Sounding Architecture: Inter-Disciplinary Studio at HKU

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ABSTRACT

Sounding Architecture, is the first collaborative teaching development between the Department of Architecture and the Department of Music at the University of Hong Kong (HKU), introduced in Fall 2016. Composed of 67 students and 6 tutors, at the start of their studies, the Year 2 students of the Bachelor of Arts (Architectural Studies) (BAAS), received a year of basic training in the foundation courses. they were able to experiment with sound, shape and materials with no specific goals, except to construct a sound instrument and develop a set of drawings that informs both construction and performance depending on their individual suitability and finding. This was followed by practical work in the workshops led by composer Ken Ueno (UC Berkeley), composer Eli Marshall (Cornell University), percussionist Deborah Waugh (HKU) and fabrication laboratory manager Donn Holohan (HKU), all accompanying their disciplines.

In this paper we present critical observations about the studio after a final public presentation of all projects in the 29th of November 2016. The Review was conducted with demonstrations by groups of students supervised by different tutors, in each case focusing on a different strategy to create a connection between Sound, Music, Acoustics, Space and Architectural Design. There was an assumption that the core working process would have to include the design of a new musical instrument, which in some cases became the final deliverable of the Studio and in other cases a step in a process that leads to a different outcome (such as an architectural design, a performance or a social experiment). One other relevant aspect was that Digital technology was used in the design and fabrication of the physical instruments' prototypes, but in very few cases, it was used in the actual generation or enhancement of sound, with the instruments relying almost exclusively in acoustic and mechanical sound.

Author Keywords

NIME, Architecture, Design Research, Inter-disciplinary Teaching, Design Studio, Prototyping

ACM Classification

H.5.5 [Information Interfaces and Presentation] Sound and Music Computing.

1. INTRODUCTION

Architecture and Sound have been approached in many different ways [1] [2]. On the other hand, the design of New Musical Interfaces for Music Expression (NIME) is an established research field with conferences and peer-reviews publications for over 15 years [3]. However approaching this topic from the perspective of Architectural Design, as a pedagogical exercise, is an innovative

and substantial contribution to the field. Nevertheless, one should always keep in mind that the most successful musical instruments, such as the piano or the violin, took centuries to be developed until they become perfectly fine-tuned and sophisticated, as we know them today. Even with the advances of modern digitals tools for design and prototyping, as well as University level knowledge supervision and references, the expectation of what can be achieved in one semester needs to be framed into an adequate perspective.

Even so, the projects developed by the students tackled, in an empirical way, some of most relevant research topics in the field of Sound and Music Computing [4] or Auditory Display [5] [6].

The projects explored issues such as sonification, collaborative music instruments, multidimensional interaction design, wearable music instruments, performance, notation, collective improvisation, collaborative composition, participative performance or generative sound.

Figure 1. Sounding Architecture Poster

2. SOUNDING ARCHITECTURE PROJECTS

The Year 2 Coordinator was Thomas Tsang and projects were developed in groups supervised by Miho Hirabayashi, Ryo Fujimori, Wei Tseng, Jae Lim and Sony Devabhaktuni, each one introducing a distinctive approach towards the Sounding Architecture studio. In the beginning of the semester the students were challenged to answer the question *"Can we understand architecture or building as form of a music instrument where the design might not necessarily be performed exactly how it was conceived?"*. The goal was to search for latency or gap between building and performance, by trying to understand how a building is being used in the same way an instrument could be used and performed. In the early foundation of architectural education, the body and the relationship of the 1:1 scale is addressed. In that sense, this project reinforces how building can be closer to us.

The process resulted from discussions and open-ended questions to the students, such as: *"Are architects able to perform their architecture?"* or *"By performing, do we get to reflect on our work and understand through research where it can be developed further?"*. Since the majority of our students play traditional classical instrument (mainly Western) and contemporary music is not part of their repertoire, the students' understanding of sound is more based on what is given to them, as opposed to being discovered. Architecture design works in the same way in terms of the discovery process.

In addition, the basic requirement of Year 2, is to get students to develop a discourse on inter-disciplinary practice, which is highly supported by the University's 3 pillars agenda[1] and the basic requirements of the defined learning outcomes:

- Develop awareness of design and finding problems via design.
- Training of basic skills of drawing and modeling, developing observations on the concrete part of the everyday to a form of abstraction.

In this paper, we present a critical review of the projects developed during this course.

2.1 Participative social interaction and music notation

Group 1 was supervised by Thomas Tsang and included 6 projects that developed diverse works with the common denominator of drawing inspiration from seminal master works of experimental and electroacoustic music, proposed by the course supervisor. The projects followed different approaches focusing on a unique aspect that was crucial to the music piece they were assigned. We can highlight the following 4 projects:

2.1.1 Silence is not universal

Silence is not universal is an installation that explores the importance of silence as an element in music composition and more importantly as form of tuning in other senses. To test some of the ideas, the students developed a device that allows two people to look at each other's face depriving them of other senses by minimizing peripheral vision and ambient sound.

The experiment was carried out in the busy streets of Hong Kong with several subjects. This conceptual prototype has several possible directions for further developments, but for these students the importance of exploring these concepts, specially in the public place, is relevant to understanding how music can be composed, and most importantly getting familiar with the notion of designing spaces of intimacy in the public place, as defined in the term "no-place" by the French anthropologist Marc Augé [7].

Figure 2. Silence is not universal by Minia Cheung and April Soo

2.1.2 Bench Automata

Bench Automata is a sophisticated installation that also explores the social interaction in the public space. The students developed an elaborate foldable bench that reacts when a person sits on it, with a low pitch vibration that will trigger tactile and sonic perception. The purpose was to test how subjects react and interact with this bench in a public space. To create the sound effect the students used electronic components, when realizing that the physical structure of the object could not provide a loud enough acoustic sound. This is an approach to generate sound that was not used by any other groups and that has tremendous potential to be explored in future developments of this Studio. The students also used wireless digital tracking to better analyze the behaviors of the subjects.

2.1.3 Sounding Column

Sounding Column is a musical interface that hangs from above and provides different pads for percussive performance. The device itself does not introduce novelty but the students took the opportunity to explore Notation as a form to organize sound during a performance. The notation developed by the students was adapted to this specific instrument and guided them during the performance presented live. Exploring the relevance of notation as a language to compose and perform organized sounds was an important and meaningful experience to these architecture students.

2.1.4 Double Front

Double Front is a percussion instrument made out of galvanized steel that provides different textures, based on the shape and areas of resonant boxes. With microphone amplification it provides an engaging sonic experience that can be further explored in the future.
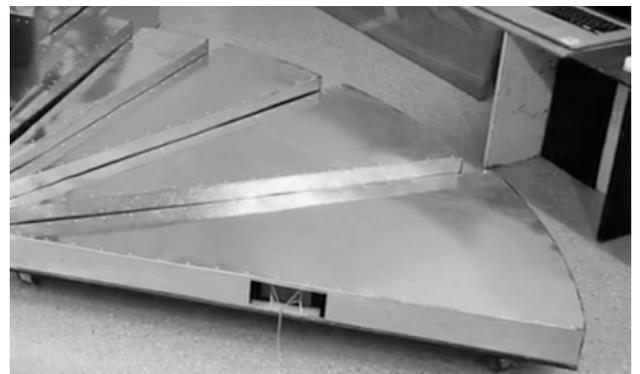
Figure 3. Double Front by Francis Cheung and Nicole Yung

2.2 Collaborative Music Instruments

Group 2, supervised by Miho Hirabayashi, included 5 projects developed under the theme of Collaborative Music Instruments. This is an extremely important research topic in contemporary musical instrument design, especially in the digital domain. The students tackled some of the major issues that arose from designing instruments that were meant to be shared by several performers. The following 3 projects stand out:

2.2.1 Wall Euphony

Wall Euphony is a wall design that incorporates a shared musical instrument. A wall that encases several "Kalimba" musical interfaces separates the performers. The performers react to what they can hear across the wall replicating a behavior as if they were in a room trying to listen to what is happening in another room, but communicating and interacting musically with the other peer. This Design, not only served the purpose of a captivating performance, but also could be considered as a prototype for a model, which could be developed into a real-world product that could make sense as an interior-architecture strategy.

Figure 4. Wall Euphony by Shivangi Das and Wing Tung Wong

2.2.2 The Tandem Breeze

The Tandem Breeze is a Multi-User wind instrument in which the performers face each other connected by the body of the instrument to their mouths. By extending or compressing a sliding mouthpiece into each other's direction and blowing into it, the performers can create pitch variations that combine an organic coupling of their body movement and gesture, with the combinations of distinctive musical notes. The instrument has a dramatic performative effect providing an intense interaction between the players and a unique sonic experience.

Figure 5. Tandem Breeze by Janice Chu and Raphael Galvez

2.2.3 The Sandwich

The Sandwich is a percussion instrument that explores multiple materials providing a variety of timbres that allows for extensive creativity while performing. It is designed to be shared by two performers facing each other and a reacting to gesture and expressions that can be seen through the instrument. From all the instruments designed in this class this was the one that provided the widest range of timbre variety, almost as if the music was in "color" while the others were in "black & white".

2.3 Sonification

Group 3, supervised by Ryo Fujimori, included 5 pieces that had in common the concept of sonification as form transposing to sound a range of perceptual information that results from a physical behavior or movement. From these projects we can single out 4 performances:

2.3.1 Paper-tearing

Paper-tearing is a semi-automated device that explores the idea of capturing and amplifying the sound of a cutter tearing paper. It is a dramatic installation that was used in a performance that induces some sense of danger. The acoustic sound projection was very subtle but once amplified properly it becomes a very engaging and powerful sonic experience.

Figure 6. Paper-tearing by Xiangning Wang, Hoi Yin Yeung and Charlene Lau

2.3.2 The Clear Box

The Clear Box is a device that has the goal of sonifying water waves, by mapping the cyclic vertical movement from a set of floaters positioned along an aquarium into a rudimentary xylophone. The system is very ingenious and has the potential to create a very tight and clear mapping with an extremely musical outcome, as long as the mechanics of the prototype can be improved with better robustness.
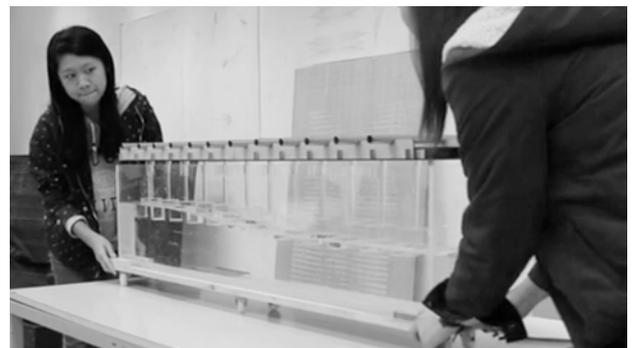
Figure 7. Clear Box by Oi Tung Lam and Xinhao Chen

2.3.3 The Black Box

The Black Box is a performative wearable structure that reacts and adapts to the movement of a full body performer enclosed within the object construct. The structure resembles a human size accordion that is played with full body movement and by inflating and compressing, it blows out a stream of air that will trigger whistles, bells and rudimentary wind chimes for a musical effect.
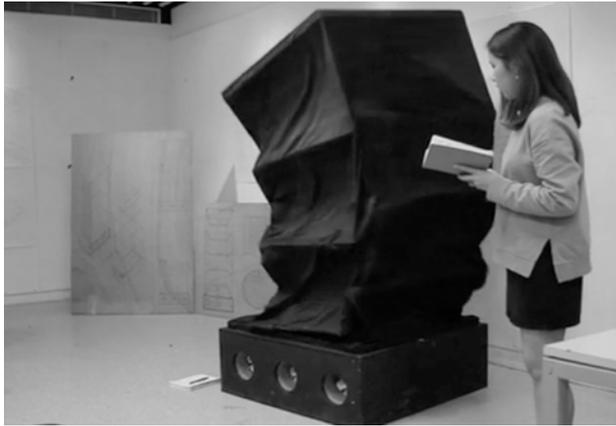
Figure 8. Black Box by Talia Lam and Du Hoi Ming

2.3.4 Tensionball

Tensionball is possibly the most inspiring system developed in this section, since it explores the mapping of extremely complex pendular cyclic movements with a completely mechanic acoustic system that convincingly sonify the nuances and expressiveness of the ball's movement. By introducing a wider variety in the sound sources triggered by the movement, the system can introduce even more emphasis on the sound specialization in order to produce an immersive sonification experience.

2.4 Instrument Design for an Ensemble

Group 4 supervised by Wei Tseng, was also divided in 6 groups of students, approaching the instruments' design so that these must become part of a performative ensemble. Each instrument contributes to a section of a musical piece and plays its role in an integrated and complementary way, to the ensemble. The musical instruments followed diverse approaches that range from windpipes triggered by the movement of a helix to a large-scale music box or a human scale seesaw triggering glass marimba keys.

Figure 9. Seesawphone and The Music Recorder by Bertha Leung, Chi Yan Tam, Ming Yan Ho and Wing Ching Yuen.

2.5 Wearable Musical Instruments

Group 5 was supervised by Jae Lim and explored a rather unique approach in Music Instrument Design by introducing as a project topic the notion of wearable music Instruments, a topic that has been relatively less explored in this area, but with inspiring examples such as Nick Cave's Soundsuit [8]. Three groups of students developed wearable sounding devices that encases more than one performer, are mobile as a vehicle and produce musical sounds, either as a result of moving parts or by the acoustic modulation performance voices within the structure of the Suit. In particular the experimentation with voice in this type of structure is very fruitful for architecture students, since it gives then a unique perspective on the issue of acoustic spaces to be cohabited by human.

Figure 10. The Howl, Ditto and Epidermal Being by Gina Park, Zackary Yuen, Sherry Cheung, Gracia Wong, Chinghey Chan, Daniel Stiensmeier, Yukuan Guo, Hiu Tung Lui, Lydia Chiu, Natalie Lai and Kevin Lai

2.6 From Form to Architectural Space

Group 6, Supervised by Sony Devabhaktuni, included 3 groups of students and followed a more traditional approach in terms of what an Architecture Studio usually addresses in an Architecture School. The students were challenged to develop an acoustic music instrument that derived from an existing classical string instrument, but expanded in space, scale or dimensions. The instrument resulted in expressive designs that could be performed live. After that, the students isolated certain visual perspectives of the instruments' form that provided reference and inspiration for a real design of a building, which became the final deliverable of the studio.

3. CONCLUSIONS

The experiment of introducing a multidisciplinary approach into an Architectural Studio at HKU primarily had the goal of expanding the students' minds and provides inspiration for creative and innovative Architectural Work. However, the results surpassed this goal, by providing the students with a valuable experience in Sound and Acoustic Centered Design, which will inherently create a competitive advantage on their skills and knowledge as future practicing architects. On the other hand, from the perspective of NIME, the development of new and original ideas of Interfaces for Music Expression, was a rewarding result, in the sense that fresh and original approaches for established problems, were introduced and suggested from a totally different perspective, then they would have been developed by Musicians, Computer Scientists or Engineers (as they usually are in NIME). In future editions of this Studio the pedagogical and Artistic perspective of this work, can benefit from a stronger inspiration in music and acoustics, as well as from the introduction of multidimensional interaction strategies, the use of sensor and contact microphones to capture the inner sounds of materials and the use of acoustic sound as triggers for additional layers of sound processed digitally.

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