned the discourse of style, the architecture of modern times is characterized by its capacity to take advantage of the specific achievements of that same modernity: the innovations offered by present-day science and technology. The relationship between new technology and new architecture even comprises a fundamental datum of what are referred to as avant-garde architectures, so fundamental as to constitute a dominant albeit diffuse motif in the figuration of new architectures.
—Ignasi de Sola Morales[1]

Throughout history we have witnessed urban transformation in relation to the important pressure brought by new inventions and technological innovation, in order to address the challenges of rapid and complex urban growth.
The formation of large industrial metropolises has dealt with separate issues in different eras, reflecting the complications and challenges of their times. For example, some of the issues that emerged from 19th century's wide urban development included intensive urbanization, over-populated cities within industrialised environments, air pollution and sanitation as well as an increased demand for infrastructure and services in order to improve the everyday urban living conditions. In order to address these challenges, new technologies, which were an integral part of the industrial revolution itself, provided the solutions to resolve many of these issues.
Nowadays, rapid urban growth and the extensive development of mega-cities in combination with worldwide overpopulation, present significant challenges in various aspects of urban living. Some of them include the challenges posed in the development and integration of infrastructure and public transportation systems, the need to enhance connectivity and the application of smart mobility, providing innovative and affordable housing solutions, rethinking the post-pandemic healthcare environment and promoting urban wellbeing, as well as providing environmental sustainability solutions to meet long-term urban resilience targets. The greater the complexity, the more versatile the solution required. Urban transformation nowadays extends the network

[1] Branko Kolarevic, Architecture in the Digital Age, Design and Manufacturing, p.3, Taylor & Francis,1st Edition, 2003

of professionals and organizations that are involved in the development of cities and that influence the way we live. Urban planning and place- making is not just the job of the planner or the architect anymore; the city of the future requires a symbiotic and creative approach in order to resolve issues that reflect the complexity of the contemporary built environment. Currently, there is an emphasis on reinforcing collaborative efforts that involve a diverse network of stakeholders, ranging from technological companies and innovators to governmental and municipal bodies as well as citizens local activist groups, since it has become increasingly vital to address the complex challenges faced by cities and communities alike.

Taking into consideration all of the above that describe the new digitally influenced era, we need to re-evaluate the role of the architect, not only as a professional in the sector but as the enabler of communication and collaboration between different motivations, provocations, aspirations and gaps, an enabler for urban growth that encompasses open and inclusive public spaces that are interactive and engaging, cities and neighborhoods that can accommodate the needs of future urban living.

The significance of information in the era of digital transformation includes the production, communication, application, and control of information, among others. Digital technologies play a determining role in managing this information, and also have the ability to facilitate the integration of separate fields of expertise and processes in various relevant sectors, making their use an interdisciplinary process that requires collaboration and extensive networks and resources.

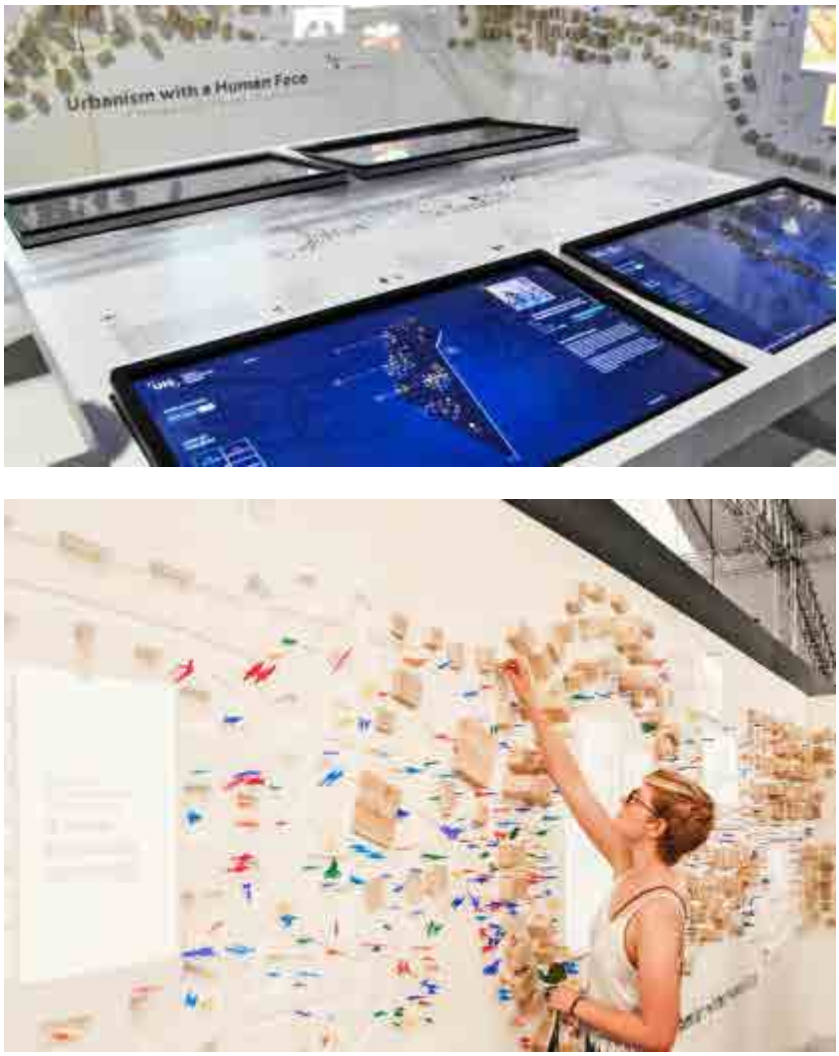


Photo 1. and 2. The Israeli Pavilion at the UN Conference HABITAT III, Quito, Ecuador ©HQ Architects

The 40 sq meter surface of the pavilion walls were designed as a wall survey. A scaled city composed of different urban spatial typologies was built on those walls, and the visitors were invited to choose a figure and pin it on their favorite spot in the city. This way the walls functioned as a continuous visual survey of urban qualities.

1.2 Planning, Power & Capitalism – Architecture and urban planning are strongly interrelated with financial operating systems, and most notably with Capitalism.
'*Cities are omnipresent in today's public discourse concerning the present and the future of global societies, in positive or negative terms: as places of innovation for some(inspiring new technological applications, creating lifestyles, business experiments etc.); of exploitation for others (reproducing income and wealth imbalances, phenomena of ethno-racial discrimination, etc.). Ambivalent attitudes towards the urban phenomenon reflect those towards capitalism itself, which is a socio-economic system historically vacillating between hope and despair, between a promise of prosperity and development and an experience of inquiry and injustice. As a result, in the current 'urban age', as it is customarily defined, cities are no longer viewed merely in relation to, but within capitalism, as its constitutive element.'* [2]
As cities continue to grow and urbanization accelerates, they shape and are shaped by capitalism, making this relationship between cities and capitalism strongly interrelated, dynamic and multifaceted. As architects and planners, we work and create within this particular socio-economic framework and employ our creativity to meet the challenges it poses in order to provide feasible, sustainable and versatile urban solutions.

2. Vision | Sustainable and Inclusive Cities

2.1 Climate change and sustainability is a driving force for the city of its future development. With extreme weather phenomena and unprecedented environmental circumstances, we are to take into consideration the important effect it has in building resilient cities. This is an area where data and technologies can play a key role in building efficient, flexible and future-proofed smart cities.

2.2 Mobility and enhanced connectivity – Digital Technologies are crucial for the future of urban mobility and smart cities transformation**.** In this rapidly changing yet interconnected world, smart mobility plays a pivotal role in the shape and function of cities, resilient urban growth and building efficient and sustainable cross city connections. Smart cities require smart mobility and enhanced connectivity. In order to achieve this, it is essential to have a collective understanding of the urban environment and how this interactive layer works. Connectivity is essentially based in continuous motion and incoming data. Therefore, an essential part of smart mobility is the process of detection and appreciation of the various relationships, resonances, associations, conveyances and inter-dependencies that firstly inform the design process and consequently shape the urban fabric and the built environment. Mobility is also closely aligned with sustainability and the need to provide enhanced connectivity that is also ecological and environmentally sustainable. This can be manifested by providing infrastructure for alternative means such as electric bikes, car sharing, as well as create smart mixed-use neighborhoods and urban environments that promote walking connectivity and a healthy lifestyle.

[2] Ugo Rossi, Cities in Global Capitalism, Series: Urban Futures. Introduction, Cambridge; UK, Malden; MA, Polity Press, 2017

Photo.3. The Or Sderot mixed-use residential complex © HQ Architects
The complex features an open parking floor with a lower-than-average number of parking spots aiming to minimize the dependency on private cars and the "wasted" area needed in the ground floor. In order to achieve this, the management will run a shared vehicles service, providing battery loading stations placed for electric bicycles and scooters, making this complex a more sustainable and healthier place to live.

2.3 Inclusivity and Social Equity: Smart cities are being influenced by broader socio-economic and institutional contexts. Smart cities of the future need to invest further in public and social infrastructure, in order to enhance the quality of life and well-being and provide opportunities for all. Investing in public and social infrastructure is an integral part of creating smart and socially inclusive spaces that can accommodate the needs of diverse populations and cater for local communities. Moreover, unlocking the potential of disused neighborhoods and breathing new life to disadvantaged cities and neighborhoods is key in creating more egalitarian and resilient urban growth, while also making wider urban destinations out of this process, which can also provide economic growth and cultural benefits for both cities and their inhabitants.

Photo 4 and 5. Lea Goldberg Residential and mixed-use scheme © HQ Architects
The urban renewal scheme in Lod focuses on enhancing connectivity, infrastructure and providing quality public spaces together with providing additional housing and commercial areas to enable families to live and work in the area. It opens marginalized spaces and vibrant walkable areas, setting the foundations for Lod's future growth and transformation into a destination, while boosting its real estate value. This is key as the Israel Regeneration Urban Renewal Authority, in order to proceed with the masterplan, relies on a sustainable

financial model mechanism. To enable this mechanism, we worked together with Lod Municipality to create social and public interventions to raise the land value before the masterplan's implementation.

3. The Architect's Role

3.1 Agents of Chaos

Redefinition of the Architect's Role: Digital technologies are providing unprecedented opportunities for redefining the role of architects in the production of cities and buildings, redefining the built environment. **No longer confined to being mere "servants of power," architects must embrace a new role as "enablers of values,"** or even **"agents of chaos."** To achieve this transformation, we need to utilize every available tool, skill, methodology, and business plan we have. Our goal as architects is to create urban environments that are resilient and adjustable, ready to absorb future shocks and stresses. By embracing and leading change, we have the opportunity to create cities that are smart, innovative and flexible. Cities that defy predefined programs, allowing the unknown to flourish and surprise. We are redefining what purpose-built means by creating spaces that can become catalysts for diverse opportunities, empower all members of society and enable communities to thrive.

3.2 Enablers of Values

Our Values
In our process to be agents of chaos, we create designs that embody and promote key values, such as 'Equality of opportunities', 'Freedom', 'Ecological awareness' and 'Resilience', among others. These values align with the broader goals of creating more inclusive, sustainable, and resilient cities; equitable urban environments where communities can prosper and thrive.

Tools and Methodology

- Research
- Mapping
- Interdisciplinary Collaboration and data collection
- Data driven design smart technologies in different stages from research to construction

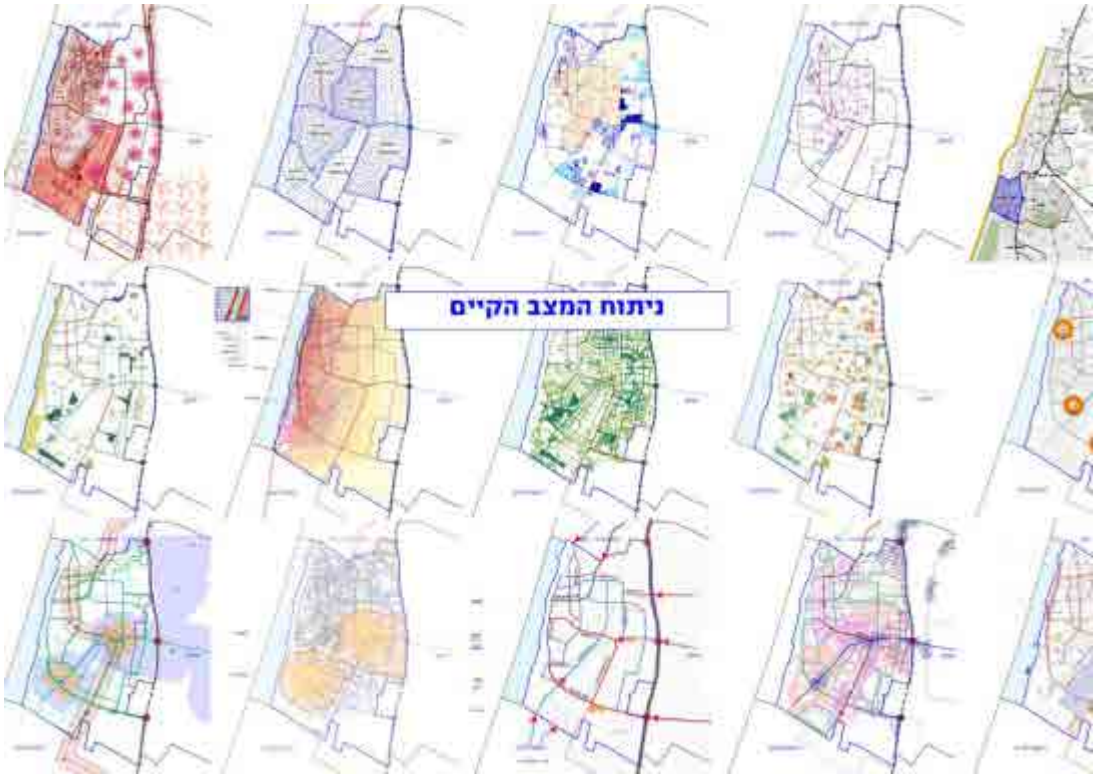


Photo 6. Research study and Mapping for an Urban Renewal Master Plan in Bat Yam, © HQ Architects

Conclusion

Smart city in the era of innovation: Human scale in urban scale

It becomes evident that the evolution of smart cities is a versatile and complex process that can be achieved through the dialogue between the architect/planner, the local community and the governmental bodies as well as other stakeholders that can provide knowledge and data, in order to produce in-depth and insightful research that undergoes as part of the design process. Engaging with local communities from an early stage is crucial, as it is recognizing their preexisting relationship with cities and neighborhoods, in order to provide viable solutions for a resilient future, for both cities and citizens.

It is only through collaboration and shared intelligence that we can unlock the full potential of our cities and add value to our neighborhoods, while creating high quality living, working and leisure spaces as well as public and civic spaces for all. Today, technology is one of the strongest mediums to promote cross-disciplinary collaboration, in order to influence and enhance the connection between the city, the neighborhood and their citizens. By embracing change and as "*enablers of values*," architects can shape cities that foster inclusion, creativity, serendipity and flexibility in order to accommodate future needs and absorb shock and stresses.

References

Townsend, A. M. (2013). SMART CITIES: Big Data, Civic Hackers, and the Quest for a New Utopia. New York, NY: W. W. Norton & Company

Sheller M. (2018). Mobility Justice: The politics of movement in the age of extremes. London; Brooklyn, NY: Verso

Steenson W. M (2017). Architectural Intelligence How Designers and Architects Created the Digital Landscape. The MIT Press

Zuboff S. (2019). The Age of Surveillance Capitalism, London; Profile Books Ltd.

Willis, K. S. & Aurigi, A (2017). Digital and Smart Cities. London: Routledge

Mosco V. (2019). The Smart City in a Digital Age. Bingley, UK: Emerald Publishing Limited

Sklair L. (2017). The Icon Project: Architecture, Cities, and Capitalist Globalization. New York: Oxford University Press

10.10:

10-Year Retrospective of Architectural Education Outcomes In 10 Themes On The Topic Of *Postindustrial Development Of The Area Between Dunavska Street And The Danube's Belgrade Waterfront*

Dr Bojana Jerković-Babović
Department of Architecture, University of Belgrade – Faculty of Architecture, Belgrade, Serbia
bojana.jerkovic@arh.bg.ac.rs

Abstract: This paper aims to present 10 main groups of results as the outcome of 10 years of work undertaken as part of the educational process of completing a master's thesis at the Master Studies at the University of Belgrade – Faculty of Architecture, on the topic of Post-industrial Development of the area between Dunavska Street and Danube's Belgrade Waterfront, under the mentorship of professor Nebojša Fotirić, with assistant Dr Bojana Jerković-Babović. The subject area represents a peculiar spatial phenomenon in Belgrade and as such it served for a whole decade as a practice ground for the development of creative and innovative architectural and urbanistic exhibits, concepts and projects. Dealing with the very complex spatial context through the process of architectural design, the results present the outcome and methodology of architectural education, affirming architectural and urban design as a process involving research, theory and design, and intermediality. The outcomes are classified into three main parts which will be visually presented in this paper - (1) *hybrid typologies and programmes* dealing with new ways of interpreting the new functions in the post-industrial phase of this locality; (2) *tendencies of form and structure* which relate to the deliberation of architectural and urbanistic structures in the foreseeable future, and (3) new cultural and aesthetic values of urban space in *phenomenological and aesthetic perspectives*.

Keywords: architectural education, Master thesis, architectural design, design process

The specificity of the spatial framework of the topic is reflected in the fact that it includes the former First Industrial Zone of Belgrade, which in the modern context, devastated and abandoned, is explored in a post-industrial sense, concerning the contemporary needs of Belgrade life and its associated architecture and urbanism. The first industrial zone of Belgrade is the area with the longest continuity of industrial function in Belgrade and as such, caused the expansion of the city along the right bank of the Danube along with the development of urban settlements and the Belgrade railway. The existing industrial buildings are evidence of continuous industrial development in a discontinuous physical form, and the diversity, inhomogeneity and multitude of material pieces of evidence of the history of this area are the specific value and architectural heritage of Belgrade. The creative potentials of preserving, affirming or assimilating this heritage in contemporary design architectural-urban interventions represent a complex issue that problematizes the relationship between the contemporary, dynamic social-spatial context and the static position of the abandoned, devastated spaces of the former industry (Jerković-Babović, Zorić, Fotirić, 2011, p 139).

Concerning the development of Belgrade, the location in question is seen as an architectural and urban void, unkempt and unaffirmed, despite significant locational qualities in the context of modern urban life - proximity to the innermost city centre and proximity to the river. This zone represents a border territory across which, in addition to abandoned industrial buildings, the question of lowering the city to the river, and activation of the Danube bank in the infrastructural and recreational, cultural or residential domain of modern Belgrade everyday life is raised. The stretch of the location in question, which follows the course of the Danube and Dunavska street, in the given zone between the mentioned two landmarks, respectively includes the Sports and Recreational Center "25. May - Milan Gale Muškatirović", a residential area along Tadeusa Košćuška Street and Danube Quay, the Dorćol marina, the former power plant "Snaga I svetlost", the "Dunav" heating plant, the "Žitomlina" silos, the port of Belgrade and industrial facilities next to the port and the shipyard (now club "Hangar", cargo centre, "Tempo", etc.) (Map of Belgrade, 2022).

The location in question includes Marina Dorćol and the Port of Belgrade, as the two most important zones on the Danube coast in Belgrade, the use of which is reviewed and analyzed in the context of the modern way of life. The proximity of the city centre, its urbanity and the density of the city matrix are interrupted by the former industrial zone, where Dunavska Street is recognized as an immaterial stretch of the border. The post-industrial phase of the given context is explored as a basic theme, opening questions of a new program from new housing models, through complete hybridity of content to new forms of industry that correspond to contemporary cultural and social development. The mentioned zones, in direct or indirect, visual contact with the Danube, appear as significant points of the potential of coastal activation and inclusion of the Danube Bank in the new architecture and urbanization of this area.

Ten years of experience in working on this topic (from 2012. to 2013.) has shown that the research and understanding of the spatial potential of this area of the Belgrade coast results in current individual topics that students approach to the treatment of a specific, selected part of this area or individual, abandoned objects of former industry. Through the relationship between theoretical research in architecture and their translation into project tasks, dealing with the topic of the post-phase of the former industrial zone at the Studio has over the years repeatedly gone beyond the mere contemporary utilization of the found space, the reconstruction or revitalization of the industrial heritage, and has positioned the subject location high in the domain of contemporary cultural, philosophical, technological and aesthetic frameworks of contemporary architecture, and often the architecture of the future (Fotirić, Jerković-Babović, 2023, p 158). In this way, the direct research, and theoretical-practical experience that we have collected during ten years of dealing with this topic, shows that the topicality of the topic and its spatial scope is actualized and refreshed every year (Fotirić, Jerković-Babović, 2023, p 159).
Although the diversity of ideas, concepts, research topics and projects over the past ten years of work on the topic Production of the city: the post-industrial phase of the area between Dunavska Street and the Danube coast in Belgrade can be analyzed and presented in multiple layers, following the specificity and authenticity of each solution, the work so far is summarized in three main groups (Fotirić, Jerković-Babović, 2023). Through three basic groups, we encompassed three basic levels of architectural and design creativity, i.e. new ways of thinking about architecture through function, form and spatial experience, within nine basic, recognized thematic units.

This paper is conceived as a visual essay that illustrates the results of decades of research and design on the topic, based on three main parts: 1. Chronology of study topics, student groups and expressions with a synthesis of the main research and design topics that are recognized in them (figure 1), 2. Visual fragments of research projects that illustrate the synthesized basic research topics (figure 2) and 3. Classification of the results into basic groupings that include (1) functional, (2) form-structural and (3) ambient-aesthetic domains of the architectural project (figure 3).
The first group of results refers to the hybridity of typologies and programs, where we consider new ways of interpreting the architectural function in contextualizing the theme of the post-industrial phase of the given location. Contemporary architectural and design tendencies, architectural theory and practice, show an increasingly pronounced loss of typological frameworks and principles, so the hybridity of the program during the year proved to be the most dominant feature of thinking and solving the architectural function. The outcome of the analysis is a modern interpretation of architectural typologies as former conventions and models of spatial organization that are transformed following changes in social patterns of functioning in the modern city and new life dynamics.
The second group of results includes design-structural tendencies, which refer to the reflection of architectural-urban structures of the near future of the given context and the development of Belgrade's architecture in general. This grouping of results is divided into two basic categories that appear over the years, namely: Networked systems, open type and Isolated systems, closed type. In this group of results, we considered the architectural design, the basic recognized principles of the formation of architectural and architectural-urban solutions, through which the subject of the post-industrial phase of the subject intervention zone is contextualized in a physical sense. By systems, we mean complex urban-architectural structures that integrate new design tendencies and considerations in architecture.
The third group of results in the past ten years includes interpretations of new cultural and aesthetic values of urban space, where design directions are recognized that operationalize contemporary phenomenological-aesthetic perspectives of new spatial experience. The students' theoretical research and their practical interpretations resulted in the implementation of contemporary socio-spatial values in architectural design, whereby specific spatial atmospheres and identities are projected through the creative process. In this way, through the perceptual domain and visualizations of the potential, and future character of the architectural space, we considered the artistic and aesthetic aspects of architecture in the post-phase of the subject area.

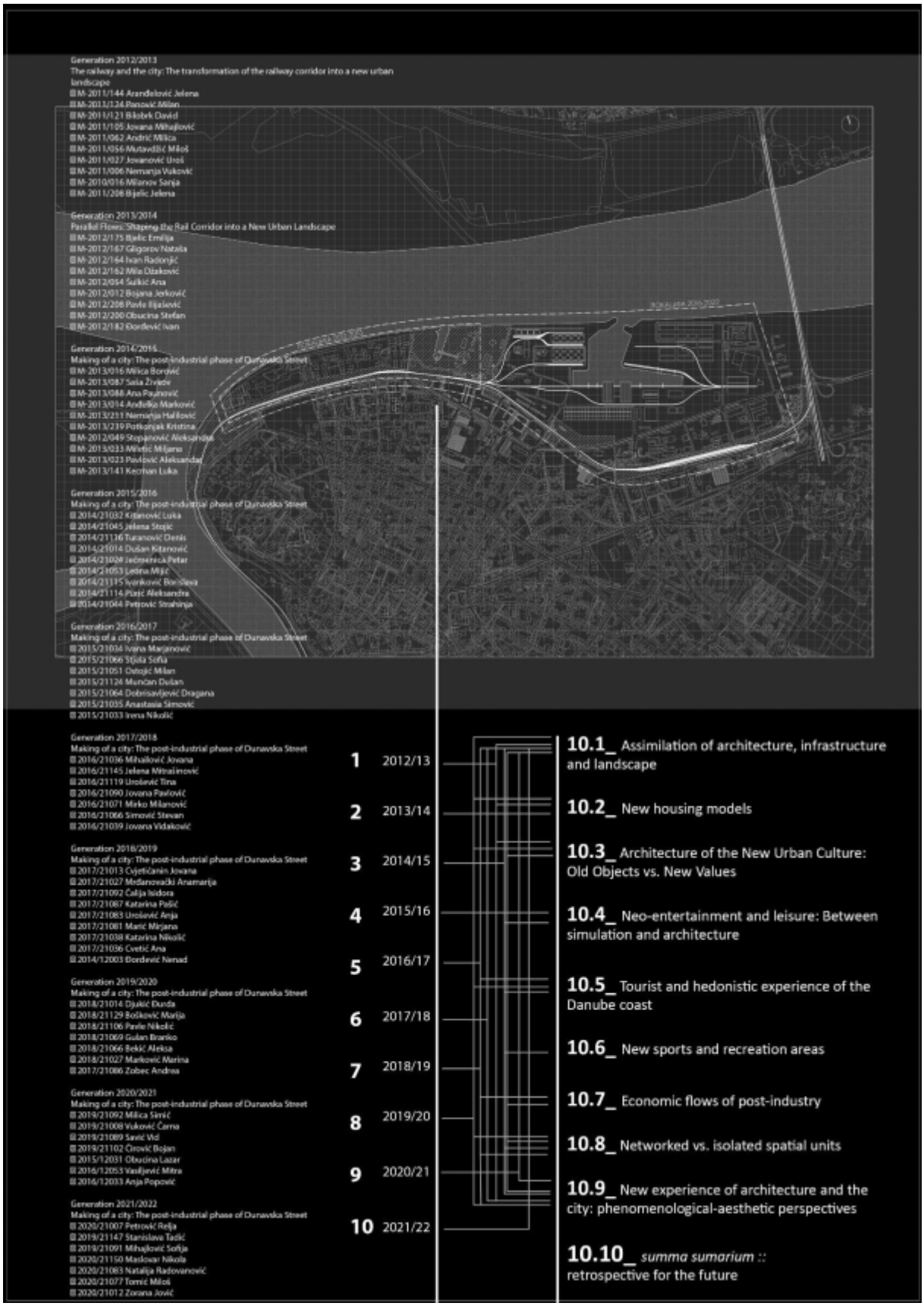


Figure 1 - Chronology of study topics, student groups and expressions with a synthesis of the main research and design topics that are recognized in them

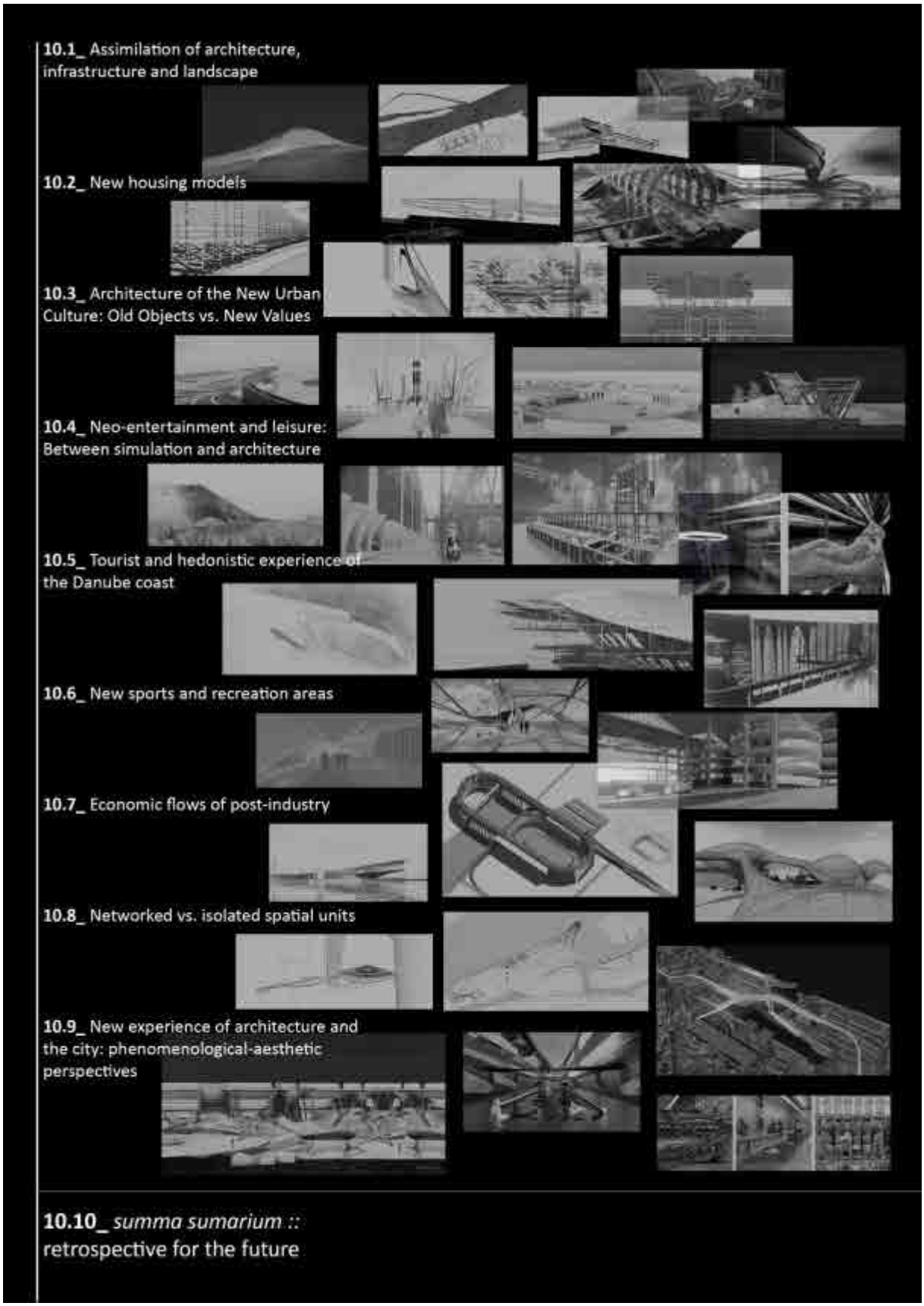


Figure 2 - Visual fragments of research projects that illustrate the synthesized basic research topics

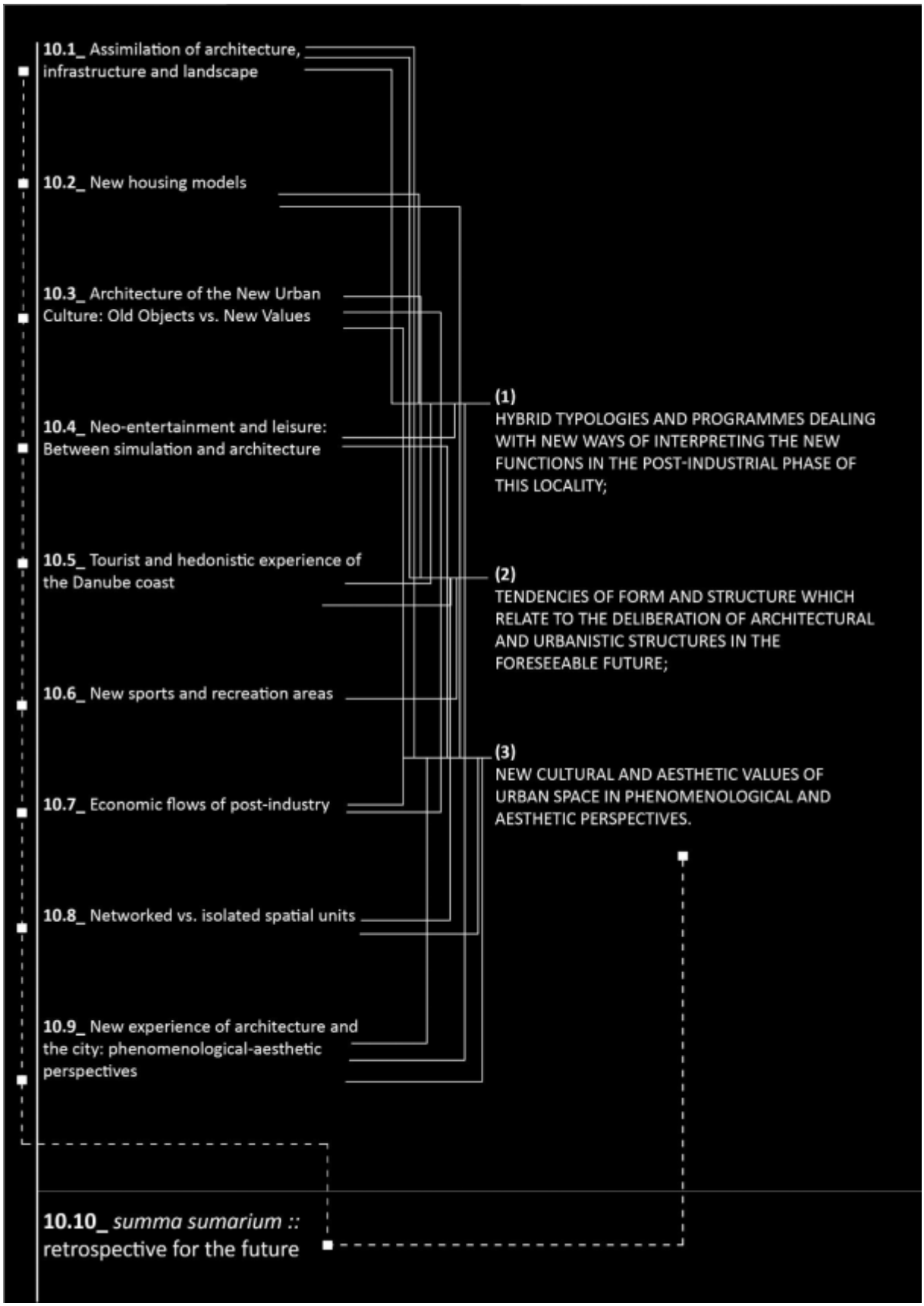


Figure 3 - Classification of the results into basic groupings that include (1) functional, (2) form-structural and (3) ambient-aesthetic domains of the architectural project

References

Fotirić, N., Jerković-Babović, B. (2023) 10.10 Making of a city: Postindustrial development of the area between Dunavska Street and the Danube`s Belgrade waterfront. Belgrade: University of Belgrade – Faculty of Architecture.

Jerković, B., Zorić, A., Fotirić, N. (2011) "Prva industrijska zona Beograda: Pozicija kulturnog dobra u savremenim metodologijama arhitekture", Kulturno dobro danas – vrednost i značenje, Zbornik radova VIII konferencija. Beograd: Zavod za zaštitu spomenika kulture grada Beograda, pp 134-146.

Map of Belgrade (2022) "Karta Beograda ", Karta Beograda, http://www.kartabeograda.com/ (accessed 10.7.2022.)

Democratising Urban Planning in Belgrade: Insights from Participatory Forums in Belgrade

Iva Čukić, Marko Aksentijević, Jovana Timotijević, Božena Stojić, Olga Andrić
Collaborators: Irena Fiket, Andrija Stojanović, Antonije Ćatić, Marija Mićanović
Ministry of Space collective, Belgrade, Serbia
iva@ministarstvoprostora.org

Abstract: Despite legal provisions for citizen participation in urban planning in Serbia, the actual practice lacks democratic capacity, resulting in spatial conflicts and injustices. The Ministry of Space collective aims, through research and experimentation, to not only formulate effective critique of the current system of urban planning and development, but to offer possible strategies and models for its democratization. By presenting the methodological and empirical insights provided by the implementation of four particular participatory forums (mini-publics, citizens' assemblies) on the territory of Belgrade (2021-2023), we would like to contribute to current attempts to democratise urban planning and development of our cities.

Keywords: democratising urban planning; participatory forums; deliberative democracy; citizens' assemblies; urban development

In the context of a broader democratic deficit, there has been an increasing focus on participatory and, more significantly, deliberative democracy. The concept of a democratic deficit applies to a wide array of global contexts. Among the most pressing concerns associated with the democratic deficit is the erosion of democratic norms and institutions. This erosion encompasses the ascendance of authoritarianism and the concomitant decline of civil liberties, resulting in the suppression of opposition voices (Zakaria, 1997; Diamond, 2008). Additionally, the burgeoning phenomenon of populism, frequently intertwined with anti-democratic proclivities, poses a significant threat to democratic principles, as it centralizes power within the grasp of a "few" rather than entrusting it to the institutions intended to uphold checks and balances (Mounk, 2018). At the same time, as cities grapple with considerable economic pressures, we are witnessing the proliferation of neoliberal urban development. This approach has faced criticism for exacerbating the democratic deficit, particularly within urban environments. One manner in which neoliberal urban development can contribute to the democratic deficit is by prioritizing the interests of developers and investors over the needs and aspirations of local communities (Florida, 2002). This prioritization can lead to the displacement of long standing residents and the destruction of cultural and historical landmarks, in addition to the marginalization of low-income and minority communities (Jacobs, 1961). Furthermore, neoliberal urban development can intensify pre-existing inequalities, particularly concerning access to affordable housing, public transportation, and other indispensable services (Harvey, 2005). This can engender a scenario wherein only those possessing the financial means to participate in the market-driven system reap the benefits of urban development, while those who are marginalized or excluded from the system find themselves left in the margins (UN-Habitat, 2016).

In addition to the challenges facing democratic institutions and processes, there are also opportunities for reform and improvement. Many individuals and organizations globally are actively engaged in endeavors aimed at tackling these challenges and advocating for the advancement of democracy and its inherent values. In such a context, with the perennial experience in struggles for the democratization of urban development, the collective Ministry of Space has engaged in creating the instrument - *participatory forum / citizens assembly* - that enables more active and inclusive deliberation among diverse interests. Citizens assemblies are a form of deliberative democracy in which a group of citizens are brought together to discuss and make recommendations on a particular issue or set of issues. These assemblies can be an important tool for promoting democratic participation and addressing the democratic deficit that can arise from neoliberal development. By presenting the methodological and empirical insights provided by the implementation of four particular participatory forums (mini-publics, citizens' assemblies) on the territory of Belgrade (2021-2023), we would like to contribute to current attempts to democratize urban planning and development of our cities. Our objective is to establish a framework for greater citizen engagement in the urban development process, initially focusing on urban planning and subsequently extending to other spatial policies, including housing and the management of spatial resources.

While the legislative framework in Serbia envisages mechanisms for citizen participation in the adoption of planning documents, the actual implementation reveals a glaring deficit in genuine democratization, often falling short of even the minimal requirements, and sometimes, regrettably, even less (Čukić et al. 2022). Consequently, an increasing number of conflicts and spatial injustices make up urban life in our cities (Lukić 2022; Stojić 2020;

Čukić & Perić 2019). Therefore, if there is a nominal commitment to the substantive democratization of the planning process, it seems that the current practice, as well as the regulation, needs a radical transformation.

Figure 1 Group discussion, Forum 1, Elementary School, New Belgrade

Hence, for us, one of the potential catalysts for radical transformation in this context are citizens' assemblies. These deliberative forums, with their commitment to inclusivity, empower marginalized communities and ensure their voices are integrated into the decision-making process (Bächtiger et al., 2010). By championing deliberative democracy, citizens' assemblies enable informed discussions, consensus-building, and the formulation of equitable and sustainable urban policies (Fishkin, 1997; Abelson et al., 2003).
In the broader context, citizens' assemblies encourage a shift from a short-term, profit-driven focus to a more comprehensive and forward-looking perspective on urban development (Dryzek, 2000). They facilitate consideration of not only immediate economic gains but also the long-term social and environmental consequences of development decisions. This shift promotes the creation of more balanced, sustainable, and resilient urban environments (Mouffe, 2000). Beyond their instrumental role, citizens' assemblies nurture civic engagement and shared purpose within communities, encouraging increased involvement in the well-being of their city (Warren, 2017).

Figure 2 Plenary discussion, Forum 3, Cultural center, Padinska skela

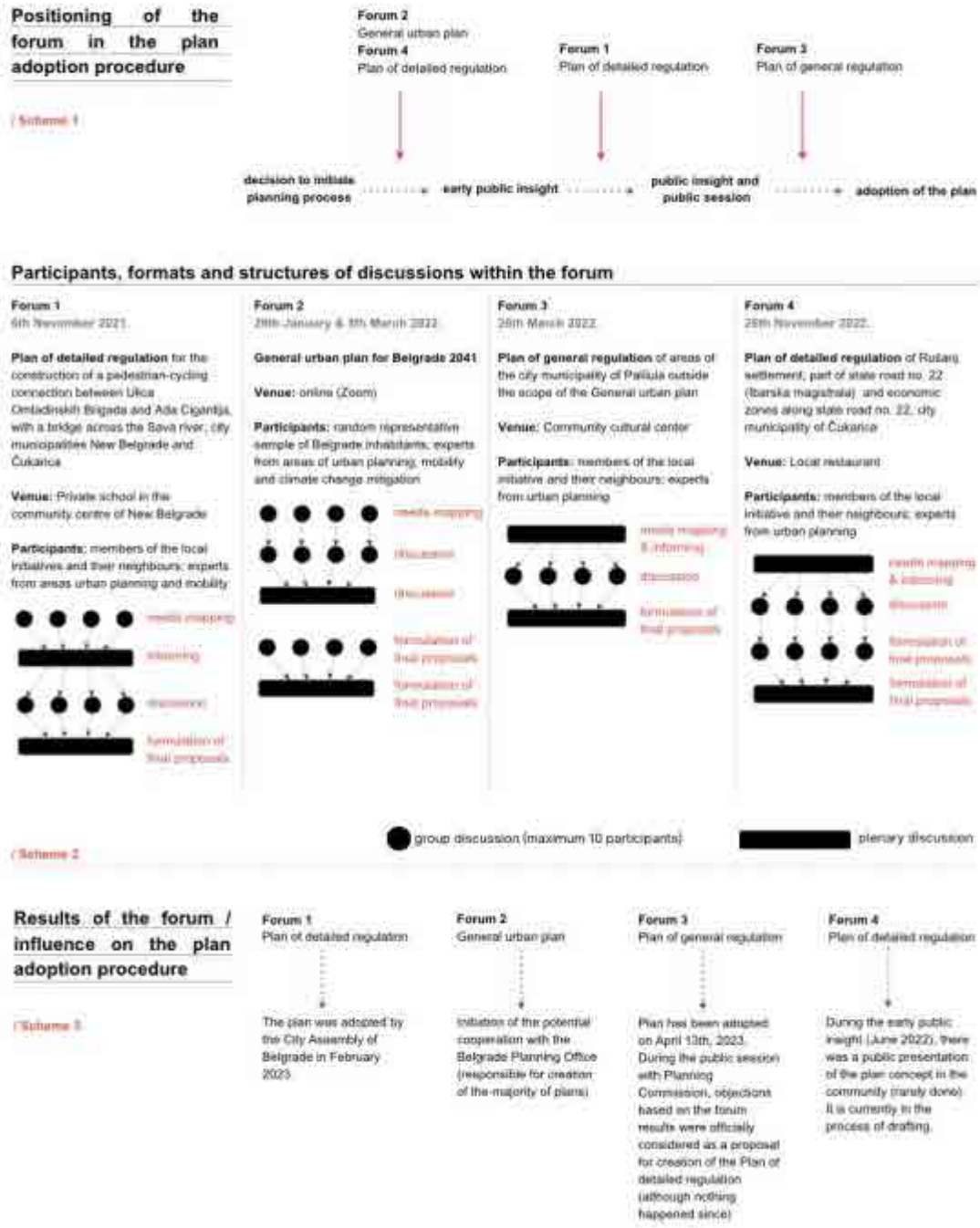


Figure 3 Overview: Positioning of the forum in the plan adoption procedure; Participants, formats and structure of discussions within the forum; Influence of the forum on the plan adoption procedure

The Ministry of Space collective has organized four participatory forums different in their formats depending on the scope of the plan, phase of the plan adoption, participants and structure of the forum. This approach allowed us to gain insights into how each of these elements influences the discourse and ultimate outcomes of these forums. The forums have processed different plan types, including the Detailed Regulation Plan, the General Regulation Plan, and the General Urban Plan, all within the Belgrade territory (Scheme 1). While we firmly believe that citizen participation should ideally commence at the earliest stages of the planning process, such as immediately after the decision to draft a plan, we have organized forums at various junctures, such as before the early public insight, during the period between the early insight and public insight, and before the public hearing - the public session of the Planning Commission (Scheme 1). The composition of participants within these forums is carefully tailored to the topic at hand, typically reflecting the scope and subject matter of the urban plan being

addressed (Scheme 2). Experts were selected based on their expertise relevant to the plan's focal areas. The format of participatory forums was adaptable, contingent upon the plan's scope and anticipated subjects. It combines smaller moderated discussion groups and plenary sessions, fostering an environment where all stakeholders can engage collectively (Scheme 2). The overarching goal of participatory forums is to steer these diverse insights toward the collaborative discovery of solutions that best align with the interests of the local community and the broader public. Beyond involving citizens and experts, the deliberation process often includes decision-makers, plan processors, and investors who are associated with the specific urban plan. Unfortunately, invitations were sent to these parties during the preparation for the first forum, but all of them declined to participate.

Upon comprehensive evaluation of these four forums, conducted collaboratively with all participants, the anticipated potential of this format to foster collaborative urban planning, facilitate rational and high-quality discussions, and yield improved and more legitimate planning solutions is expected to be substantiated. This format serves not only as a means of transformation and education for citizens interested in specific urban areas but also for experts actively engaged in the process. A prevailing challenge in the current context is the imperative involvement of representatives of the public sector, such as institutions and decision-makers, who must recognize the enduring significance of citizen inclusion in shaping cities to achieve social and spatial justice.

References

Bächtiger, A. (2010). Actors and Act-Structures in Deliberative Systems. The Good Society, 19(1), 1-6.

Fishkin, J. S. (1997). The Voice of the People: Public Opinion and Democracy. New Haven, CT: Yale University Press.

Abelson, J., et al. (2003). Public Deliberation in Health Policy and Bioethics: Mapping an Emerging, Interdisciplinary Field. Journal of Public Deliberation, 1(1), 1-51.

Warren, M. E. (2017). The Quest for Deliberative Democracy. In S. Elstub & P. McLaverty (Eds.), Deliberative Democracy: Issues and Cases. Edinburgh, Scotland: Edinburgh University Press.

Dryzek, J. S. (2000). Deliberative Democracy and Beyond: Liberals, Critics, Contestations. Oxford, UK: Oxford University Press.

Mouffe, C. (2000). The Democratic Paradox. London, UK: Verso.

Čukić, I., Stojić, B., Ćatić, A., & Mićanović, M. (2022). Izrada planova iza pritvorenih vrata. Izveštaj o stepenu učešća građana u procesima urbanističkog planiranja u Beogradu za 2021. godinu. Belgrade, Serbia: Institut za urbane politike / Ministarstvo prostora.

Čukić, I., Perić, A. (2019). Transformation of the spatial planning approach in Serbia: towards strengthening the civil sector? In B. Scholl, A. Peric & M. Niedermaier (Eds.), Spatial and transport infrastructure development in Europe: example of the Orient/East-Med corridor (pp. 272-290). Hannover, Germany: Verlag der ARL.

Diamond, L. (2008). The Democratic Rollback: The Resurgence of the Predatory State. Foreign Affairs, 87(2), 36-48.

Florida, R. (2002). The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life. New York, NY: Basic Books.

Harvey, D. (2005). A Brief History of Neoliberalism. Oxford, UK: Oxford University Press.

Jacobs, J. (1961). The Death and Life of Great American Cities. New York, NY: Vintage Books.

Lukić, M. (2022). U susret novom GUP-u Beograda 2041: Kako do pravičnije građanske participacije? Kritika: časopis za filozofiju i teoriju društva, 3(2), 317-332. DOI: 10.5281/zenodo.7369712

Mounk, Y. (2018). The People vs. Democracy: Why Our Freedom Is in Danger and How to Save It. Cambridge, MA: Harvard University Press.

United Nations Human Settlements Programme (UN-Habitat). (2016). Habitat III Issue Papers 22 - Urban Governance. Retrieved from

Stojić, B. (2020). Pozicije građana u razvoju i planiranju gradova – mogućnost građana da utiču na proces izrade planskih dokumenata. Belgrade, Serbia: Regulatorni institut za obnovljivu energiju i životnu sredinu RERI. Available at: https://www.reri.org.rs/wp-content/uploads/2020/04/Analiza-pozicije-gradjana-u-razvoju-i-planiranju-gradova-1.pdf

Zakaria, F. (1997). "The Rise of Illiberal Democracy." Foreign Affairs, 76(6), 22-43.

Urban Education For Future Traffic Engineers: A Large City Challenges - Alternative Traffic Modes, Ecology, Morphology And Flow, Sensitivity Of Space

Svetlana Batarilo, Ranka Gajić
Faculty of Transport and Traffic Engineering, University of Belgrade
s.batarilo@sf.bg.ac.rs, r.gajic@sf.bg.ac.rs
Students: Bojan Mirković, Sergej Srećković, Anastasija Pantić

Abstract: At the Faculty of Transport and Traffic Engineering of the University of Belgrade, 2022-23 school year, in the course Fundamentals of Urbanism, second-year students of all departments were given concrete tasks after completing the course in which they mastered the basic theoretical concepts. The task was to observe and notice, and after analysis and valorization, to propose improvement solutions to detected problems in the central area of Belgrade, which are related primarily to mobility, but also morphology, accessibility and safety, with a special emphasis on alternative modes of transport, and ecology.

Keywords: *alternative transport modes, flow, accessibility, ecology*

Introduction

This paper presents the response of the students of the Faculty of Transport and Traffic Engineering to the assigned topics within the teaching unit named Urban Reconstruction in the course Fundamentals of Urbanism. The course is organized for the second-year students of the Faculty of Transport and Traffic Engineering, University of Belgrade, and it is mandatory within all departments, as a part of the necessary education for future traffic engineers. Their projects, which are the subject of this paper, concern problems in the city related to space: morphology, public space with emphasis on urban contents, accessibility and safety, mobility in space which includes motor vehicles mobility as well as pedestrian mobility, and other types of alternative traffic mobility modes, interconnection between mobility and urban content, i.e. the traffic matrix and urban functions, the flow of the traffic matrix, but also the consequences of interventions in the space with an impact on the environment and health.

The teaching unit Urban reconstruction comes at the end of the semester, when students have already mastered all the basic concepts through the teaching units Morphology (city, streets, blocks), Flow and Legibility, Contextuality, Urban functions, Urban parameters.

Subject - Fundamentals of Urbanism

Within the subject curriculum, the following goals are set in the education of students, 1/ developing awareness of the importance of the subject in their further professional education and also later in practice, in terms of understanding the city, its origin, development and changes in the city that they will influence on as experts, which also implies the understanding of modern tendencies in development, the problems of the modern city (primarily traffic and alternative traffic modes), the world trends in a city development, and models of the cities of the future; the issue of ecological preservation 2/ stimulation of students to find ways to recognize (as the first step), then understand and possibly solve urban problems that are put before them, which they will encounter within planning teams as future traffic engineers and 3/ increasing the applicability of knowledge about the modern theory of urbanism with all the influences that the modern city endures.

Within the subject, we focus on connecting theoretical knowledge concerning basic urban concepts and processes, as well as contemporary trends in urban development and planning, with practical work on certain problem assignments. Practical work implies the analysis as a first step, valorization that follows it, and then the solution of specific existing problems in the space familiar to the students, in the form of project of reconstruction, explained mostly through examples. A special part of the assignment implies the independent setting of the task within the given topics (sixteen of them), in such a way that the student himself recognizes the space, and the specific problems inside that space, which can be located inside given topics (sixteen of them).

Assignment

While working on the course, students are provoked to creativity through facing a large number of different spatial problems that are put before them. The problems are mostly based on traffic within the central locations of Belgrade, with an emphasis on alternative modes of traffic in the city as a possible solution; potential of space usage, specially of physically integrated streets; and parking; accessibility and safety as important characteristics of public spaces; networking, flow and legibility of space. A plenty of problems that are to be solved is achieved

by intersection of the assigned topics (sixteen of them) with five central locations of Belgrade, where each location has a certain number of micro-locations with specific space problems. These problems are detected by the students themselves, who then create their own specific topic within the given topic, on a recognized microlocation with specific characteristics.

The given topics are: 1. Utilization potential of a public space; 2. Utilization potential of a physically integrated street; 3. Public spaces: analysis of urban content in a service of city's vitality, safety and accessibility; 4. Analysis of the elements of morphology according to Lynch in order to achieve readability and flow in the city; 5. Diversity or imitation: Contextual analysis of morphology and urban content in public space; 6. Flow analysis and proposal for better flow in the city (through the street profile and/or through interventions on the street network); 7. Flow analysis and proposal for better flow in the city (through alternative modes of traffic); 8. Restoring the comfort and vitality in the city's space: public space of the city, city squares, river coast, abandoned spaces... - through problems and potentials to interventions for improvement of the analyzed space; 9. Plenty of urban content and legibility of the public space of the city: analysis and proposal for improvement of a significant urban space; 10. Networking of public spaces in the city; 11. Proposal for the network route of bicycle paths, analysis of the convenience of the selected route of pedestrian and bicycle traffic according to ecological and microclimatic criteria; 12. Morphological analysis according to urban parameters indicators - parking, traffic, proposal for improvement; 13. "15 minute city" – designing activities with the aim of realizing the idea of '15 minute city' in a city space; 14. Accessibility and safety in a comfortable public space: a design proposal for the mobility of persons with difficulty moving; 15. Analysis of the accessibility of urban content related to public city transport mobility; 16. Pedestrian mobility: psychological experience of pedestrians and safety of pedestrians.

The results

Numerous solutions are the answer to the course concept, and the questionnaire we conduct at the end of the semester shows an increased level of awareness among students about problems in the environment and also a greater interest in the city. The five locations intersect with the sixteen assigned topics, and then by independently recognizing the problems in the microlocation within the assigned five locations and the assigned topics, each student sets his own topic and as a result we get a very large number of topics, which means large number of designs.

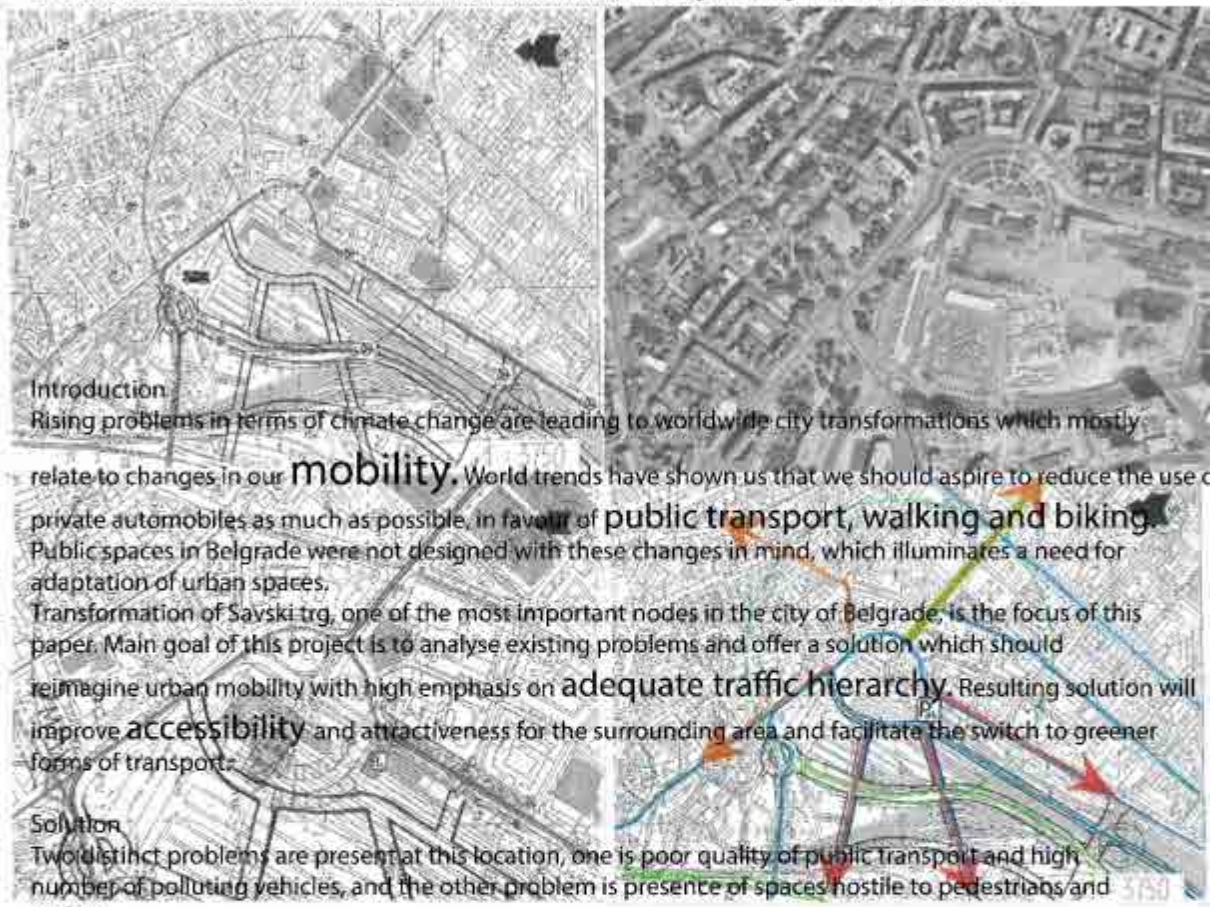
After setting / defining the topic, the analysis of the space is approached in relation to the given parameters concerning the topic, the valorization of the space follows, and finally the proposal of a design in the direction of improvement, or reducing the bad influences that are recognized. The independent detection of the topic-problem implies also an independent approach to the design presentation of found solutions, with a mandatory display of respectable successful examples of areas with similar problems from around the world. The students were asked to rely on the aspects and principles of sustainable development, with the suggestion to apply SWOT analysis when analyzing the existing condition on the location, but also to assess for themselves which type of analysis is useful in the case of the chosen topic. The scale of the map for displaying the analysis and intervention, as well as the scope of each student is different and depends on the specifics of the topic.

The presented works were chosen on the basis of a broad insight and positioning of the given topic within the knowledge that the students acquired during the course in the theory of urbanism, thorough work on the analysis and evaluation of the previously recognized space in relation to the given topic/problem, thus independent detecting of problems inside the location, and finally, finding a wider range of solutions through knowledge of theory and examples of successful solutions implemented throughout the world; but also based on the desire of the students to continue their work on this topic, that is, to upgrade what they have learned.

The knowledge that we gained through working on such a program, we have used to modify or completely set aside some topics in the current school year, to increase the range of locations and expand the research not only to Belgrade but also to cities within Serbia, especially those cities that students know well because they are born there or spent some part of their life there.

SUSTAINABLE URBAN MOBILITY PLAN FOR SAVSKI TRG

Bojan Mirković
Student of the 2nd year on Faculty for Traffic and Transport Engineering, Railway department



Introduction

Rising problems in terms of climate change are leading to worldwide city transformations which mostly relate to changes in our **mobility.** World trends have shown us that we should aspire to reduce the use of private automobiles as much as possible, in favour of **public transport, walking and biking.** Public spaces in Belgrade were not designed with these changes in mind, which illuminates a need for adaptation of urban spaces.

Transformation of Savski trg, one of the most important nodes in the city of Belgrade, is the focus of this paper. Main goal of this project is to analyse existing problems and offer a solution which should reimagine urban mobility with high emphasis on **adequate traffic hierarchy.** Resulting solution will improve **accessibility** and attractiveness for the surrounding area and facilitate the switch to greener forms of transport.

Solution

Two distinct problems are present at this location, one is poor quality of public transport and high number of polluting vehicles, and the other problem is presence of spaces hostile to pedestrians and cyclists.

Public transportation mainly relies on diesel suburban and urban buses, even though this location is the heart of Belgrade's tram network. To solve this, tram network citywide should be extended, separated where possible and speeded up with priority at intersections. Purchase of new, modern low floor trams will improve comfort of travel. This location will also be served with metro lines 1 and 2 in the planned metro system. To further strengthen rail based public transportation, return of urban and suburban railway with an underground station can also be considered in order to replace suburban bus lines. Main goal of this change is to minimize the use of vehicles with internal combustion engines and shift most of the traffic to the rail based modes with seamless cross mode integration. This will, in turn, mean a citywide lowering of noise and air pollution and slashing parking needs.

Pedestrian and biking infrastructure should be made safer and more accessible with main pedestrian corridors becoming dedicated pedestrian streets for increased comfort and attractiveness. Plentiful underground bike parking should be built to enable "Bike and Ride" concept.

Conclusion

Ultimate goal of this transformation is to encourage **greener traffic hierarchy** with walking & biking given the most priority, then public transportation, especially **rail based modes** which are faster, more comfortable and cleaner. In the last place are private automobiles which, in their nature, are space inefficient and are biggest contributors to most problems found in urban environments around the world.

Adequate space allocation is a key for future **green transformation.**

Figure 1 – Design 1: Sustainable Urban Mobility Plan for Savski Trg

ANALYSIS, VALORIZATION AND NEW DESIGN IDEAS FOR ACHIEVING GREATER COMFORT AND VIBRANCY FOR SLAVIJA SQUARE AREA

Sergej Srećković
Second year student of the Faculty of Traffic, Railway Department

Introduction

Today, urbanism is inseparably intertwined with the awareness of environmental protection in order to preserve our planet in good condition for future generations. Comfort, pleasantness, vitality, vibrancy, are desirable qualities of urban space.

A pleasant space that we are searching for is an ecological and microclimatic space characterized by the presence of greenery, the effect of water and sound, sunshine on cold days, or shade on hot summer days, harmony of temperature, air currents, air quality, noice reduce. We will be guided by these parameters when we present solutions for a given problem.

Within the given topic - Restoring the comfort and vitality in the city's space: public space of the city squares, river coast, abandoned spaces... - through problems and potentials to interventions for improvement of the analyzed space - we have chosen the area of Slavija Square for analysis. It is a place that is inevitably visited by everyone passing through Belgrade, but it is not the most representative part of our city, so comfort is one of the qualities that should be achieved in this space.

Slavija is an important centre in terms of traffic in the city, which is the reason for this place to be congested and polluted most of the time. Together with cars and other motorized traffic passing there, so do pedestrians, and there are also commercial and residential buildings in this area. All those participants should be combined into one compact whole, which will be beneficial both for them and for the environment.

The solution

We concluded that it is necessary to improve the space where the traffic will flow smoothly, but also to create a sense of comfort and convenience in the space where everyone can move easily and have a pleasant stay. The idea is to come up with steps that would achieve greater comforts in a given location, but also to be able to implement these steps at any other location of the city, respecting the specific context.

1. Reconstruction of the existing space
2. Design of new facilities
3. Design of pedestrian routes
4. Shared space, physically integrated street
5. Space for enjoyment

Conclusion

Through the given topic and problem solving, we tried to achieve and fulfill all the requirements set before us in order to turn the not-so-attractive and polluted space into a friendly, pleasant, vibrant, and,most importantly, healthy space. In every city there are countless places that need help to become more beautiful and healthy. Through our given step proposal and additional harmonization and context fitting, we can hopefuly reach that goal and make every city comfort and pleasant.

Figure 2 – Design 2: Analysis, valorization and new design ideas for achieving greater comfort and vibrancy for Slavija Square

ANALYSIS OF THE AVAILABILITY OF URBAN FUNCTIONS IN RELATION TO TRAVELING BY PUBLIC CITY TRANSPORTATION IN THE AREA OF DORĆOL

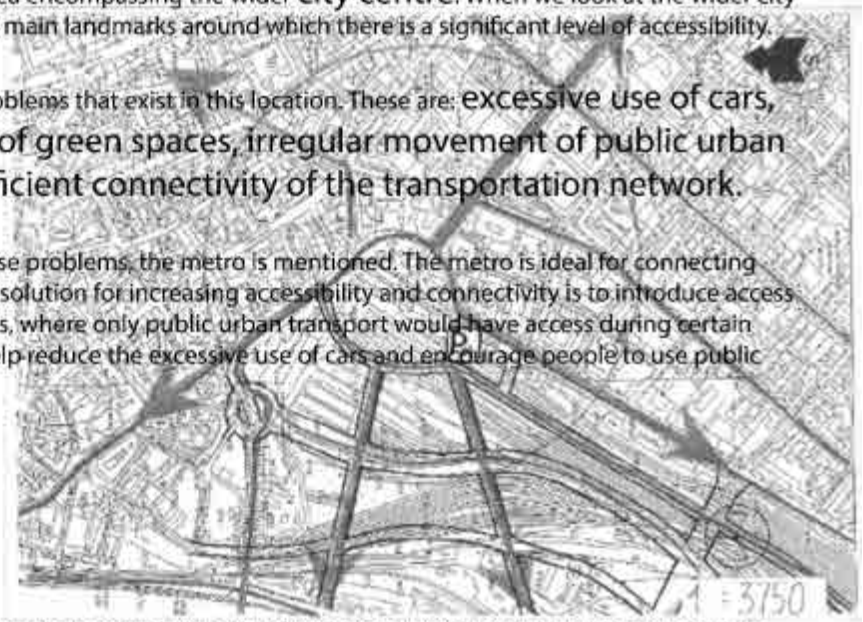
Anastasija Pantić
Second year student of the Faculty of Traffic Engineering. Road Traffic Department

In modern cities, **public transport** is one of the key segments of infrastructure. As cities grow larger and infrastructure becomes more complex, we must think about how to connect facilities and improve **accessibility** at specific locations. The topic can be analyzed from various aspects, but when it c omes to accessibility in relation to public urban transport, it is best to consider the public urban transport in Belgrade as a whole.

This paper focuses on the area encompassing the wider **city centre**. When we look at the wider city centre, we see that there are main landmarks around which there is a significant level of accessibility.

The paper mentions four problems that exist in this location. These are: **excessive use of cars, limited accessibility of green spaces, irregular movement of public urban transport, and insufficient connectivity of the transportation network.**

As a possible solution to these problems, the metro is mentioned. The metro is ideal for connecting urban centers. One possible solution for increasing accessibility and connectivity is to introduce access control in public urban zones, where only public urban transport would have access during certain time intervals. This would help reduce the excessive use of cars and encourage people to use public transportation instead.



In conclusion, in order to make the space more accessible and connected, it is necessary to improve or reorganize the space. It is also important to consider that for greater accessibility of facilities, we need transportation that would connect these facilities. The key is to carefully plan the space and the locations where certain facilities would be placed, as this would improve both accessibility and connectivity.

Figure 3 – Design 3: Analysis of the accessibility of urban functions in relation to traveling by public city transportation in the area of Dorcol

References

Базик, Д (1994). Понуда градске сцене: потенцијали микро-простора града,, Архитектонски факултет Универзитета у Београду, едиција Архитектоника, свеска 17

Богдановић, Р (1990). Урбанизам - урбане форме, урбанистичко планирање; Саобраћајни факултет, Београд

Гајић, Р., Батарило С: Радни практикум за урбанизам

Ступар, А (2019). Град: Форме и процеси, Орион Арт.

Златановић-Томашевић, В., Гајић Р., Стевановић Н. (2020). Управљање урбаним развојем, прилагодљив град и заштита простора и животне средине, зборник радова XII научно-стручне конференције са међународним учешћем, Удружење Инжењера Београда, Београд.

https://www.beograd.rs/lat/gradske-aktuelnosti/1737205-master-plan-saobracajne-infrastrukture-beograda---smart-plan-2021-2027-2033/Street-design-manual_ENG.pdf

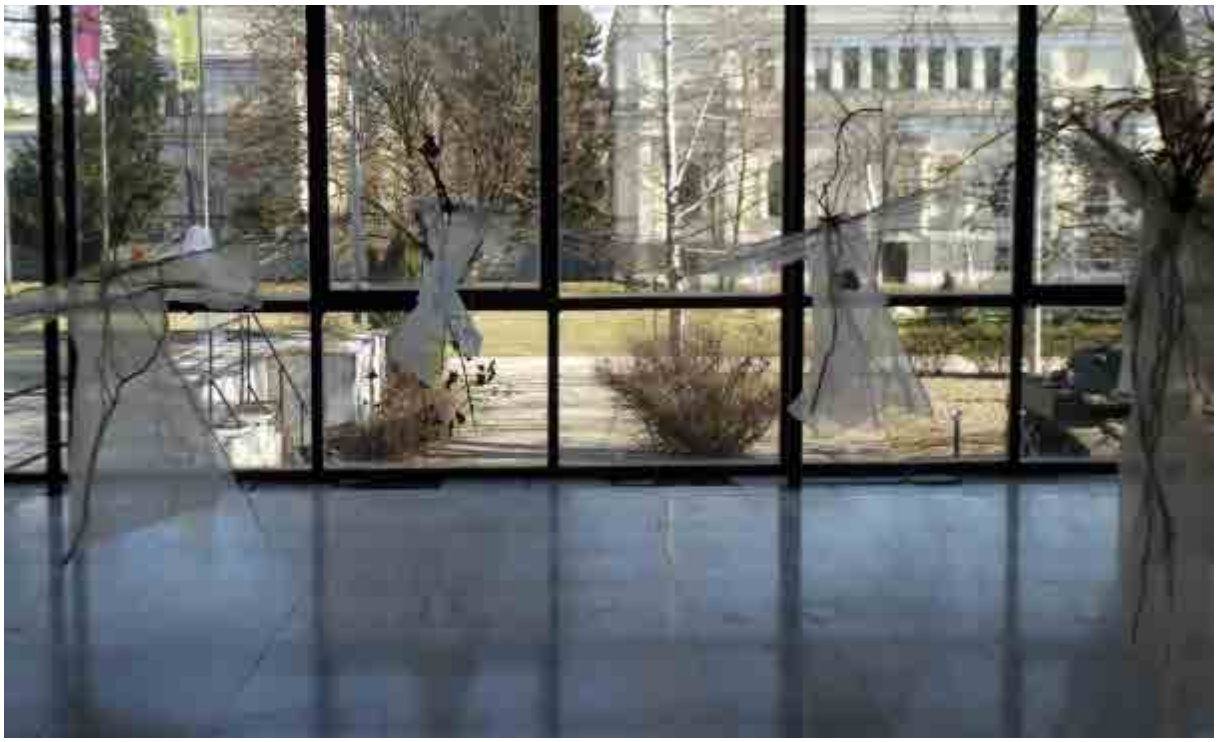
https://vtsnis.edu.rs/wp-content/plugins/vts-predmeti/uploads/Prirucnik za urbani dizajn.pdf

https://www.google.com/amp/s/amp.theguardian.com/cities/2016/apr/01/story-cities-13-eixamplebarcelona-ildefons-cerda-planner-urbanisation

Distant moments condensed: Mnemotechnics of the city.
Case study: The Wedding installation
Nora Lefa

The magic happens when history is present in the moment, when people seem to have been there forever, when buildings seem to be extensions of nature, just to complete the picture; it is the state of two distant moments being related; the experience in which the past intertwines with the present, and is brought back to life. In such a milieu the artist can feel the tension of the invisible, condensed, information and represent it with the stroke of a brush opening new horizons, making a comment, giving a new interpretation, or awakening our dead parts into feeling, into breathing, into reviving people living there. Usually there is no need for huge and glossy projects; gestures giving the opportunity for imagination suffice. This is not another paper to prove how "less is more", but to add its voice to those claiming that substance is found in simple words told in the right moment and place increasing their power. Examples and inspiration for such projects come in this case from music, and mainly by Chopin who is revolutionary, playing with human psychology, making visionaries out of listeners. His music is creating worlds that we can never reach, but still holding us captive of magic so we are absolutely there, and starting all over again in a never-ending process.

Sometimes everything is there, just in front of us: nature, the sky, the sounds, the people, the train, the smell, our feelings of now and then, memories and hopes, expectances…. "It is not that reality entered our image: the image entered and shattered our reality" noted in the early 2000's Slavoj Žižek (Žižek, 2002, 16).
The installation "Wedding" attempts to create and reveal a sign by activating everything that is already there. Or, at least, by not ruining the existing composition. It is nothing but a meeting, an invitation to discourse, as a sign of coming together at the venue, a transparent hall in the center of the city, open to the city, facing the city; the building housing the Historical Museum of the City of Sarajevo, its exhibit being the city itself, the garden, its people, the millions of colors nature has painted, pain, painted by time and by those things that happened, and those which should have happened. All these trees were there, remembering and witnessing.
"Wedding" is a composition of reality, in which features of the surroundings come together and merge. It plays with boundaries - joy, sadness, anger and laughter- while visualizing fantasy characters; scarecrows dress up in wedding gowns. The brides are dressed, as tradition dictates, in white, while swaying in the wedding dance. The dissonant sounds of the past and the feelings of the past, abruptly interrupted stories, are refracted, and gently arranged in front of us -like in a "fake" setting in which visitors can enter to "live", to experience the next steps of the story they are deprived of. Offered they are as a second chance, like in heaven, dreaming of happiness with an orchestra tuning their instruments for a dance that is almost about to begin.
The redundant branches sacrificed for the rest of the city to survive have entered the Museum, to acquire flesh and bones, to speak by remaining silent. They came together and formed beings resembling scarecrows, brides placed at a distance from each other; each one alone but in relation to the others. They looked at each other, they looked at the audience, and the audience looked back at them, each time in a different way because they changed, depending on their position.
That simple. The meeting was successful, the exhibits communicated with the audience who ended up being the exhibits themselves. And, all together being at a festivity, a wedding. But, without music; the sound of the orchestra never proceeded past the first notes, the tuning of the instruments… The exhibition had a duration of twenty-four hours; it breathed with the city, and silently became part of it. Thus, it was integrated into its surroundings, and lived in parallel with the time and the lives of the people of the city. There were some more intense moments, some moments of "crescendo", such as the sunset, when the colors changed, the sunrays reached the "wedding" and a flock of ravens sat on the scarecrow brides… At night they were still there, absorbing and reflecting the lights of the city which are enhanced by the light of the projectors screening verses of love poems, gently "taking everyone where they need to be"...



Picture 1: by Author, Historical Museum of Bosnia and Hercegovina, Sarajevo

The "Wedding" could be chapter 9 of the book “Sarajevo again” that would have remained stuck in the labyrinths of consciousness, that is in the realm of the virtual, if it had not been actualized in the medium of the exhibition. For a better understanding, one should recall Deleuze's proposal to replace the distinction real - possible with the modal distinction actual - virtual, in which the actual and virtual are completely real, the only difference being that the actual has a concrete existence, while the virtual does not, which doesn’t make it less realistic.

Picture 2: by Author, Historical Museum of Bosnia and Hercegovina, Sarajevo

"**Time passes**, and little by little everything that we have spoken in falsehood becomes true", said Marcel Proust. In the "wedding" installation, reality is in front of us, but still gives us the "hope", and the chance to go back to that point when the dream stops; remembrance of Things Past or In Search of Lost Time that we are trying to recall and to bring back, just like in the poetry of Chopin's Waltz in A minor Op. 34 No. 2. With the *rubato* (the deliberate undermining of rhythm) he gives us back the time he seems to have "stolen", time and again never reaching the crescendo, while being always almost there… At the same time, tension and release, again and again, the two "voices" merging into one. The melody is sad but still has the ability to reach so close to the reality of loneliness of the soul and to touch it, in the end offering relief, personally and collectively. From D major to C minor and again to A minor it guides us to the unreal experience of heaven and back to reality. But again, let us be reminded that for Plato reality consists of immutable ideas that exist beyond the realm of the sensible world, in the heavens.

Picture 3,4 : by Autor, Historical Museum of Bosnia and Hercegovina, Sarajevo

A visualization of music*: The project was inspired by music. Of course, that doesn't mean that the installation has reached the difficult goal of visualizing Chopin's* Waltz in A minor Op. 34 No. 2. *Chopin makes visionaries and performers out of listeners. By getting into every single person so deeply he manifests his presence and is so real here with us without being physically present; he transforms our bodies and our minds as nothing else. It is pure magic… By entering deep into our scars, he heals them. After interpreting or after listening to his music we are left with the feeling of absolute satisfaction and fulfillment. The complexity of his music totally immerses us– but without dampening our critical thought and our creativity. His music is creating worlds that we can never reach; still holding us captive of its magic, we are absolutely there and start all over again in a never-ending process.*

Bibliography

Bachelard, Gaston (1994). *The Poetics of Space*. Trans. Maria Jolas. Boston: Beacon Press.
Buci-Glucksmann, Christine (2002). *La folie du voir: Une esthétique du virtuel.* Paris: Galilée.
Deleuze, Gilles (1966). *Bergsonism*. Trans. Hugh Tomlinson and Barbara Habberjam. NY: Zone, 1991.
Heidegger Martin (2002): *Off the Beaten Track*, English edition of *Holzwege*, ed. and transl. Julian Young and Kenneth Haynes, Cambridge University Press, Cambridge, UK 2002 (includes "Der Ursprung des Kunstwerkes," translated as "The Origin of the Work of Art," and " Wozu Dichter?", translated as "What are Poets for?").
Proust**,** Marcel (1992***).*** *In Search of Lost Time*. Trans. C. K. Scott Moncrieff and Terence Kilmartin. New York: The Modern Library.
Žižek, Slavoj **(**2002): Žižek, Slavoj, *Welcome to the Desert of the Real*. London-New York: Verso.

.

Soundscapes of Women's Experience – Transdisciplinary Acoustic Narratives of Lake Palić

Jasna Jovicevic
Artist, independent researcher, Palić, Serbia
www.jasnajovicevic.com
jasnajovicevic@yahoo.com, https://orcid.org/0000-0002-0163-0261

Abstract: *Soundscapes of Women's Experience* is a site-specific, transdisciplinary artistic project that integrates recorded sounds from Lake Palić's natural, urban, and social environments. These recordings blend seamlessly with original instrumental compositions and audio testimonials from senior female residents, culminating in a distinctive musical audio walk. The project engaged senior women (aged 60+) in organized group walks along the lake, fostering physical activity, social connections, musical appreciation, and the rekindling of memories rooted in social and ecological contexts.
As a composer and the leader of the project, I recorded the sounds of the walks through a sonic intervention in the location, recontextualizing the acoustics of the landscape into a new sound space – a music piece. Additionally, I integrated the recorded testimonies of the senior women taken during the walks into that musical audio walk. The composition is slated for both live performance and recorded release in Spring 2024. Concurrently, we will publish the testimonials, senior narratives, and critical analyses.
This applied artistic initiative addresses infrastructural, social, and ecological concerns, with the overarching goal of reintegrating senior female residents of Palić with their natural environment and local heritage. It actively encourages their participation in community-based cultural activities while examining gender-stereotyped roles amidst ecological, social, urban, and political transformations. By exploring global issues through local shared experiences, the project offers a unique perspective bridging feminist political ecology and acoustic ecology.

Keywords: acoustic ecology, soundscape, artistic research in music, senior female experience, marginalized social groups.

Soundscapes of Women's Experience is a site-specific transdisciplinary artistic work created from the recorded sounds of the natural, urban, and social environment of Lake Palić, combined with original instrumental music and audio recordings of testimonies from older female residents of the Palić area. Invited senior women (aged 60+) engaged in organized women's group walks along the lake, listened to the sounds of the environment that evoked memories and experiences in both social and ecological contexts. These gatherings comprise local women who convene for supportive activities including physical exercise, social interaction, and the enjoyment of music concerts. As a composer and the leader of the project, I recorded the sounds of the walks through a sonic intervention in the location, recontextualizing the acoustics of the landscape into a new sound space – a music piece. Additionally, I integrated the recorded testimonies of the senior women taken during the walks into that musical audio walk. The piece will be performed live and recorded/published in Spring 2024, and testimonies, senior`s storytelling, and critical texts will be published. This applied artistic project aims to address infrastructural, social, and ecological issues while reconnecting elder female residents of Palić with nature and the history of the place, encouraging their participation in cultural activities within the community. It also explores the gender-stereotyped roles of senior women who testify to the ecological, social, urban, and political changes of the locality.

Fig.1 Project Logo

Program Context: Lake Palić, known as a regional tourist hub, fails to provide sufficient cultural and social opportunities for its elderly residents due to centralized activities in Subotica. While neighboring communities have established senior citizens' clubs, Palić lacks such resources. The local community and the municipality both

neglect to actively support social cohesion among this vulnerable demographic. Additionally, there is a significant absence of programs aimed at enhancing well-being, leaving residents without meaningful social engagement options. Factors like low pension incomes and the lingering effects of the COVID-19 pandemic further limit opportunities for socialization, leading to increased isolation and a sense of invisibility within society, posing a considerable threat to the psycho-physical well-being of senior women.

Lake Palić, once a renowned spa and tourist destination where local and regional residents enjoyed swimming and leisurely summer days enriched by a diverse cultural program, has, in the past decades, acquired a reputation as a stagnant locale with little to offer, largely due to human-induced factors and various ecological disasters. The developed tourist and urban infrastructure, while potentially appealing, remains financially and logistically inaccessible to the local residents.

In order to comprehensively and innovatively address these challenges, I have chosen to utilize the concepts of soundscape and acoustic ecology as a foundational framework for exploring the auditory environment of Lake Palić.

Acoustic ecology, often referred to as soundscape ecology, provides a unique perspective on the complex interplay between sound and the environment. This multidimensional field seeks to understand the environment through auditory perception, encompassing a wide range of soundscapes, from natural settings to urban areas and our daily lives. It offers valuable insights for researchers, policymakers, and urban planners aiming to create healthier urban environments, prompting a reconsideration of our relationship with both urban and natural soundscapes. This exploration, when combined with gender studies, offers a distinct view of how sound influences our perception of gender in relation to our sonic surroundings.

In the context of ecofeminism, which explores the intersection of gender and environmental concerns, this project highlights the significance of women's experiences in shaping our understanding of the environment. It underscores the unique perspective of senior women, who have witnessed ecological, urban, and social changes over time, making their voices essential in the broader discourse on environmental and gender issues.

The primary **target demographic** for this project includes senior women aged 60 and above who reside in the Palić area. The project strives to unite these senior women through organized group activities, colloquially referred to as a "women's circle." These activities included group walks along the lake, yoga practice, followed by convivial gatherings at the cinema "Abazija," during which participants engaged in discussions, shared life experiences, recounted personal stories, and memories, all while enjoying drink and a short music concert that I performed. Notably, these conversations were meticulously audio-recorded for documentation purposes and further investigation.

Fig.2 Women`s Circle

Fig.3 The Walk

Relevance of the Project in a Post-COVID times, and social neglecting: The COVID-19 pandemic has underscored the vulnerabilities faced by senior women, particularly in terms of their physical and mental health. Isolation and limited social interactions during lockdowns have exacerbated feelings of loneliness and anxiety among this demographic. Moreover, the project serves as a means of forging new friendships and strengthening the bonds of togetherness among senior women. Research has shown that engagement in collective activities and the development of social networks can have a profoundly positive impact on mental health and overall quality of life among older adults. Shared experience of the participants show that they feel neglected and invisible to their surroundings.

Significance of Senior Women's Memories of Lake Palić: The senior women's memories of Lake Palić hold significant cultural and historical value, harkening back to a time when the area was a lively recreational center with a beach, a tramway to Subotica, and a thriving social scene. These memories offer a glimpse into the past, reflecting the politics, social dynamics, and urban landscape of that era. The recollections are filled with nostalgia for idyllic summers spent by the lake, featuring picnics, barbecues, and joyful gatherings with family and friends.

Lake Palić wasn't just a place; it was an integral part of their formative years, embodying a vibrant community and a deep sense of belonging. However, the present has seen significant changes due to shifts in politics, economics, demographics, and urban development. The participants lament the absence of programs tailored to their needs and interests, leading to feelings of marginalization.

Fig. 4. Yoga Exercise

Fig. 5. The Walk

Artistic creation is in progress

This artistic project is deemed relevant and innovative due to its integration of soundscape elements, ecological awareness, and community engagement, resulting in a distinctive sensory experience. By melding the testimonies of older women with the natural soundscape, it offers a fresh perspective on the convergence of gender, ecology, and urban landscapes, thus presenting a novel and thought-provoking approach to artistic expression.

Through this artistic research, I investigate the concept of sound pollution and urban infrastructure through its innovative exploration of ecological dynamics within the urban landscape, utilizing soundscape interventions as a medium for understanding and enhancing the symbiotic relationship between inhabitants and their environment. In this program, I personally led walks, yoga exercises, and concerts for senior women in order to establish a personal connection with them and actively contribute to the formation of a new community. I also seek to highlight the therapeutic benefits of "deep listening" technique and yoga in nature-based group activities, fostering calmness of mind and body, and enhancing social cohesion. This experience significantly influenced me in creating a musical composition that includes composing for a string quartet and saxophone, integrating soundscapes and recorded testimonies of senior women into a holistic, intricate, and transdisciplinary artistic musical piece.

Fig. 6. The Walk

Fig.7. Urban Landscapes

Still to come…

The program is now on the half way. Women`s circle, facebook private group with over 80 members, and 9 walks with deep-listening sessions, yoga practices, socializing during music concerts, as well as soundscape recordings, and testimonies' recordings are implemented so far. Now is the time for deeper exploration of sound bank, production, recording, and the postproduction of a musical piece. This project will be publicly presented in Spring 2024.

Citizen Association ARTRUST has received support for realization of this program from the Swiss government as part of the "Culture for Democracy" project, implemented by the HearteFact Fund, and the Municipality of Subotica.

Fig.8. Walk and the Sunset

References

Truax, B. (1978) “Acoustic Ecologies in Urban Environments: Exploring the Impact of Noise Pollution The Sonic Environment of Cities”. *Environment and Behavior*.
Cobussen, M. (2022) *Engaging with Everyday Sounds*. Open Book Publishers.

The Architecture of Fluidity
Visualization of the Research Process of Figurative and Nonfigurative Instrumentalisation of the Fluidity Phenomenon in Architecture

Dr Bojana Jerković-Babović
Department of Architecture, University of Belgrade – Faculty of Architecture, Belgrade, Serbia
bojana.jerkovic@arh.bg.ac.rs

Abstract: Based on the research on the phenomenon of fluidity in architecture, this paper emphasizes the importance of connecting theory and practice in expanding the operational knowledge of architectural design, in the contemporary fluid state of intense changes in the context of architectural creation. This poster presents a visualization of the research process that uses inductive graphic narrative in deductive methods of analysis and synthesis of (1) theoretical platform, the interdisciplinary theoretical framework of the phenomenon of fluidity; (2) principles of fluidity architecture; (3) design procedures for instrumentalisation and (4) sets of methodological instruments that include all three levels of architectural creativity function, form and experience. At the same time, the authentic technique of architectural research with drawing and diagram, which shows the original model of thinking and operationalization of knowledge from the domain of architectural theory into the design process, is visualized in this paper. The interpretive graphic narrative analyzed and systematized the sets of characteristic methodological procedures and instruments from the analysis of representative examples of projects of selected leading architectural representatives. The outcome of the integral theoretical-practical analysis is the definition of the *flow*, the universal principle of both figurative (form and function) and non-figurative (perception and aesthetics) instrumentalisation of the fluidity in the process of architectural design, which is visualized in this paper.

Keywords: fluidity, flow, architectural design, research by design, visual narrative

Contemporary architectural theory interprets the design process as dynamic, fluid and variable (Hensel, 2012; Allen, 2009; Vidler, 2010; Garcia, 2010; Kwinter, 2010; Spiller, 2010; Gausa et all, 2003 etc.), as a reaction to the fluidity of the contemporary context (Castells, 1996, 2004; Pawley 1998; Virilio, 2000; Graham & Marvin, 2001, Bauman, 2000, 2005). The complexity of the contemporary context and the need for a dynamic, active role of the architect goes beyond mechanical procedures, so "the project becomes a larger theoretical construct, defined outside the studio or construction site, expressed through a medium that goes beyond the object and the drawing" (Alen, 2009, pp 12). Therefore, "practice is not a static construct, but is defined by its flows" (Allen, 2009, p 13), which is why there is not one narrative, one theory, or one principle, but the architectural design is based on their pluralism. Such pluralism implies the constancy of changes, actions and engagements, so tactical improvisations over time accumulate solutions in new operating principles and models, constantly building on previous experiences. Accordingly, unlike purely discursive practices, the material aspects of architectural practice evolve by operating with translations, transpositions and transcoding of various forms of presentations and media, which constantly develops new concepts in the dynamics of the design process.
The visualization of research in this paper aims to show how hyperproduction, the exponential acceleration of the design process, fragmentation of architectural elements, dematerialization and dispersion of disciplinary and physical frameworks in contemporary architecture affect the design process, methods, techniques, tools of contemporary architectural conceptualization, operationalization and representation of the fluidity phenomenon.
By the constancy of changes during the design process, and as a consequence of the fluidity of the contemporary context of the architecture and the city, design becomes an iterative process in which "process and behaviour relationships are modelled" (Ayres, 2012, p 4) and the dynamic, performative potentials of the design process are affirmed. Liminality and erosion of conventional forms of architectural presentation and historically based instrumentalization techniques resulted in the dominant development of diagrams as the leading methodological instrument of architectural practice at the end of the 20th and during the 21st century.
Within the analysis of the instrumentalization of fluidity in architectural design, the point of view according to which the diagram is equated with the flow and represents the basic instrument of conceptualization and operationalization of flows in architecture is significant (Garcia, 2010, 25). Diagrams instrumentalise dynamic processes, relationships, movements, non-figurative flows, effects, etc. in architectural design. Concerning contemporary urban phenomena - globalization, new technologies, current issues of sustainability, new models of political, social and cultural systems and transdisciplinary influences of complexity and pluralism -

diagrammatic practices in architecture are intensively developing in an eclectic manner of multidisciplinary methodologies. Anthony Vidler writes about the diagram as an instrument that corresponds to the speed of the contemporary context, variability in the process of operationalizing parameters and conditions, as a drawing that "affirms the process versus the product" (Vidler, 2010, 55). Vidler says that diagrammatic representations contributed to traditional values, styles and ways of visual communication "dispersing into the universal flow of the abstract" (Vidler, 2010, 55), which emphasizes transparency, infinity, liminality, inexhaustibility, extensions, etc. Sanford Kwinter analyzes the key categories and phenomena that are operationalized with diagrams concerning the methods and methodologies of different architectural schools and thoughts (Kwinter, 2010, pp 122-127). Accordingly, the diagram is developed as a synthetic instrument for understanding and creating a space through which the perceived reality is related to the formal system that is being organized.
Based on the above, the need for presenting a new, authentic author's model of thinking was recognized, where diagrammatic drawing stands out as an instrument of connecting theory and practice in architecture and urbanism, connecting the scientific and creative domain, through a visual graphic narrative.
This paper highlights the visual, simultaneously deductive and inductive graphic narrative, as an authentic model of research, reflection and operationalization of theoretical knowledge in design research. The investigation of the phenomenon of fluidity in architecture is positioned between the scientific and creative domain of architectural creativity and is based on the equal analysis of the extensive interdisciplinary theoretical framework and the extensive established platform of project elaborations of contemporary design practice (Jerković-Babović, 2022).

The paper is conceived as a visual essay that includes 4 main research parts with the visualization of the research results in part 5, which were carried out in research for a doctoral dissertation (Jerković-Babović, 2022):

(1) chronological analysis of conceptual aspects of fluidity in an interdisciplinary theoretical framework;
(2) analysis of the relationship between conceptual aspects of fluidity in the context and appearance of architecture and synthesis of the principles on which fluidity in architecture is based;
(3) analysis of the principle of fluidity in the works of authorities of contemporary design practice (250 projects) and definition of design procedures of figurative and non-figurative instrumentalization
(4) analysis and synthesis of methodological instruments of fluidity in the design process through representative project elaborates

(1)
The first part (figure 1) shows a visual narrative during the research process of an interdisciplinary theoretical framework that includes theories of cultural studies, philosophy, aesthetics and art, chronologically from the 17th century to the contemporary context.
The visualization represents a vertical timeline of theoretical sources from the 17th to the 21st century where connections between theoretical sources were established in the research process. On the left side of the vertical chronological line are systematized interdisciplinary sources in which the fluidity of the architectural context is read, and on the right are the sources in which the fluidity of architecture is read. The pink colour indicates the theoretical sources in which the non-figurativeness of fluidity is recognized (conceptualization, aesthetics, the experience and perception of fluidity), and the blue colour indicates the sources in which the figurativeness of fluidity is read (elements of the organizational structure, design, materialization, movement in space, etc.). In the graphic narrative, connections are drawn between theoretical sources, based on direct connection or connection to theoretical propositions and recognized similarities and aspects of figurativeness or non-figurativeness of fluidity that have been recognized. The theoretical sources start from the first uses of the terms fluidity and flow in the architectural discourse and start from the Barque period, the 17th century. The first vertical shows chronologically organized sources according to the previously explained model, with a systematization of direct chronological links of theoretical positions in which the development of fluidity can be followed. The second vertical highlights the theoretical sources in which the development of figurative fluidity is recognized from the 17th to the 21st century, and the third the chronology of the development of non-figurative fluidity, through the relationship between fluidity of context and fluidity in architecture. The fourth vertical shows the summa samarium of all the above with the newly established connections of theoretical positions that were recognized and established in this research.

(2)
The second part of the research (figure 2) presents the most significant results of the analysis of the chronology of the development of fluidity through chronologically systematized and synthesized aspects of fluidity in architecture. Aspects of fluidity are chronologically diagrammatically highlighted and connected through basic

concepts in architectural discourse, through the relationship of fluidity in the architectural context, architectural history and theory, and the appearance of fluidity in architecture, and architectural design creativity. Based on that systematization, analysis and synthesis, the deductive process visualized in the graphic narrative defined three basic principles based on fluidity in architecture. Through each of the principles, the research hypothesis was verified and proven (Jerković-Babović, 2022) and each of the principles was additionally broken down into figurative and non-figurative aspects on which it is based and whose operational value will then be analyzed through selected representatives in architectural design practice.

(3)
The third part of the research presents the visualization of the formation of a platform for the research of architectural practice of the 21st century through 5 selected case studies and 250 selected project studies (50 for each representative design authority). Aspects from the theoretical chronological analysis are visually read in the architectural elaborations, and based on that, the projects are classified according to three defined principles of fluidity. The analysis of the complete works of selected case studies (Peter Eisenman, Bernard Tschumi, Zaha Hadid, OMA, UN Studio) through 50 projects each, a total of 250 projects, was statistically processed and visually presented with diagrams of the statistical representation of the principle of fluidity and the design procedures by which the principles are operationalized in architectural design.

(4)
In this way, a platform of project studies was established for further analysis, which is shown in Part 4 (figure 4) and represents the basic part of the research. Based on a defined set of criteria for the analysis of methodological procedures and instruments in the design process, representative projects were selected through project elaborations. 15 representative projects were analyzed through the relation of the author's theoretical assumptions in which the conceptual aspects of fluidity were sought and brought into direct connection with the visual elements of the work, where the instrumentalisation of fluidity in contemporary architectural design is analyzed. Based on that analysis, models, mock-ups, diagrams, drawings, montages, etc. are singled out using deductive methods and graphic diagrammatic narratives. methodological instruments that instrumentalize the figurativeness and non-figurativeness of fluidity.

At the end of this analytical-synthetic procedure (figure 5), qualitative and quantitative parameters are summarized, based on which sets of characteristic methodological instruments are systematized. Flow, as a basic criterion, is divided into figurative and non-figurative design procedures and is linked to the functional, formative or experiential domain of the architectural project through the systematization of instrumentalization toolsets.

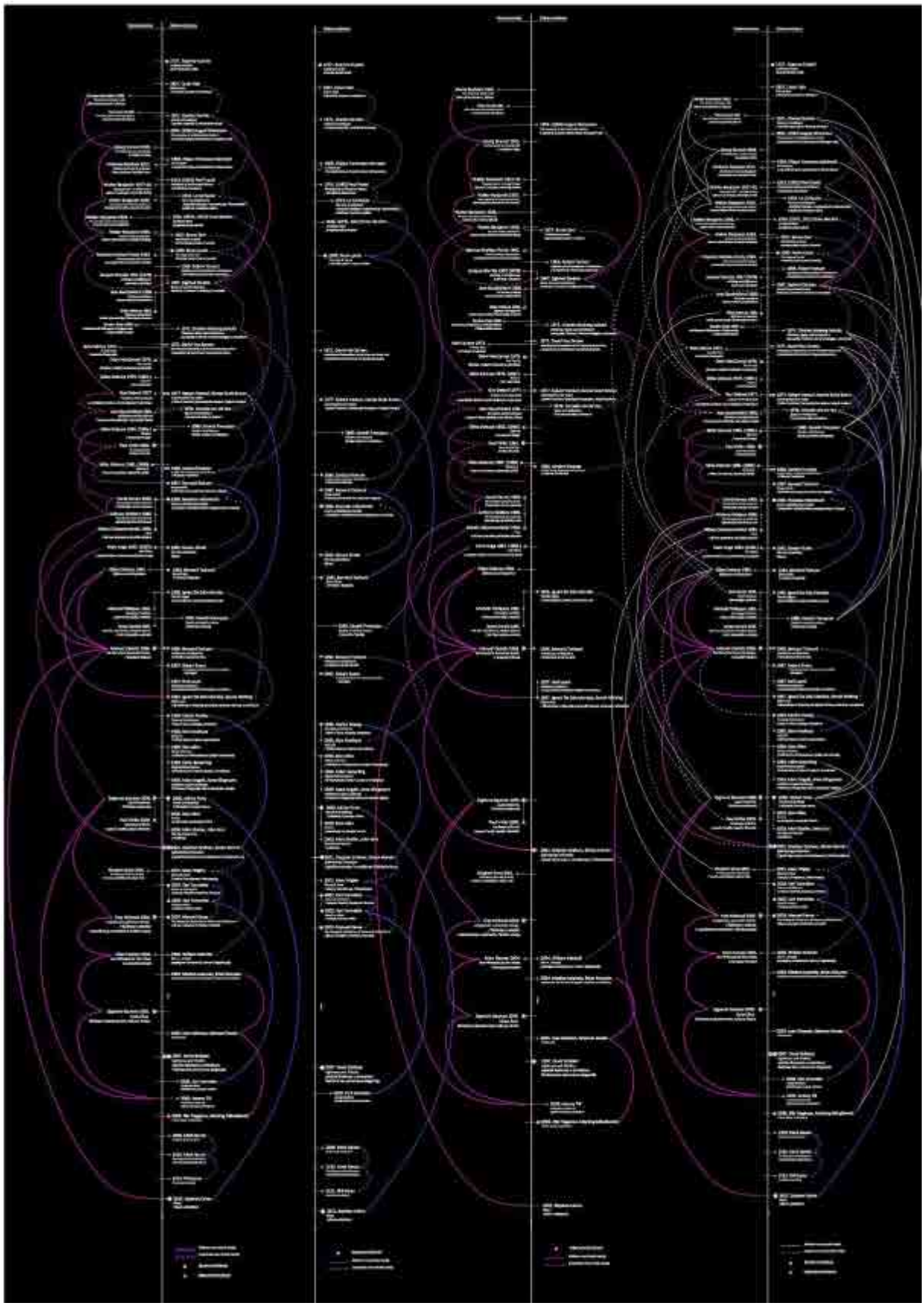


Figure 1 - chronological analysis of conceptual aspects of fluidity in an interdisciplinary theoretical framework

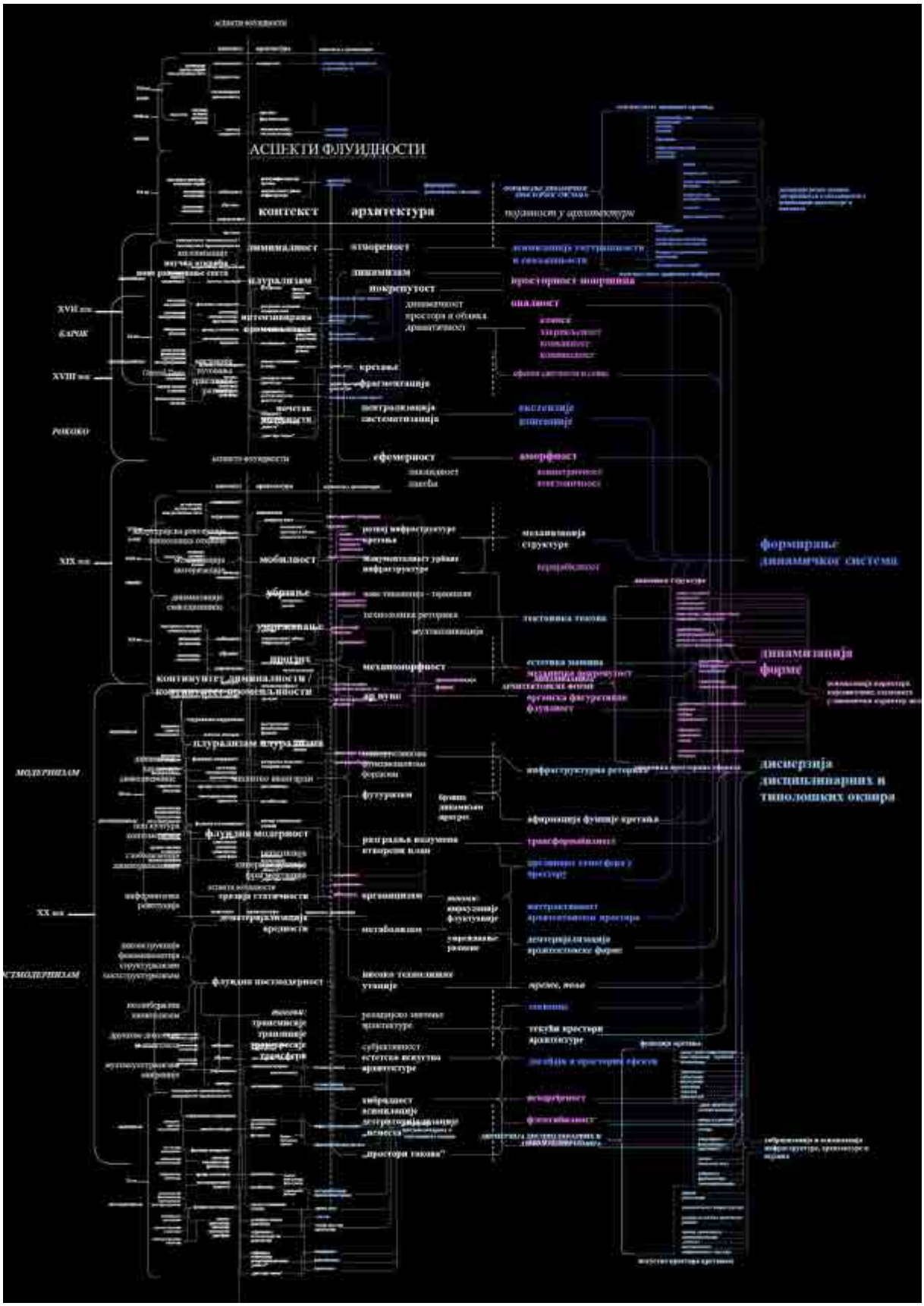


Figure 2 - analysis of the relationship between conceptual aspects of fluidity in the context and appearance of architecture and synthesis of the principles on which fluidity in architecture is based

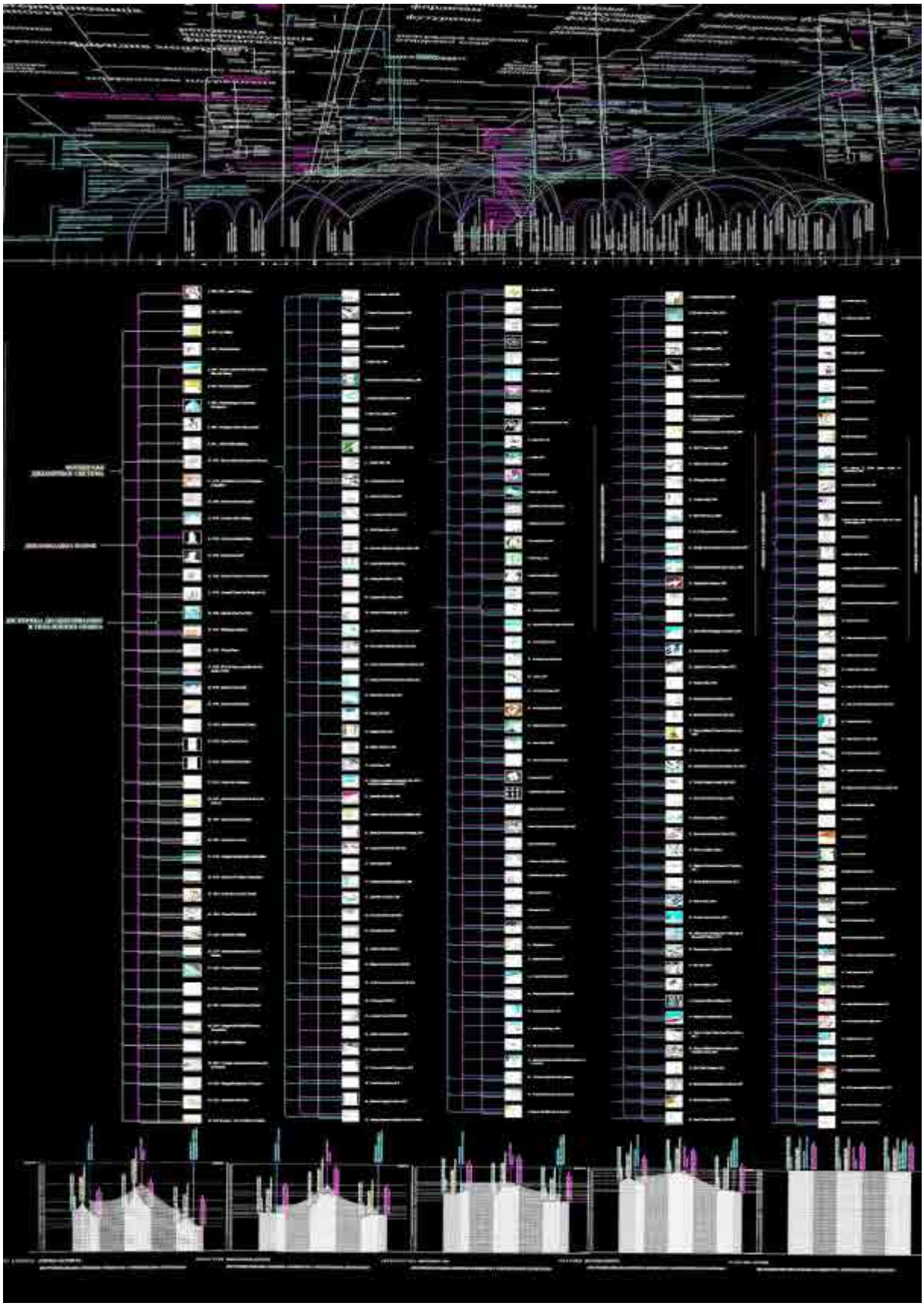


Figure 3 - analysis of the principle of fluidity in the works of authorities of contemporary design practice (250 projects) and definition of design procedures of figurative and non-figurative instrumentalization

Figure 4 - analysis and synthesis of methodological instruments of fluidity in the design process through representative project elaborates

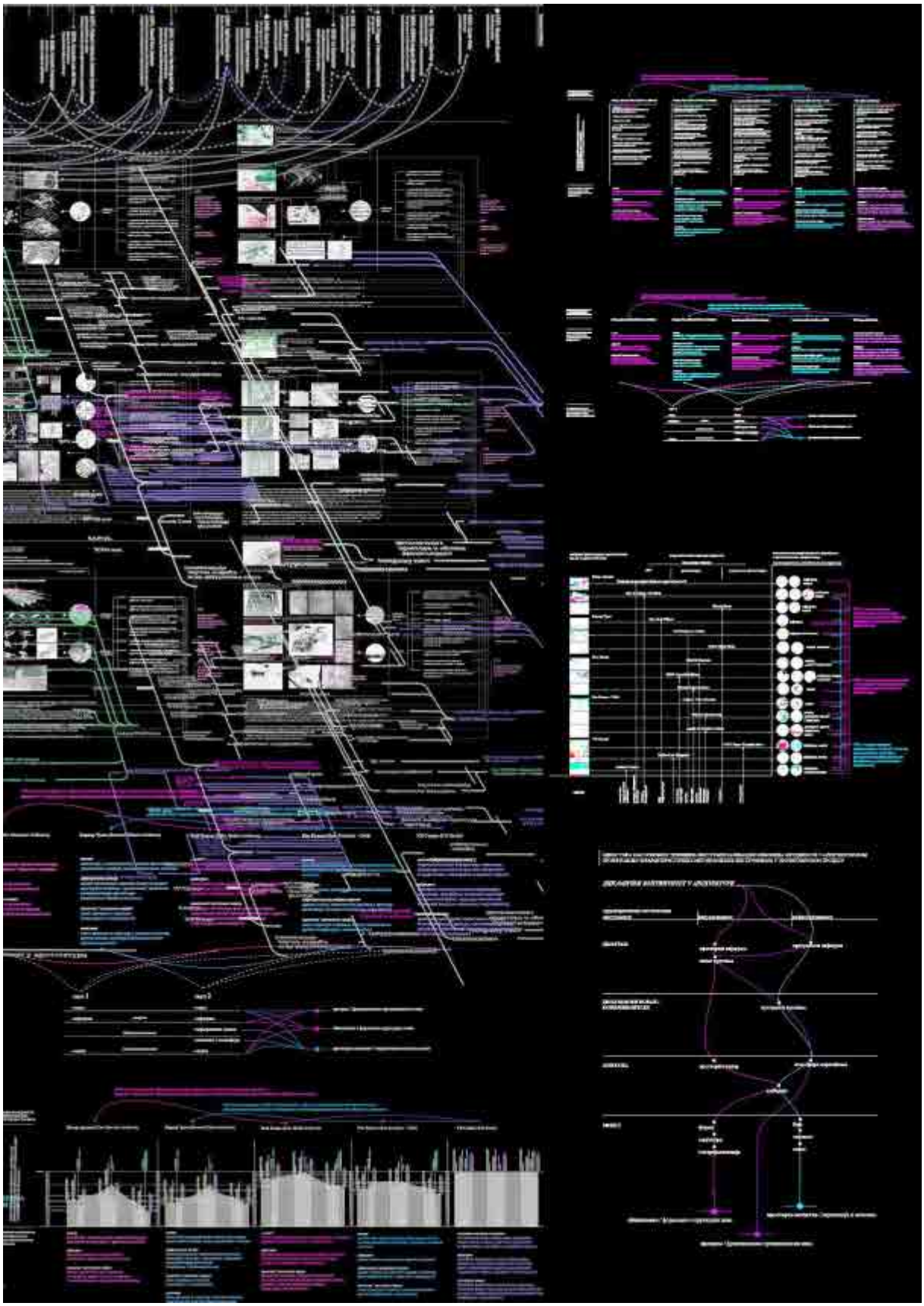


Figure 5 - analysis and synthesis of methodological instruments of fluidity with qualitative and quantitative parameters summarized, based on which sets of characteristic methodological instruments are systematized and applied to figurative and nonfigurative aspects of *flow* in the design process

References

Allen, S. (2009) Practice: Architecture, Technique + Representation. Abington: Routledge.
Ayres, P. (2012) Persistent Modelling – Extending the role of architectural representation. London: Routledge
Bauman, Z. (2005) Liquid Life. Cambridge, UK: Polity Press.
Bauman, Z. (2000) Liquid Modernity. Cambridge, UK: Polity Press.
Castells, M. (1996) The Rise of the Networked Society. Oxford: Blackwell Publishers.
Castells, M. (2004) The Informational City: Information Technology, Economic Restructuring, and the Urban Regional Process. London: Willey.
Garcia, M. (2010) The Diagrams of Architecture. London: John Wiley and Sons.
Gausa, M., Muller, W., Guallart, V. (2003) The Metapolis Dictionary of Advanced Architecture: City, Technology and Society in the Information Age. Barcelona: Actar.
Graham, S., Marvin, S. (2001) Splintering Urbanism. London: Routledge.
Hensel, M. (2012) Modelling modelling – Trajectories in developing instrumental design process. In: P. Ayres (Ed) Persistent Modelling – Extending the role of architectural representation. London: Routledge, pp 71-80.
Jerković-Babović, B. (2022) THE INSTRUMENTALISATION OF THE FLUIDITY PHENOMENON IN THE XXI CENTURY ARCHITECTURE, Doctoral Dissertation. Belgrade: University of Belgrade – Faculty of Architecture.
Koolhaas, R., Mau, B., Sigler, J. et all. (1998) Small, Medium, Large, Extra-Large. New York: Monacelli Press.
Kwinter, S. (2010) The Hammer and the Song, The Diagrams of Architecture. London: John Wiley and Sons, pp 122-127.
Pawley, M. (1998) Terminal Architecture. London: Reaktion Books.
Spiller, N. (2010) Spatial Notation and the Magical Operations of Collage in the Post-digital Age, *The Diagrams of Architecture.* London: John Wiley and Sons, pp 178-185.
Vidler, A. (2010) Diagrams of Diagrams: Architectural Abstraction and Modern Representation. In: M. Garcia (Ed) The Diagrams of Architecture. London: John Wiley and Sons, pp 54-63.
Virilio, P. (2000) A landscape of events. Cambridge, Mass.: MIT Press.

Author Index

A

Marko Aksentijević graduated from the Faculty of Political Science in Belgrade. The primary areas of his work include democratic development, deliberative mechanisms in decision-making, just city development, public resource management and housing affordability. The aim of his work is widespread participation of citizens, especially those less affluent, in developing communities in which they live in a way that will empower everyone.

Denis Ambruš was born in 1970 in Osijek, Republic of Croatia. He graduated from the Faculty of Archutecture, University of Zagreb, received his master´s degree from the FGG University of Ljubljana – IPŠPUP, and PhD degree from the Faculty of Architecture, University of Belgrade. He´s won prizes at urban-architectural competitions, two first, second, third prizes, redemption, and special recognition at the Zagreb Youth Salon. He published books ´Bringing the City Back´ (togather with Dusparić V.), ´Mechanical City´and ´Post-industrial Cities´. He works at the Faculty of Civil Engineering – University of Rijeka.

Olga Andrić is an architect. She graduated from the Faculty of Architecture in Belgrade and later obtained a master's degree. In the collective Ministry of Space, she works on rethinking new models of citizen participation in urban planning and development processes and cooperates with local communities to acquire the right to spatial justice.

B

PhD **Svetlana Batarilo,** Assistant Professor at University of Belgrade - Faculty of Traffic and Transport Engineering. Her specific field of interest is urban morphology, focusing on the relationship between architecture and sociology. She participated in architectural and urban competitions, where she was awarded. She is active participant of professional scientific conferences in Serbia and abroad.

Natalija Bogdanović (Kragujevac, 1988) is an architect. She completed her bachelor and master academic studies at the Faculty of Architecture of the University of Belgrade. She is enrolled in doctoral academic studies at the Faculty of Technical Sciences of the University of Novi Sad and doctoral artistic studies at the Faculty of Applied Arts of the University of Arts in Belgrade. She has been employed at the Faculty of Philology and Arts of the University of Kragujevac as an Assistant Professor. Since 2019, she is a chief of the Interior Architecture study program. She participated in several national and international exhibitions, competitions, and workshops in fields of Interior Architecture, Arhitecture, Urbanism and Scene Design. She is involved in scientific research and deals with designing in the fields of architecture and interior design, as well as different formats of artistic projects. Since 2017, she is the founder and president of the professional association "URBANIUM - Center for

Research and Sustainable Development of Architecture and Urbanism" and manager of the "Days of Architecture in Kragujevac" project. Together with architect Aleksa Đurić, she leads the design practice - ADDICTED design studio.

C, Ć, Č

Francesco Carota, Ph.D, is Assistant Professor at the School of Architecture and Design, University of Kansas, and Affiliate Researcher at the China Room research group, Polytechnic University of Turin. His research, teaching and professional work focuses on the design and understanding of the intertwined relations that weave architecture and urban development process together, particularly in China and more recently in less developed countries. On these topics, he published a variety of academic articles, and he coedited the volume China Goes Urban. The City to Come for Skira Editore. In addition to academic publishing, he dedicated a great deal of effort to disseminating research and architectural culture to the broader public. He was scientific director of an exhibition on Chinese architecture and urbanization held at the MAO, Museum of Oriental Art in Turin, Italy, and co-curator of the Italian Pavilion at the Shenzhen Design Week – 2018 Edition. Other than carrying on academic activities, he works as a licensed architect, and he is the cofounder of the architecture and design firm Calibro Zero Srl. His work and voice as a curator and designer appeared in different media sources, and among the many the Italian magazine Domus, the Singapore based title d+a Design and Architecture, the fashion magazine Vogue and the architecture platform Archdaily.

Darío Negueruela del Castillo works on architecture and architectural and urban history, digital humanities, urban studies. He is the scientific coordinator of the Center for Digital Visual Studies (Max Planck Society – University of Zurich) since January 2020. Before, he was Head of Research at ALICE lab EPFL.

Dragana Ćirić, PhD in Architecture and Urbanism, Independent Scientific Associate/Research Assistant Professor, Architect and PI at unit [d], Belgrade, Serbia. linkedin.com/in/dragana-ciric-16524b26/
Research Projects: dciricresearchprojects.tumblr.com Architectural Design: dciric1.tumblr.com

Dr **Iva Čukić** earned her PhD in urban planning from the Faculty of Architecture in Belgrade. The areas of her research include new models of governance, participatory urban planning and urban transformation. She actively works with the community - supporting local initiatives in their efforts to address spatial issues and contribute to socio-political change in line with the principles of social justice.

D

Vlatko Dusparić was born in 1943 in Osijek, Republic of Croatia. He graduated from the Faculty of Archutecture, University of Zagreb, received his master´s degree from the Faculty of Archutecture, University of Zagreb. He is the winner of the Golden Badge of the Urban Planning Association of Yugoslavia. Together with his male and

female colleagues, he participated in eleven urban planning and architectural competitions and won seven awards, three of which were first.He published books ´Bringing the City Back´ (togather with Ambruš D.).

Vladan Djokić, PhD in Architecture and Urbanism; Full Professor at Department of Urbanism at University of Belgrade – Faculty of Architecture (UBFA), Rector of University of Belgrade, Full Member of Academy of Engineering Sciences of Serbia (AESS), and Head of Laboratory for Urban Morphology and Typology (Morpho-Lab) at UBFA. Project Leader of Erasmus+ project HERSUS. Dr. Djokić has extensive experience of both national and international project coordination and management. He is a member of the Council of International Seminar on Urban Form (ISUF).

E

Erez Ella (1971, Jerusalem) founded HQ architects in Tel Aviv in 2008 after spending several years in New York as an Associate at OMA, where he led the TVCC project in Beijing, (1999-2005) and as Co-founder and Principal at REX (2006 – 2008). He has extensive international experience as – director and manager of several Urban, Transportation and Public projects with a strong focus on technology and innovative solutions.
Erez's involvement extends far beyond the world of architectural design. He co-curated the Israeli Pavilion at the 2012 Venice Biennial of Architecture and In 2011, he established and led for over a decade the 'Mechanism of Design and Urbanism' research unit at the Bezalel School of Architecture.

Davor Ereš is research assistant at the Institute for Philosophy and Social Theory, University of Belgrade, active in the fields of architectural design, teaching, and research with focus on the models of learning through architecture and the questions of contemporaneity. Since 2016 he is guest teacher at Confluence Institute Paris.

F

Ivan Filipović, Ph.D. (1987), a trained architect who pursues interdisciplinary research within the intersection of urban governance, identity and ideology. The combination of his training and practical experience give him a unique perspective that has been utilized to establish and work within a new field of academic study - soft power architecture.

G

PhD **Ranka Gajić**, Assistant professor at the Faculty of Traffic and Transport Engineering, University of Belgrade in Serbia. She has been involved, both as an associate and team leader, in drafting town planning documentation for cities in Serbia. Author of one Monograph, supplementary textbook and over 80 published

conference papers. She is a vice president of the Association of Engineers of Belgrade and a member of the ISOCARP. Scope of research: urban morphology, sustainable development of cities, sustainable urban land use.
Jelena Ilić Gajić, m. arch., Teaching assistant at the University of Belgrade – Faculty of Architecture, Department of Architecture, and PhD student at the same faculty. In addition to the development of professional practice and teaching experience, she is also engaged in scientific research work related to ephemeral architecture in urban city spaces. She participates in architectural competitions, workshops, art and architectural exhibitions and conferences in the country and abroad. It also deals with designing, planning and managing projects in practice (on the construction site) and their construction.

Marta Grbić, (Priština 1994) Employed as an assistant at the Faculty of Technical Sciences in Kosovska Mitrovica, department of Architecture. Works at Pro Arh Studio team. Student of PhD Program at University of Novi Sad, Faculty of Technical Sciences, where obtained Bachelor's degree. Finished Master's degree at Politecnico di Milano, Italy.

J

Dr **Bojana Jerković-Babović** was born in Belgrade in 1990. She graduated from the University of Belgrade – Faculty of Architecture (2014) and holds a PhD in Architecture (2022). She was awarded with Annual Milorad Macura Award by IAUS for the best Master's thesis and Doctoral dissertation in the field of architecture and urbanism, both on the topic of fluidity in architecture. She is a TA at the same Faculty.

Jasna Jovićević (PhD of Arts & Media, MA Composition, BA Jazz Saxophone) is a musician, composer, and researcher intrigued by interactive systems in collaborative artistic practices, and strategies for transcending performance through conscious improvisation. Jasna released 6 solo original albums, performed her works across Europe and North America at international art festivals, residencies, and concerts. Visit www.jasnajovicevic.com

K

Tamara Koneska was born in 1997 in Skopje. She completed her bachelor's and master's studies at the Faculty of Architecture in Belgrade in 2020, after which she enrolled in doctoral academic studies at the same faculty, where she's currently enrolled as a research teaching associate at the bachelor and master studies of architecture. In addition to her engagement in scientific-theoretical and professional practical work, she has participated in numerous international workshops and summer schools, alongside her involvement in the organization of international theatre and film festivals. She actively exhibits her works in the fields of architecture and visual arts at various international group exhibitions in the country and the region.

Despoina Kokkota, Architect, recently graduated from the Technical University of Crete's School of Architecture. Her design interest are focusing at “fast architecture”, visualizing the concept of speed and velocity, both in art and design, from conceptual studies to detail drawings. Currently she is engaged as a junior architect in design and construction supervision of several projects in Greece.

PhD **Milena Kordić,** Assistant Professor at University of Belgrade - Faculty of Architecture, Department of Architecture. Her specific fields of interest include practical design as well as interior design theory, focusing on the relationship between architecture and philosophy. (In-Between Space (Zadužbina Andrejević, Belgrade 2012)). Active in professional competitions with a significant number of rewarded competition entries, author of several built objects and many interior designs her work is oriented toward making new connections between theory and practice.

Dr **Mateja Kurir** is a philosopher, researcher, and editor. She was a visiting researcher at the Department of Architecture, KU Leuven (2015), and postdoc fellow at the University of Rijeka (2017). Currently she is the manager of The European Architecture platform LINA. Her work has been published as radio broacasts, articles and books. She published *Arhitektura moderne in das Unheimiche* (2018) and co-edited *Garden and Metaphor* (2021, forthcoming in English in 2023). As the editor of *On Power in Architecture* (Slovenian 2021, forthcoming in English in 2024), Kurir received the Plečnik’s Medal 2022 in the field of architectural theory, criticism, and publication.

L

Nora Lefa M.A., MSc., PhD, Associate Professor, University of Ioannina -Dept. of Fine Arts and Art Sciences, is an architect and visual artist. She has lectured at the Agricultural University of Athens, at the Technical University of Crete, at the Universities of Sarajevo, Belgrade, and Montenegro; she is now Associate Professor at the School of Fine Arts, University of Ioannina. She has presented her work in several solo and group exhibitions in Athens, Sarajevo, Belgrade, New York, Miami, Barcelona, Zurich, Paris, London and Venice. She has won distinctions for her architectural and artistic work. She has presented papers in several international conferences and has authored two books: Sarajevo Again (Athens: Plethron 2020), and Buildings Used (Abington: Routledge 2019 -co-authored). She has co-organized international conferences and exhibitions and was a member of the respective scientific committees and jury. She has translated into Greek Serbian and Bosnian poetry.

Iva V. Lokas, (nee Šibalić) was born in Belgrade in 1995, where she graduated from the School of Design in 2014 as a student of the generation and with an awarded graduation thesis. She completed the Bachelor Academic Studies in Architecture (2019) and the Master Academic Studies in Interior Architecture (2021) at the Faculty of Architecture in Belgrade. She is currently a student of Doctoral Academic Studies in Architecture and Urbanism. She begins her research work by preparing a Master's final thesis under the theme "Contemporary Spectacle -

Currents of Culture" which she successfully defended with a grade 10 of 10. The focus of the research work, in doctoral studies, is defined by examining the influence of subculture on the shaping of space. She is engaged in research work as Research scholar of Ministry of Science, Technological Development and Innovation in Institute of Architecture and Urban & Spatial Planning of Serbia, Serbia (since 2023).

M

Milica Mađanović is a Research Fellow at the Institute for Philosophy and Social Theory, University of Belgrade. She holds a PhD in Architecture from the University of Auckland (New Zealand). Milica specializes in nineteenth and early-twentieth-century architecture and urban design. Her research interests also include disabled studies and universal design.

Dr **Marija Maruna** is a full professor at the Faculty of Architecture, University of Belgrade. She is the head of courses in the field of planning theory, urban governance and strategic urban design. As a guest teacher, she participated in the study programs at ETH Zürich, TU Berlin, Universität Stuttgart, Universidad de Granada, Universitat Politecnica de Catalunya, Politecnico di Milano and others. She is the head of the Laboratory for Planning Culture and Spatial Policy Design at the Faculty of Architecture in Belgrade. She is the author of the books *Planning Theory: A Contribution to Critical Thinking in Architecture* (2019), *Urbanism of Belgrade: A Handbook for Researching the Process of Space Production* (2013) and co-author of the monograph *Strategic Urban Design and Cultural Diversity* (2009) (with Nada Lazarević Bajec). She is the editor of several monographs of national importance. She is the winner of several awards and recognitions for her scientific, research, professional and mentoring work.

Milos Milovanovic is a high-rise residential architect at Arcadis IBI Group, based in Calgary, Canada. Researcher and Assistant Professor at Union University – Nikola Tesla in Belgrade. He teaches courses related to urban planning, presentation techniques and project design on undergraduate studies. Participated in several exhibitions in Belgrade, Zagreb and Sarajevo. He was the winner of the “Project portfolio 33” competition and joined several conferences, most notable “On Architecture” and “Facing the Future”. In his research, he encompassed the theme of mythology in architecture and developed “RELATE – Learning elsewhere, learning otherwise” project with Marta Brković Dodig.

Jelena Milošević received her Ph.D. (2016) from the University of Belgrade - Faculty of Architecture. She has been employed at the University of Belgrade - Faculty of Architecture since 2011. Her scientific research focuses on structural systems and spatial structures, structural design, structural morphology, form-finding, and optimization of structures. She is a participant in national and international scientific research projects. She is the author of papers published papers in journals, proceedings, and monographs. The focus of her professional engagement is architectural design. She is the author of several competition designs and has participated in several exhibitions. She was a member of organization boards, scientific boards, and selection committees. She

is a member of the Serbian Association for Geometry and Graphics (SUGG), the Serbian Association for Earthquake Engineering (SUZI), and the International Association for Shell and Spatial Structures (IASS).

Mila Mojsilović, PhD Arch, architect, currently lectures as a Teaching Assistant at the Department of Architecture – University of Belgrade, Faculty of Architecture. She is educated in Belgrade (Faculty of Architecture) and Paris (Ecole d'Architecture de Paris-Val-de-Seine). She received her PhD from the University of Belgrade in 2020. She is involved in scientific research in the field of architectural philosophy and aesthetic. The main framework of her theoretical research is contemporary design, theory of form and the aesthetics of fragmentation. Currently she is working on the Momo Kapor Pavilion in Belgrade. She has participated in the organization of the Balkan Architecture Biennale (BAB) - international exhibitions (2015/17/19) and has served on juries in several international and national architectural competitions.

N

Marina Nenković-Riznić is a Senior Research Associate in the Institute of Architecture and Urban & Spatial Planning of Serbia. Her research fields are spatial and urban planning, municipal solid waste management, location theory, methodology for SEA and EIA–multicriterial analysis and modelling approaches, resilient cities, location theory, application in GIS. Managed several national and international scientific projects (INTERREG, Horizon 2020). Participated and managed the preparation of planning, project and study documentation and SEA as a lead planner. Published more than 200 papers in national and international scientific journals and on conferences. As a co-author or author, she has won several awards and recognitions at international and domestic competitions and exhibitions. linkedin.com/mnenkovicriznic

Iacopo Neri explores the intersection of architecture, computer science, and urban planning through his research. Currently, he serves as scientific collaborator at Digital Visual Studies DVS (MPG, UZH), and as computational lead and co-director for the Master in City and Technology at IAAC, and as web-developer at Noumena, Barcelona

Sanja Nikolić, (Belgrade, 1995) Currently engaged as Research Scholar at Institute of Architecture and Urban & Spatial Planning of Serbia. Student of PhD Program at University of Belgrade, Faculty of Architecture, where obtained bachelor’s degree and master’s degree at Politecnico di Milano. Worked as an intern at ATI Project, Milan and VMX Architects, Amsterdam.

P

Eleftheria Papadosifou, Architect, graduated from the Technical University of Crete's School of Architecture, interested in sustainable design, honed by attending multiple workshops on natural building materials. She has collaborated in an international competition for historical building renovations and has co-authored two

research publications centred on the rethinking of design principles. Presently, she is collaborating as an architect-designer in Milan specialized in comprehensive architectural services from initial design to execution.

PhD **Bojana Pašajlić** (1990, Kragujevac) Assistant professor, Univesity of Kragujevac, Faculty of Philology and Arts, Kragujevac, Serbia. She holds a Phd from the Faculty of Technical Sciences, University of Novi Sad in 2020, with doctoral dissertation "Trade buildings created from the turn of the XIX to the first part of XX centuries in Kragujevac - identity and role of the media''. Since 2021 she works as assistant professor at Faculty of Applied Arts, University of Kragujevac, Department of Interior Architecture, teaching a group of courses in the field of Stylistic Architecture. During the past years, she was a participant in numerous collective exhibitions in the country and abroad. She is involved in scientific research in the field of architectural history and philosophy. The main framework of her theoretical research is History of architecture in 20th century, Architectural heritage and Cultural Heritage, especially in the area of Kragujevac. She is engaged in independent practice in the field of Interior Architecture and Design.

Relja L. Petrovic, born in Belgrade (1996). He completed his Bachelor (2020) and Master Academic Studies (2022) at the University of Belgrade - Faculty of Architecture. During the 2019/20 academic year, he held a post as a teaching assistant (demonstrator) on the module within the artistic field of *Fine Arts* at the Department of Architecture. He is an active participant in professional workshops, summer schools and congresses. Relja volunteered at the 44th Salon of Architecture (Museum of Applied Art, Belgrade) where, after completing his studies in 2022, he began his professional career as a intern curator at the Collection of Architecture, Urbanism and Architectural Design. Currently, he is employed in the field of construction projects focused on the preservation of architectural heritage, and he has applied for doctoral studies at the University of Belgrade - Faculty of Architecture. He is an associate member of the Association of Conservators of Serbia (DKS) and a full member of the Association of Belgrade Architects (DAB).

R

Ivana M. Rakonjac, born in Belgrade, graduated from the University of Belgrade – Faculty of Architecture, got B.Arch., M.Arch. and a Ph.D. degree in the field of Architectural Design and Contemporary Architecture (2016). Employed at the same faculty at the Department of Architecture as an Assistant Professor. Her work is oriented toward making connections between theory, scientific research, and practice. She has published numerous papers in publications, scientific conference proceedings, as well as several articles in an internationally rated journal. As an author and a member of the team, she designed numerous architectural projects – multiple completed interiors, as well as several built buildings and open public spaces. She regularly participates in national and international architectural exhibitions. She is a founder of Meteor studio – architectural practice in the field of architectural, interior, lighting design, and urban planning.

S, Š

Miloš Stojković Minić, m. arch., Teaching assistant at the University of Belgrade – Faculty of Architecture, Department of Architecture (2017-2023), and PhD student at the same faculty. In addition to the development of professional practice and teaching experience, he is also engaged in scientific research work related to the topic of water in architecture – aquatecture. He regularly and very successfully participates in architectural competitions, workshops, art and architecture exhibitions and conferences in the country and abroad. He is the founder of the *Atrio* group for architectural and artistic operational practice and the MIST Arh architectural studio.

Nikolina Sekulović, M. Arch, Teaching Assistant at University of Montenegro, Faculty of Architecture. She received multiple student scholarships and recognition in architectural competitions. Currently she is a phd student at the Faculty of Architecture, University of Belgrade. Her fields of interest include research on the position of architectural practice and contemporary architectural design challenges.

Igor Svetel graduated from the Faculty of Architecture at the University of Belgrade. During the studies he started to be interested in applying computers in architectural design. In 1987 he was one of the team members who developed the GIMS Expert, a computer system for designing prefabricated buildings. During the 90's, he has developed numerous experimental programs for computer assisted architectural design with the emphasis on modelling the design process. From the middle of 2000, he focused his attention on BIM technology and led two technological development projects with the topic of using BIM technologies in architectural design. Now, he is a member of the subcommittee for standards KS U442, Information modelling of objects – BIM. He is the author of numerous papers in domestic and foreign publications.

Božena Stojić is an urban planner. She graduated from the master's course in Integral Urbanism at the Faculty of Architecture, University of Belgrade. Through her work, she deals with issues of the role and of the urban planner in the processes of city development, rethinking the model of the planning system and local self-government, as well as developing new mechanisms for citizens' participation in the process of planning and city development.

Kosta Stojanović (2000, holds a B. Arch degree from the University of Belgrade's Faculty of Architecture. He's currently a second-year master's student and a student teaching assistant at the university. His research areas include new technologies, identity, urban planning, and politics. He has exhibited his work at international architecture and design shows, winning a special prize at the 2021 Micro Eco House Competition.

Monika Štiklica, PhD in the field of architecture and has been actively working in interior design for over 20 years. Her rich career began during her studies for a bachelor's degree from the Faculty of applied arts in Belgrade and has since then been systematically building the reputation as a versatile architect and designer.

Continuously and diligently contributing to the culture of studies and education, Monika Štiklica lectures bachelor as well as master's degrees in the University of Novi Sad, as an associate professor, passing down her vast knowledge and experience built upon the experience of over 150 successful projects of which she was the author. She is the founder and lead architect of Amo design studio which designs interiors for both residential and public spaces.

T

Jovana Timotijević has a background in architecture and political studies. She is currently doing a PHD on the potential of deliberative processes to democratize urban development, at the Faculty of Political Sciences, University of Belgrade. She has been engaged in pioneering deliberative formats in the local context in numerous areas, one of which is urban planning.

Jovana Tošić obtained her Ph.D. at the University of Belgrade - Faculty of Architecture in 2022. Her academic practice began as a teaching fellow at the University of Belgrade - Faculty of Architecture. Currently, she works as a Professor of Vocational Studies at Information Technology School – ITS in Belgrade.

Giannis Nikos Tsaras, Architect, Associate Professor, department of Architectural Technology and Construction, School of Architecture, Technical University of Creta.
He completed his studies in AUTh (Aristotle University of Thessaloniki), got his master in ETSA in Barcelona (Universitat Politecnica de Catalunya) , and his PhD title in Architecture Technology and Design in AUTh. He has taught classes of Design Studios, Architectural Technology and Building, Architectural Acoustic and Digital Representation courses, in Department of Architecture of Aristotle University of Thessaloniki, Democritus University of Thrace and in School of Architecture and Design of Bachesehir Universitesi in Istanbul.
He is an active architect since 2002, specialized in design of private houses, hotels and places of performance. He has won several prizes in international and national competitions.

V

Dragana Vasilski is Full-time Professor and Head of the Department of Architecture and Urban Planning on the University Union Nikola Tesla, in Belgrade, Serbia. She is engaged in theoretical research. Her scientific competence is reflected in more than a hundred scientific papers. *Peculiarly* field of her interest is Minimalism in architecture, as the life changing architecture (htpp://miadraganavasilski.wordpress.com).

W

Christiane Wagner has been a research professor at the University of São Paulo, Institute of Advanced Studies (IEA USP), and an affiliated researcher at the Institute for Cultural Inquiry Berlin (ICI Berlin). Her research project addresses the USP Global Cities Program on Expanding Public Spaces: Smart City's Empirical Research in São Paulo and Berlin. The implementation of this project targets the 2030 Agenda for Sustainable Development, which includes the 17 Sustainable Development Goals (SDGs), focusing on the 11th goal of sustainable cities and communities. High up on her list of publications is the book Visualizations of Urban Space: Digital Age, Aesthetics, and Politics (Advances in Urban Sustainability, London and New York: Routledge, 2022).