



Digital Graffiti-scape Archaeology

Geert Verhoeven | *project coordinator*
projectindigo.eu

The INDIGO graffiti project was funded by the Heritage Science Austria
programme of the Austrian Academy of Sciences (ÖAW)





GRAFFITI

diverse creations

iconic

ТОЙ СМЕРТНОЙ
MIR, DIESE TÖDLICHE LIEBE ZW



GRAFFITI

diverse creations

iconic



multi-
faceted

GRAFFITI

diverse creations

art <> vandalism

graphical <> textual

socio-political criticism <> entertaining

legal <> illegal

tangible <> intangible



**multi-
faceted**

GRAFFITI

diverse creations

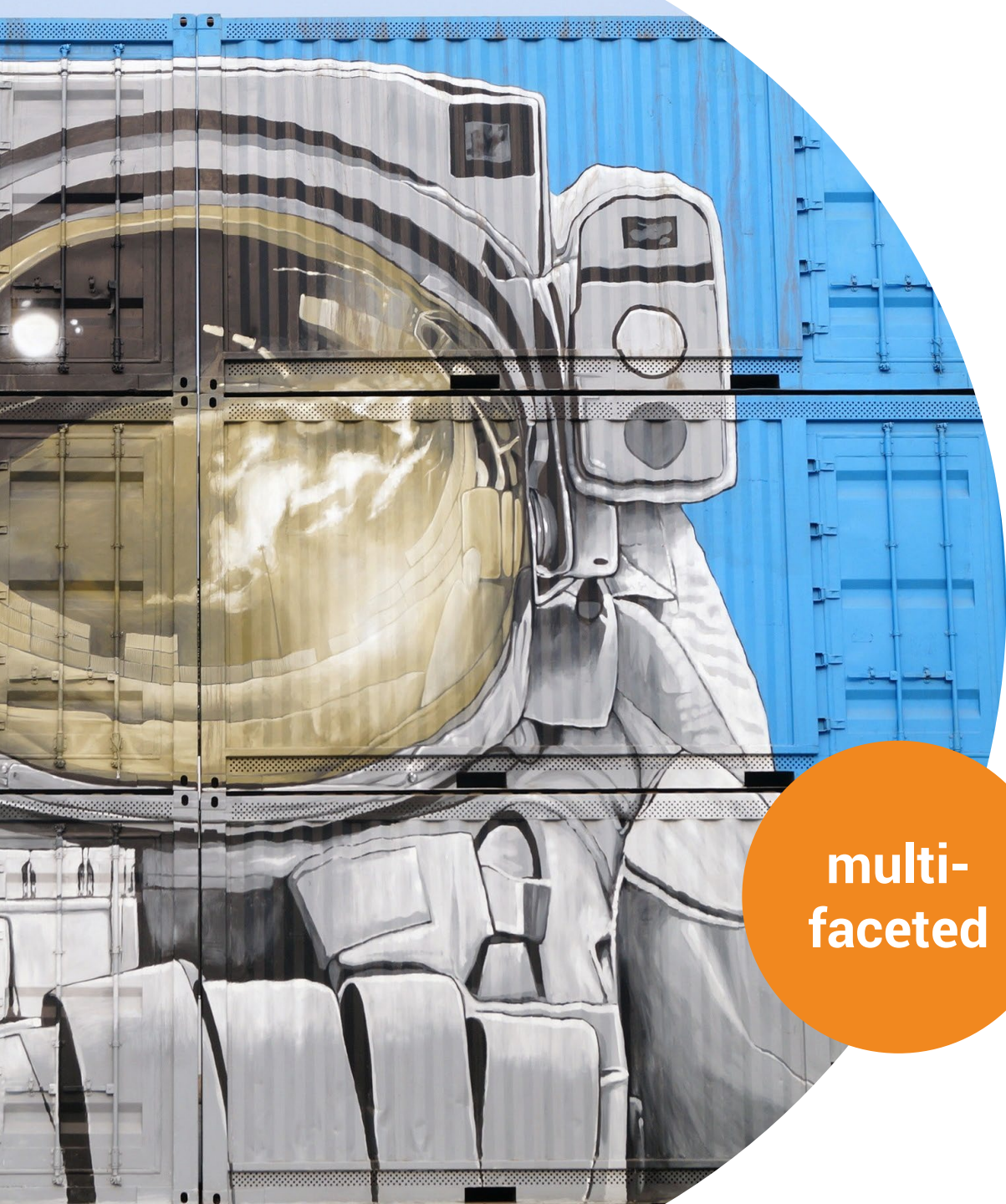
art <> vandalism

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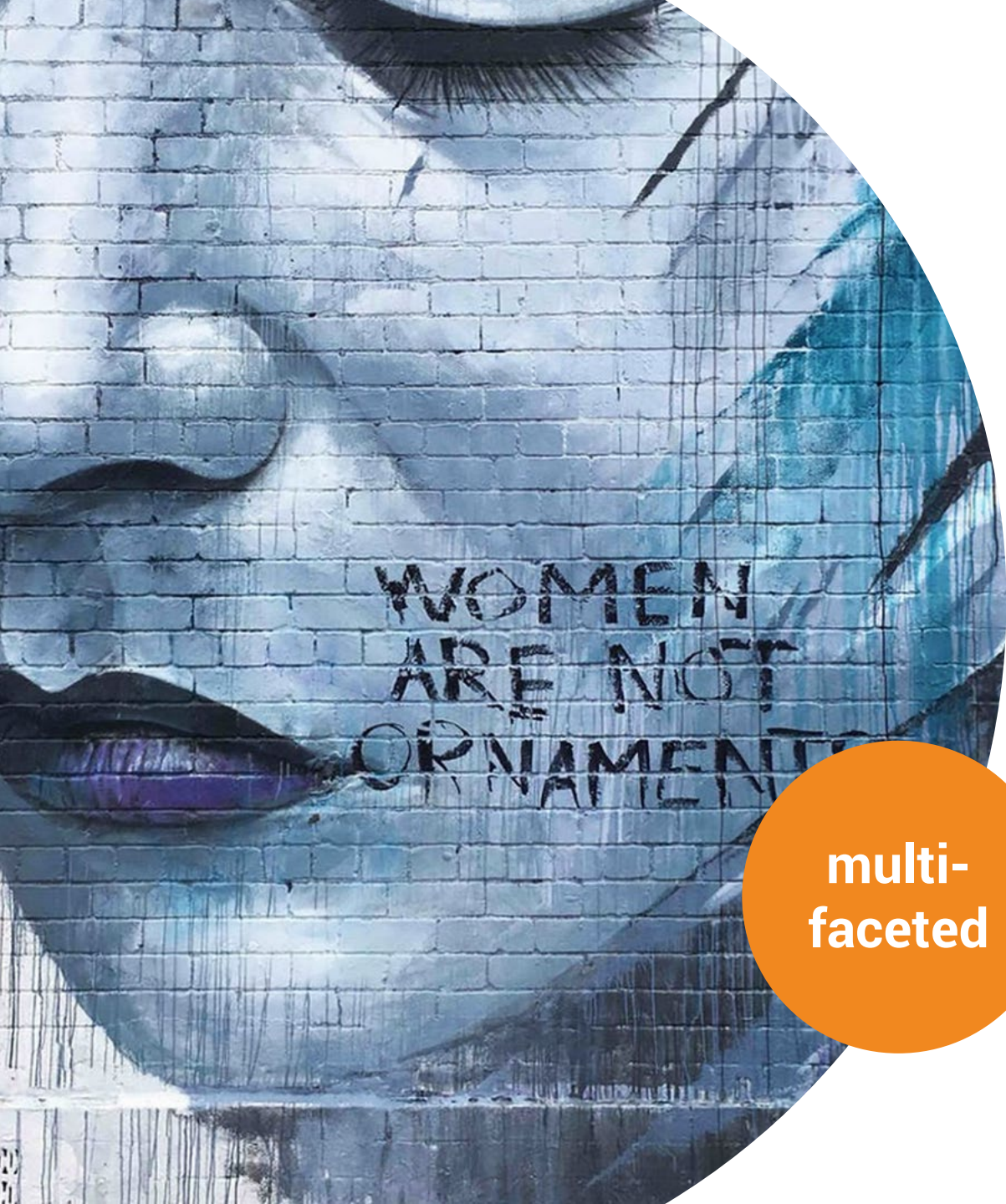
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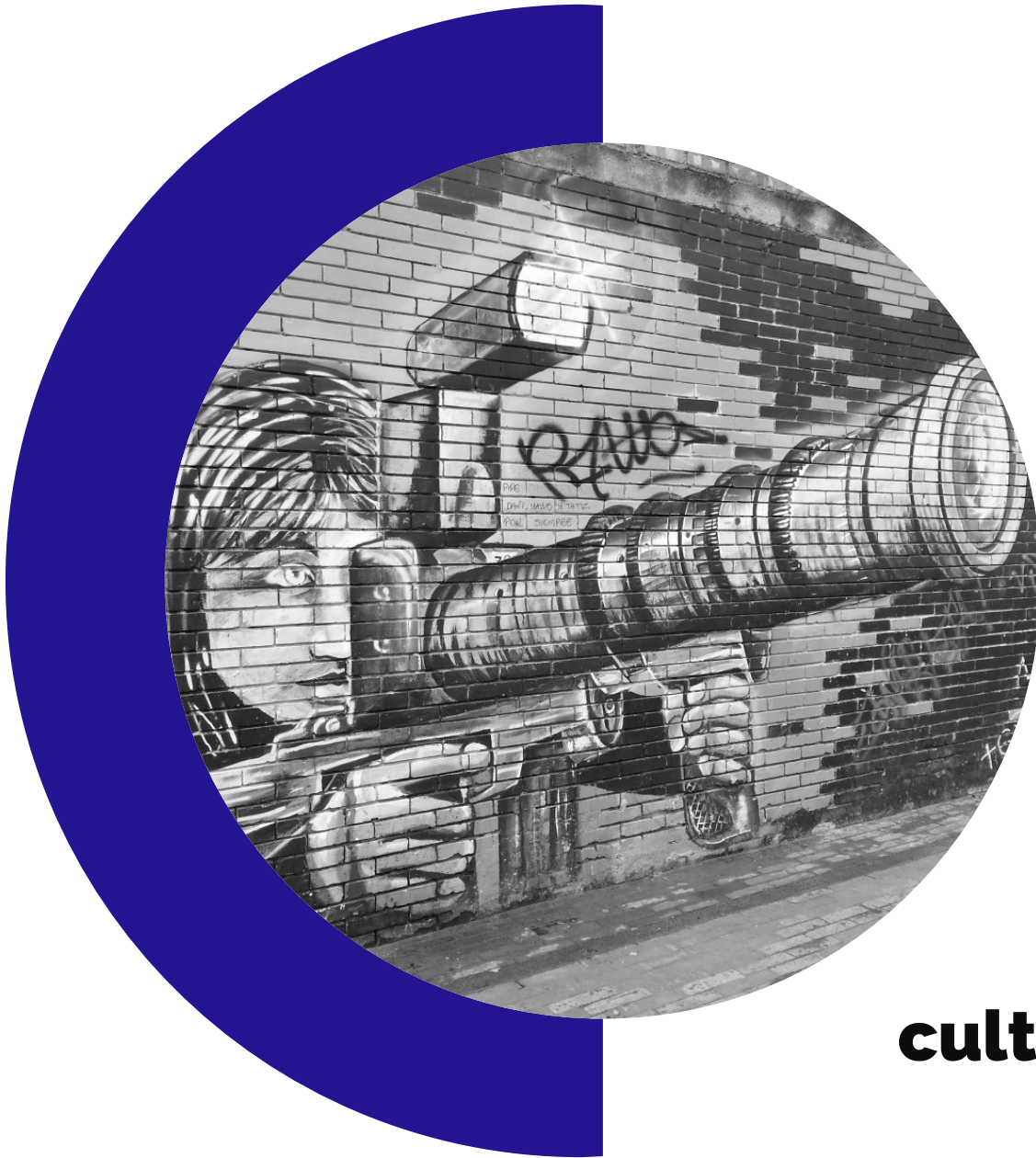
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graffiti are

unique

complex

short-lived

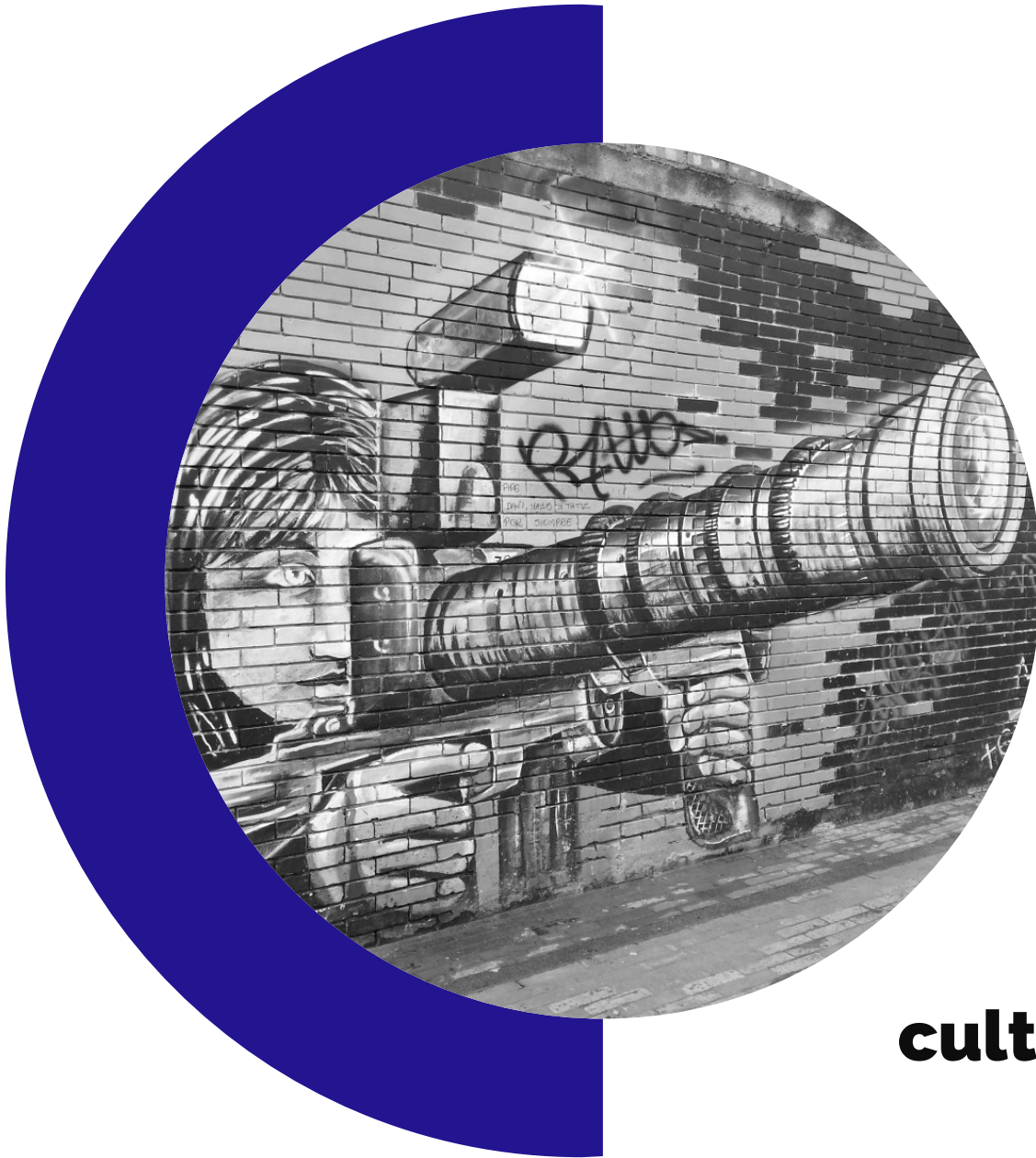
socially relevant

cultural heritage









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short-lived

socially relevant

cultural heritage



NEEDING academic rigour

“For as long as we are imprecise about the artworks we are discussing, our research will be rightfully seen as lacking scholarly rigor.”

de la Iglesia 2015





RECORDING

random
partial
inaccurate

NEEDING academic rigour

“For as long as we are imprecise about the artworks we are discussing, our research will be rightfully seen as lacking scholarly rigor.”

de la Iglesia 2015





RECORDING

random
partial
inaccurate

DISSEMINATION

unstandardised
limited interaction
closed access

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RECORDING

random
partial
inaccurate

DISSEMINATION

unstandardised
limited interaction
closed access

ANALYSIS

descriptive
fragmentary
biased



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de la Iglesia 2015



RECORDING

random
partial
inaccurate

DISSEMINATION

unstandardised
limited interaction
closed access

ANALYSIS

descriptive
fragmentary
biased

SYNERGY

one-sided
partial know-how
limited output



NEEDING academic rigour

"For as long as we are imprecise about the artworks we are discussing, our research will be rightfully seen as lacking scholarly rigor."

de la Iglesia 2015



the potential

of graffiti

to understand

society

is under-exploited

**In
di
g
o**



Inventory and
disseminate
graffiti along the
d **O** naukanal

Inventory and
disseminate
graffiti along the
do naukanal

WHAT

Inventory and
disseminate **WHAT**
graffiti along the
do naukanal **WHERE**

Inventory and
disseminate
graffiti along the
do naukanal

WHAT

WHERE

digitally preserve
and
analyse

WHY

Inventory and
disseminate
graffiti along the
dokumentalkanal

WHAT

WHERE

digitally preserve
and
analyse

WHY

WHO



LUDWIG
BOLTZMANN
INSTITUTE
Archaeological Prospection and Virtual Archaeology

Inventory and
disseminate
graffiti along the
dockanal

WHAT

WHERE

digitally preserve
and
analyse

WHY

WHO



Heritage Science Austria programme | € 580 k | 2 years

WHY

digitally preserve
and
analyse

WHAT

HOW?

WHERE

WHO

Inventory and
disseminate
graffiti along the
donaukanal



Heritage Science Austria programme | € 580 k | 2 years

5
research
pillars

INDIGO approach

INDIGO approach

5
research
pillars



INDIGO approach

5
research
pillars

creation



acquisition



INDIGO approach

5
research
pillars

creation



acquisition



processing



INDIGO approach

5
research
pillars

creation



acquisition



processing

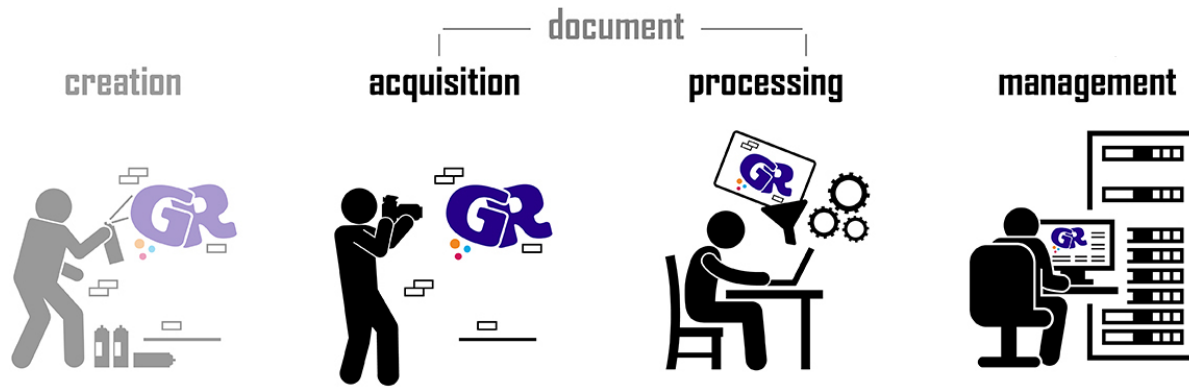


management



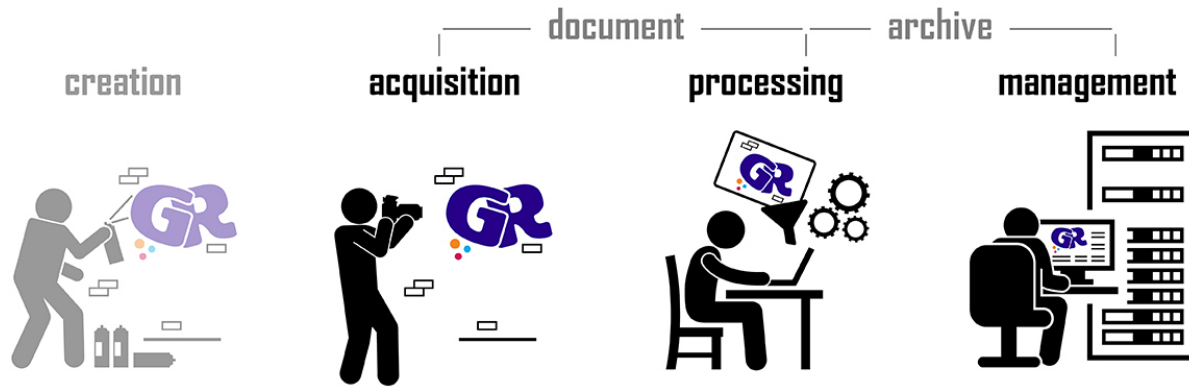
INDIGO approach

5
research
pillars



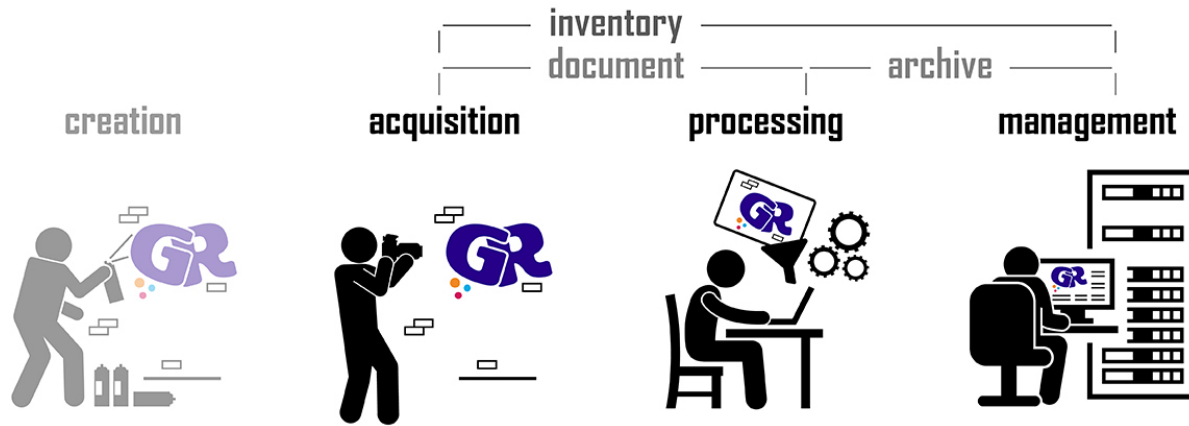
INDIGO approach

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research
pillars



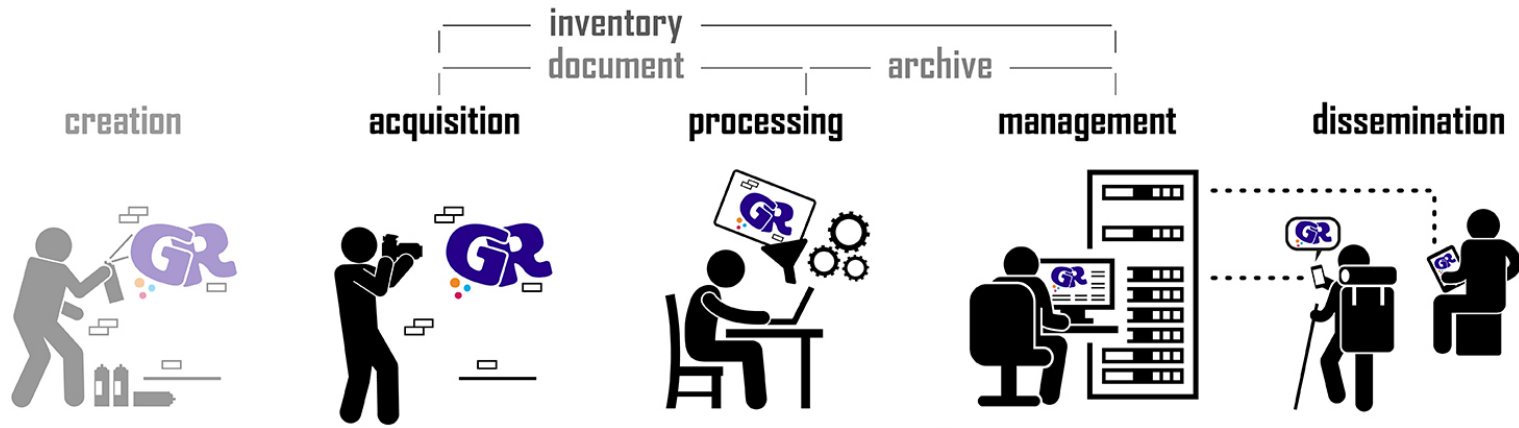
INDIGO approach

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research
pillars



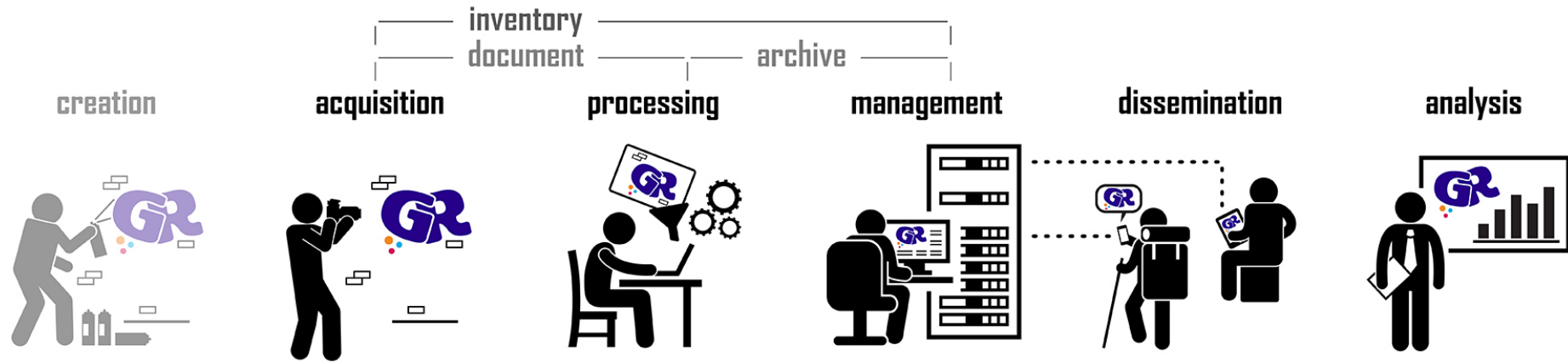
INDIGO approach

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research
pillars



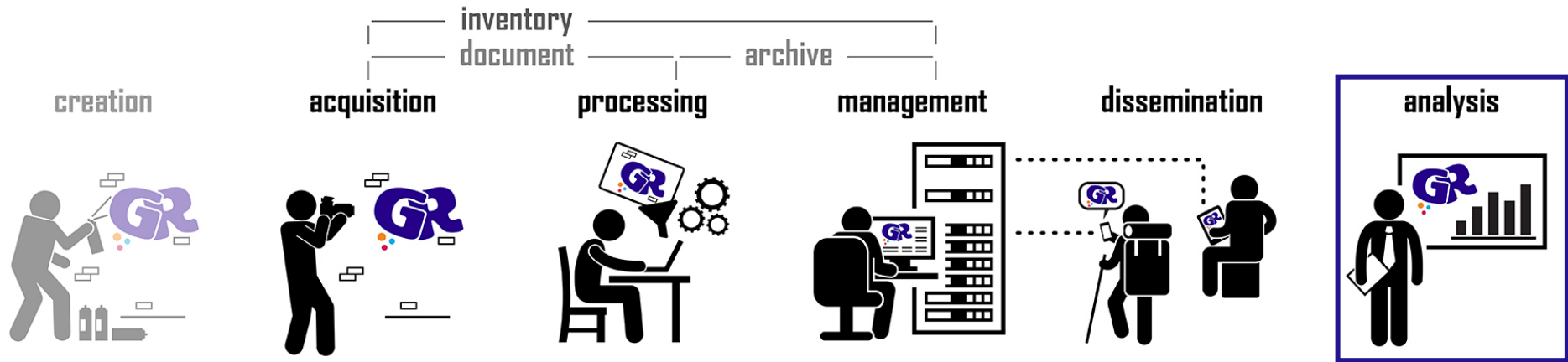
INDIGO approach

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research
pillars



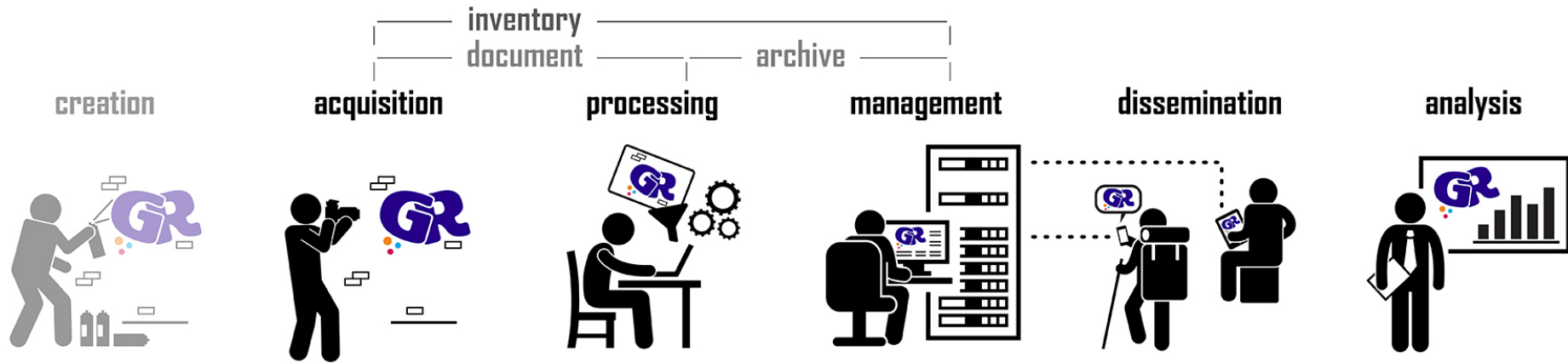
POTENTIAL questions

5
research
pillars



POTENTIAL questions

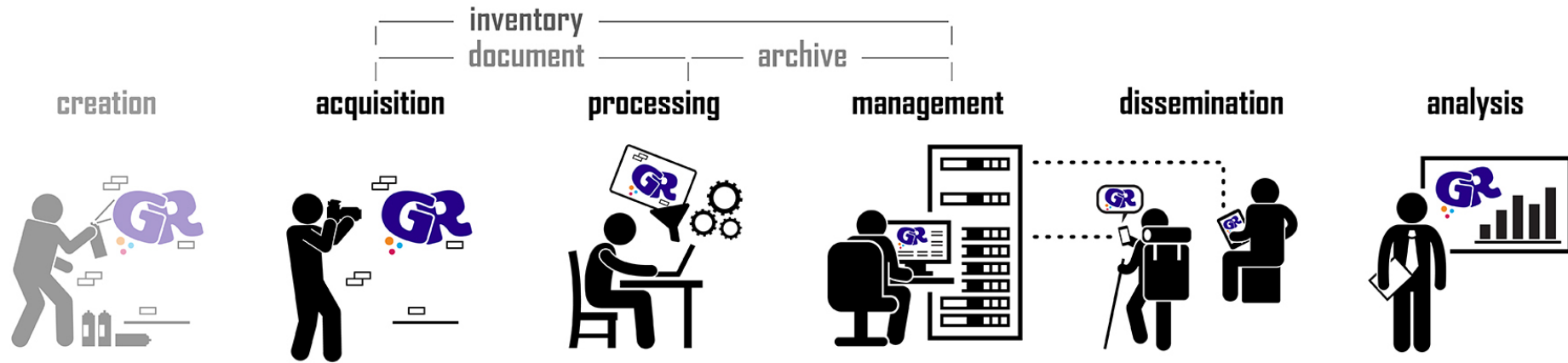
5
research
pillars



When and where do political graffiti typically appear ?

POTENTIAL questions

5
research
pillars

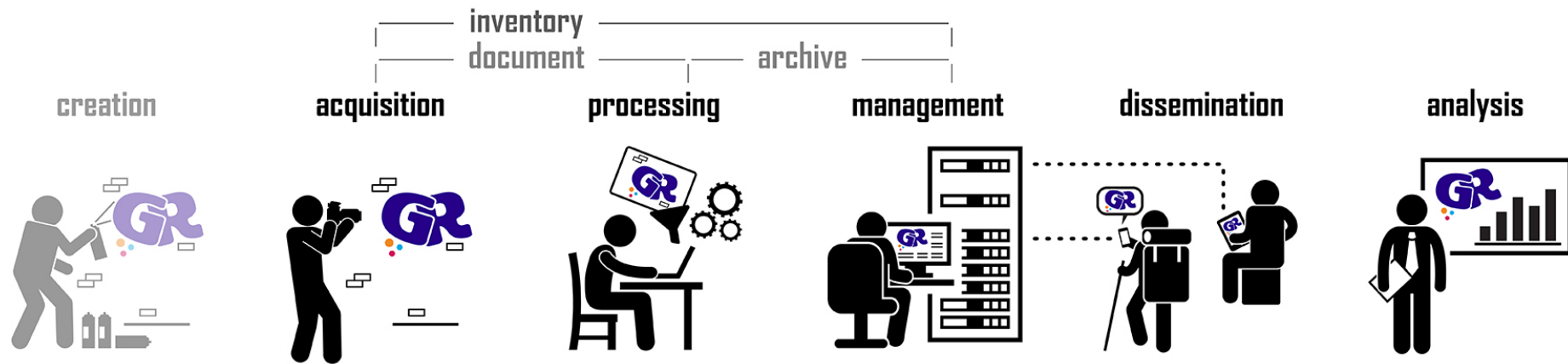


When and where do political graffiti typically appear ?

What are the main styles and colours of those graffiti, and how long do they – on average – stay visible before they are (partly or entirely) covered ?

POTENTIAL questions

5
research
pillars



When and where do political graffiti typically appear ?

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What type of graffiti commonly covers political messages ?

POTENTIAL questions

GRAFFITI *LOCATION*

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POTENTIAL **questions**

GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

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POTENTIAL **questions**

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GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

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POTENTIAL **questions**

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GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

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GRAFFITI **archaeology**

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GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

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GRAFFITI **archaeology**

ARTEFACT

LOCATION

TEMPORALITY

TERMINOLOGY

CHARACTERISATION

When and where do political graffiti typically appear ?

What are the main styles and colours of those graffiti, and how long do they – on average – stay visible before they are (partly or entirely) covered ?

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SOME results

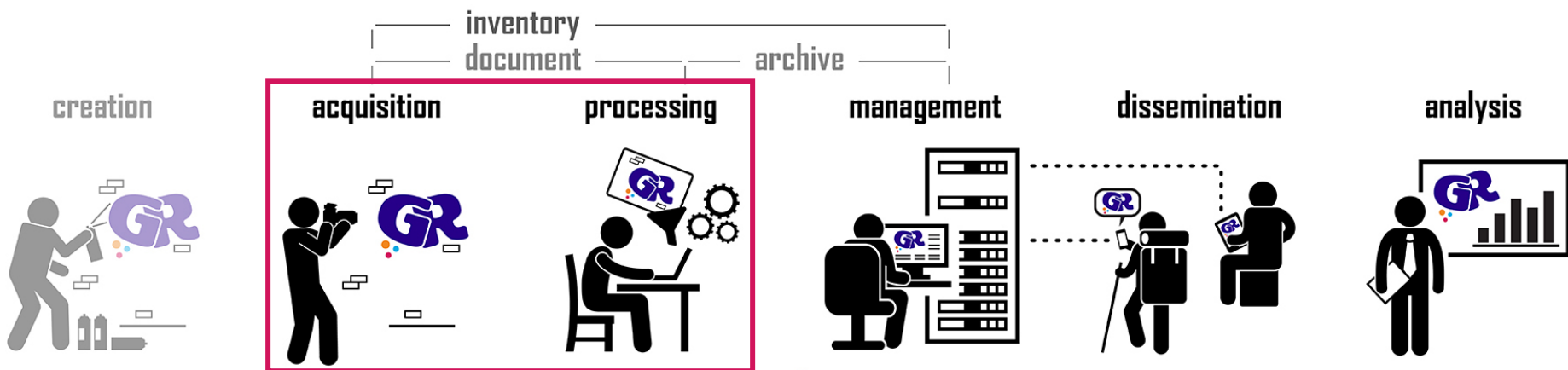
GRAFFITI *LOCATION*

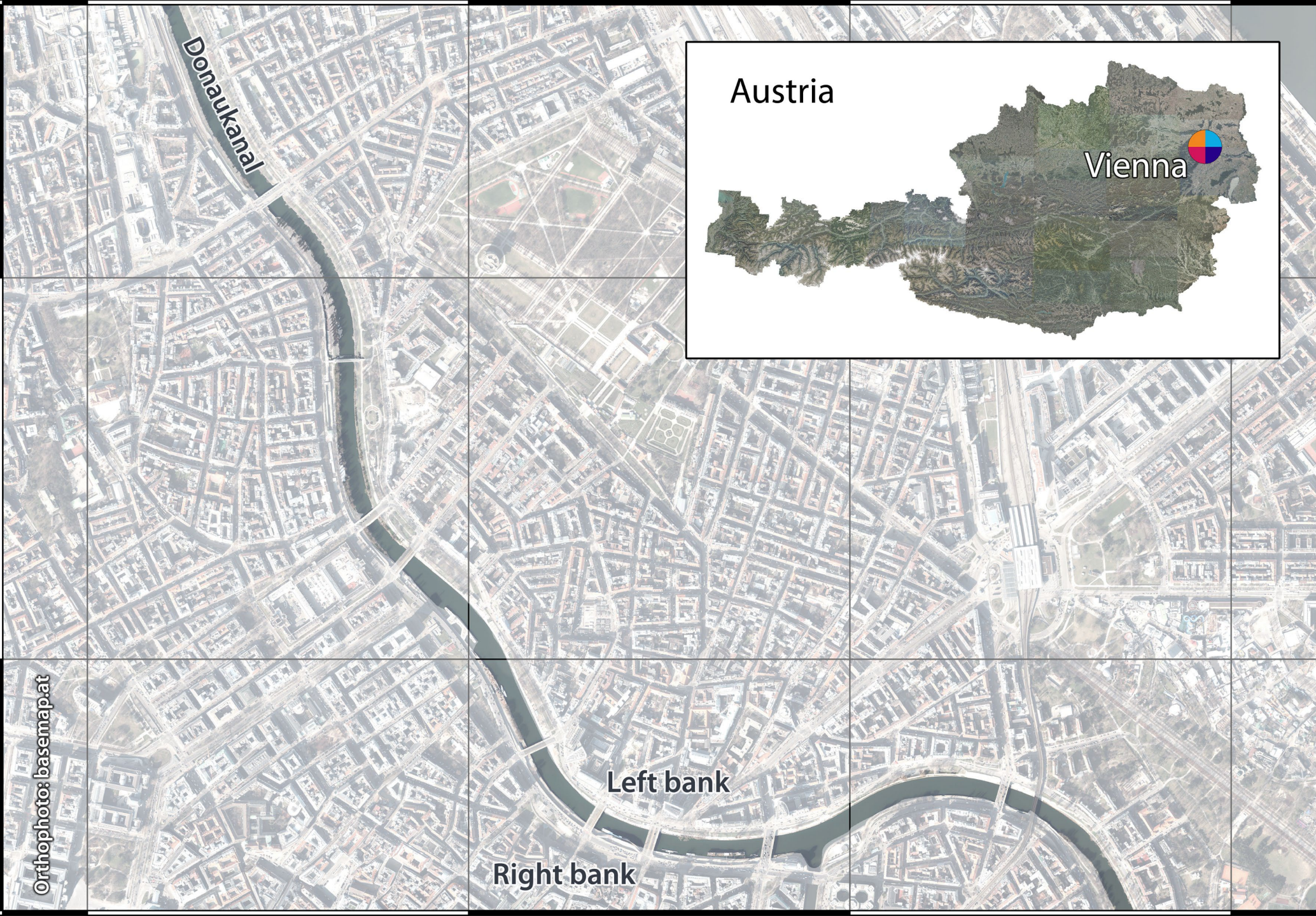
GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars





Donaukanal

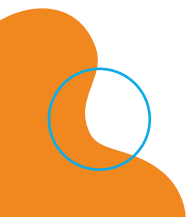
Austria

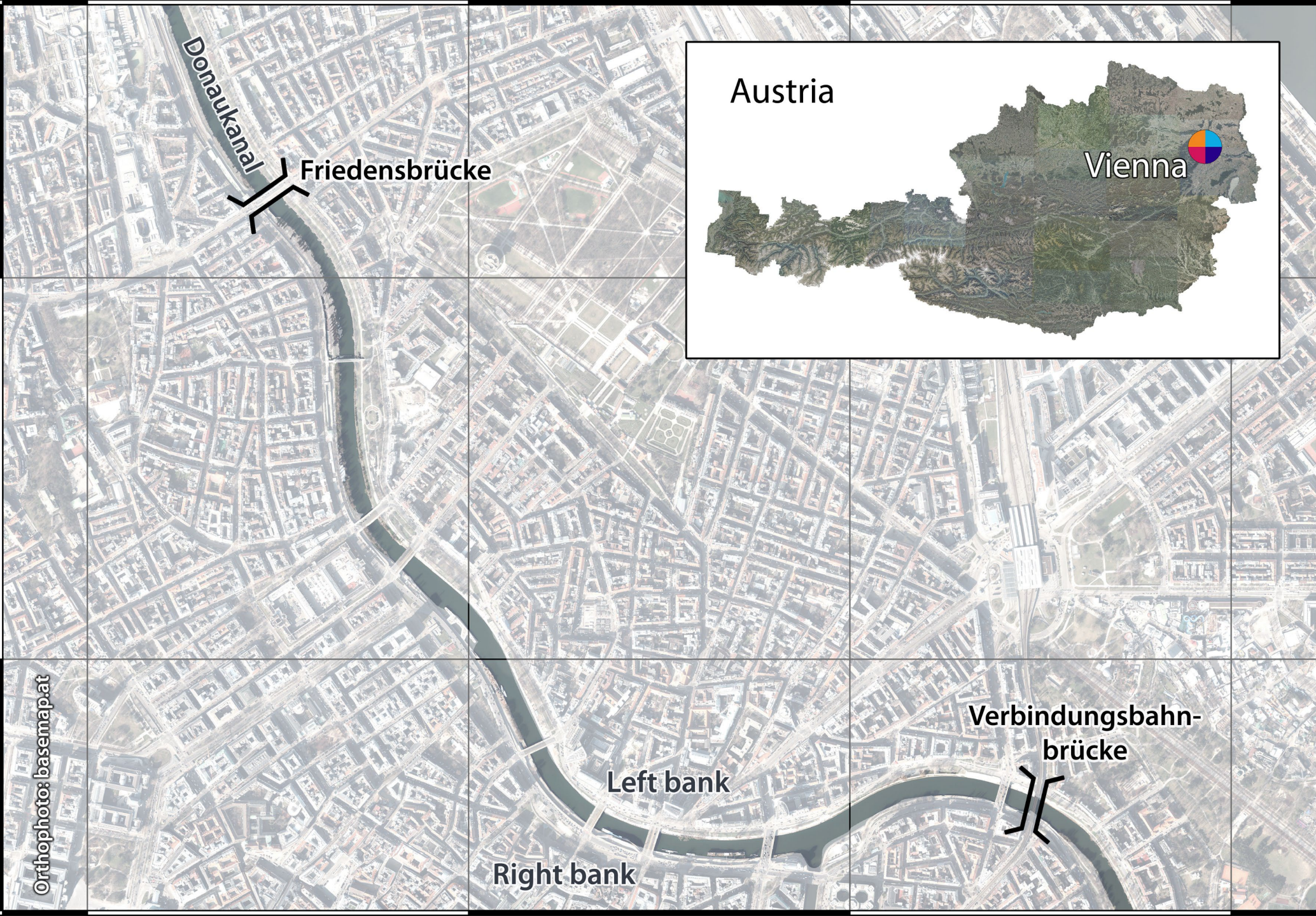
Vienna

Orthophoto: basemap.at

Left bank

Right bank





Orthophoto: basemap.at

Donaukanal

Friedensbrücke

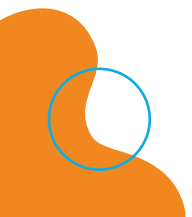
Left bank

Right bank

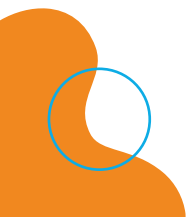
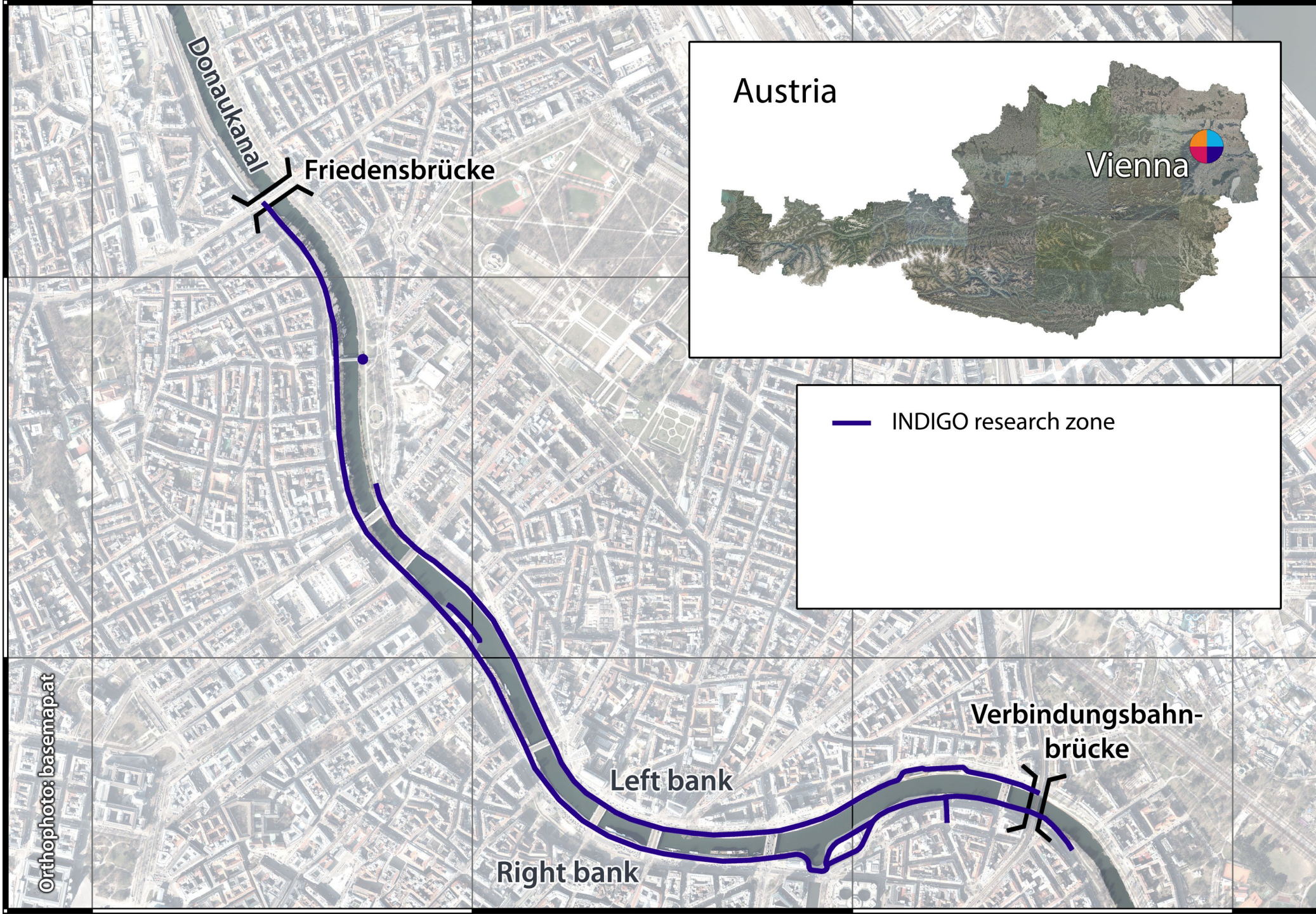
Verbindungsbahnbrücke

Austria

Vienna



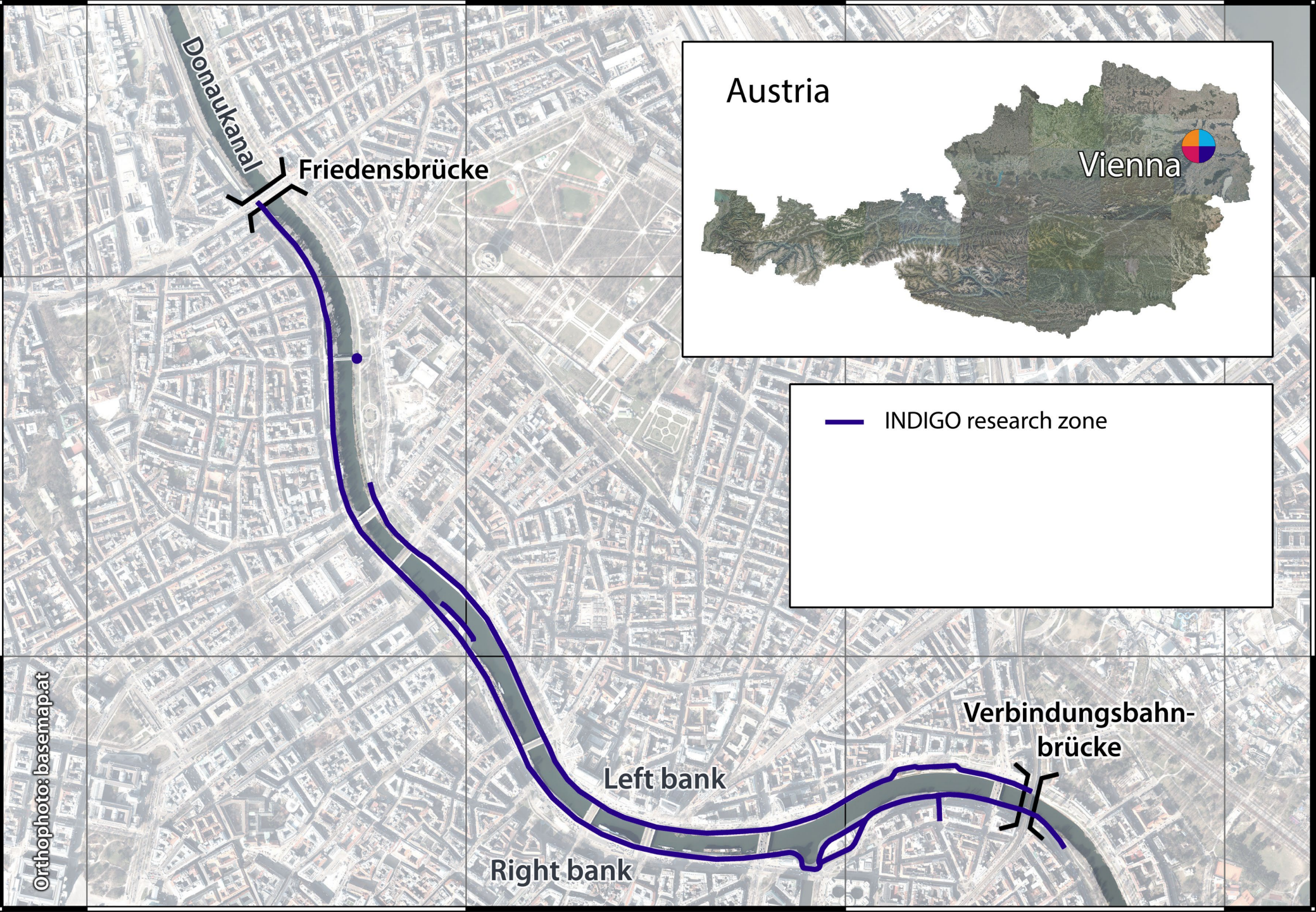
STRETCH
3.3 km



STRETCH

3.3 km

LEFT RIGHT



Austria

Vienna

— INDIGO research zone

Orthophoto: basemap.at

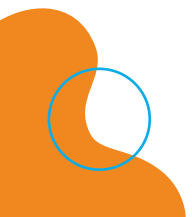
Donaukanal

Friedensbrücke

Left bank

Right bank

Verbindungsbahnbrücke



STRETCH

3.3 km

LEFT RIGHT

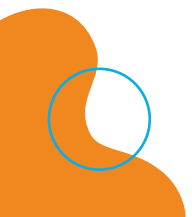


STRETCH

3.3 km

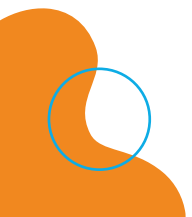
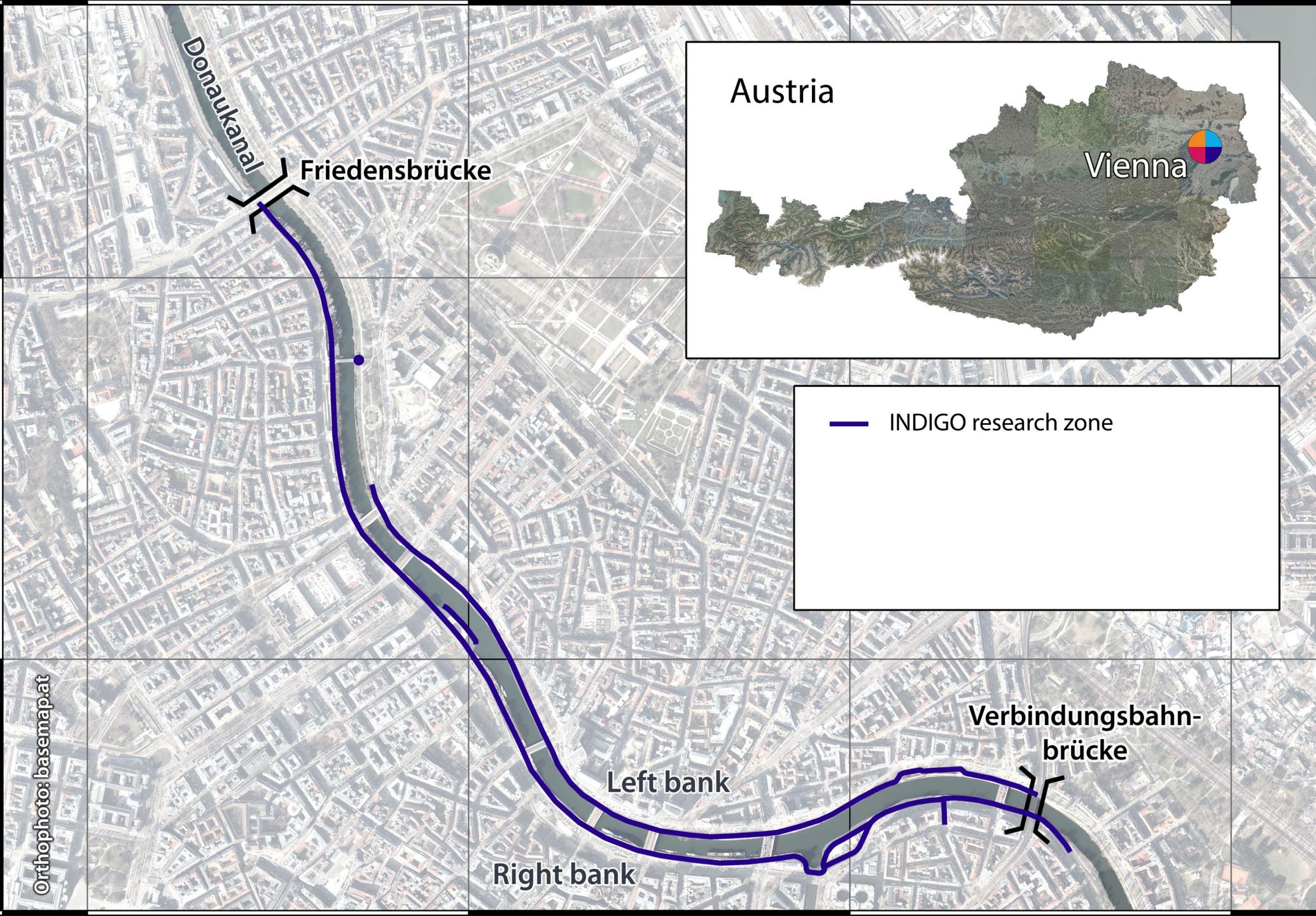
LEFT UP
RIGHT UP

DOWN DOWN



STRETCH
3.3 km

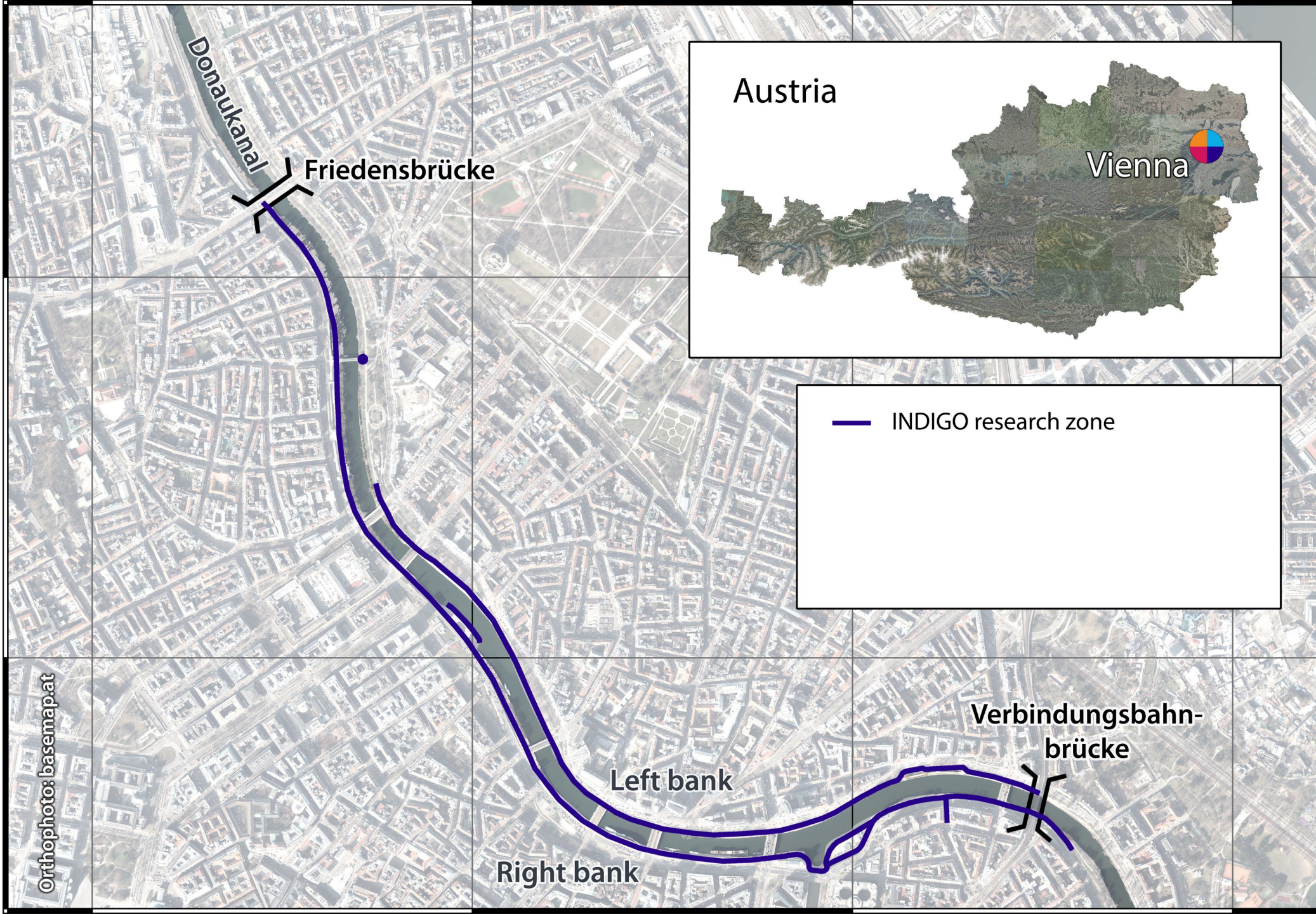
LEFT	RIGHT
UP	UP
3.2 km	5.3 km
DOWN	DOWN



STRETCH

3.3 km

LEFT	RIGHT
UP	UP
3.2 km	5.3 km
DOWN	DOWN
2.1 km	2.3 km



STRETCH

3.3 km

LEFT **RIGHT**

UP **UP**

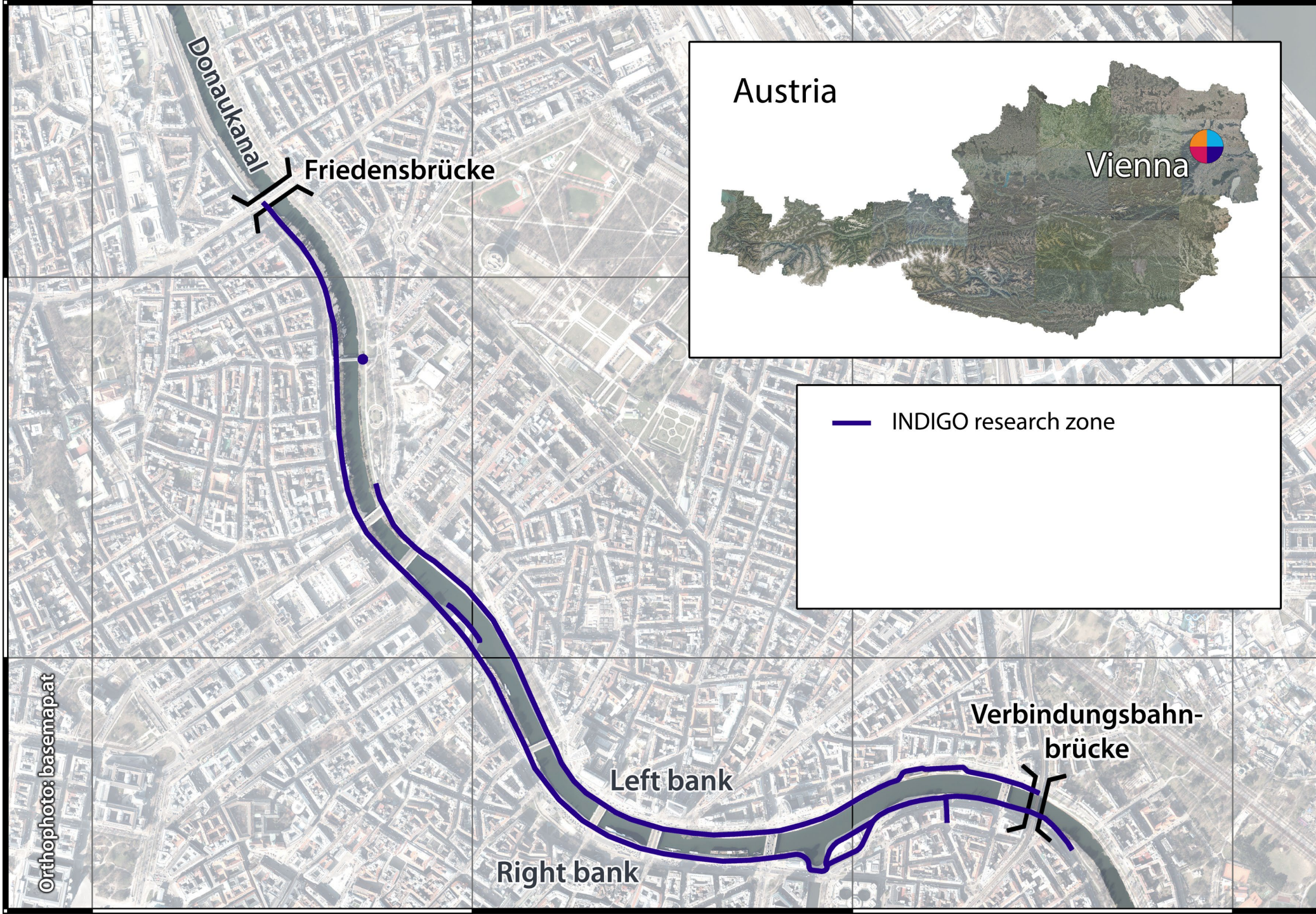
3.2 km 5.3 km

DOWN **DOWN**

2.1 km 2.3 km

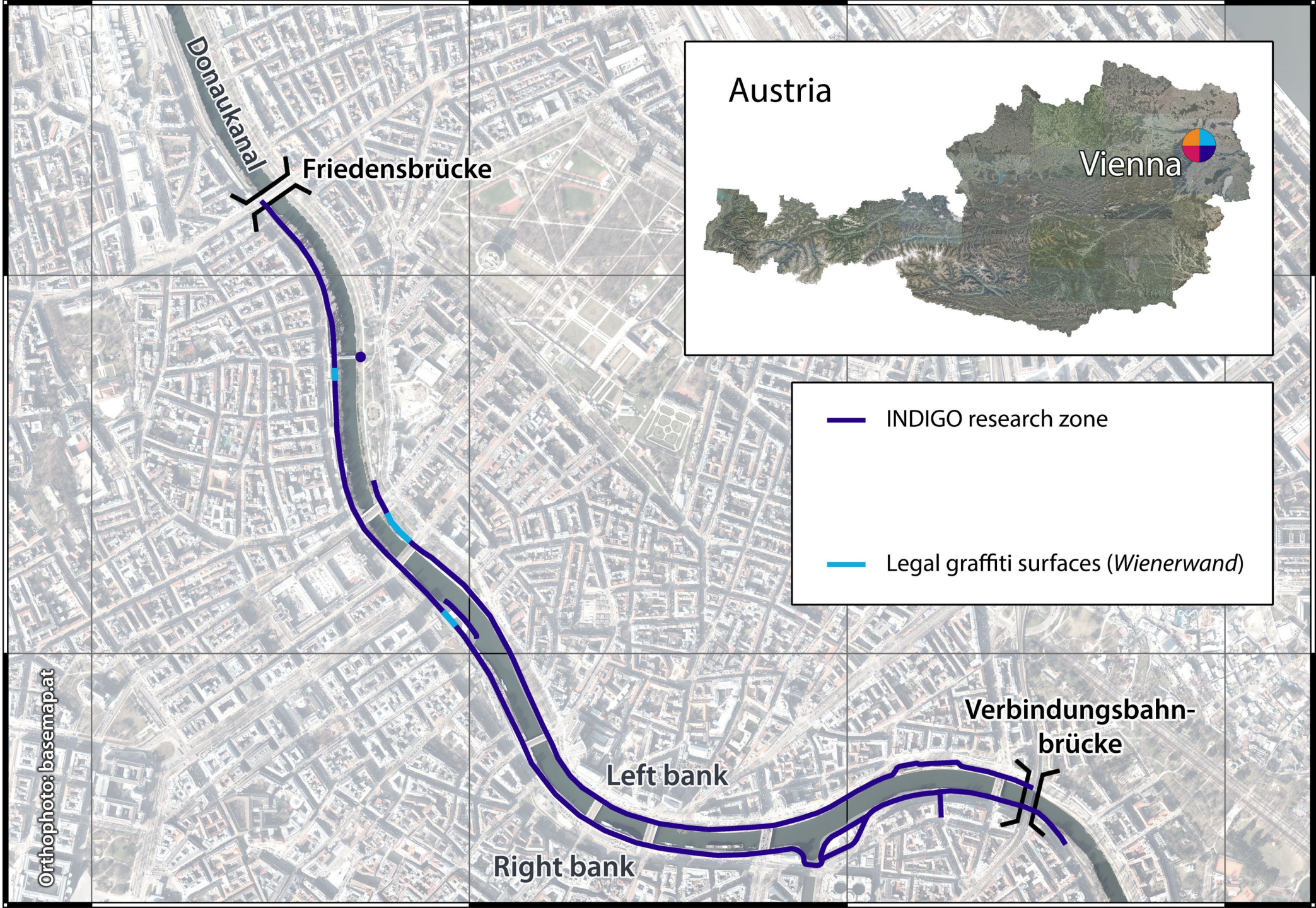
MONITORED SURFACES

12.9 km



MONITORED SURFACES

12.9 km



— INDIGO research zone

— Legal graffiti surfaces (*Wienerwand*)

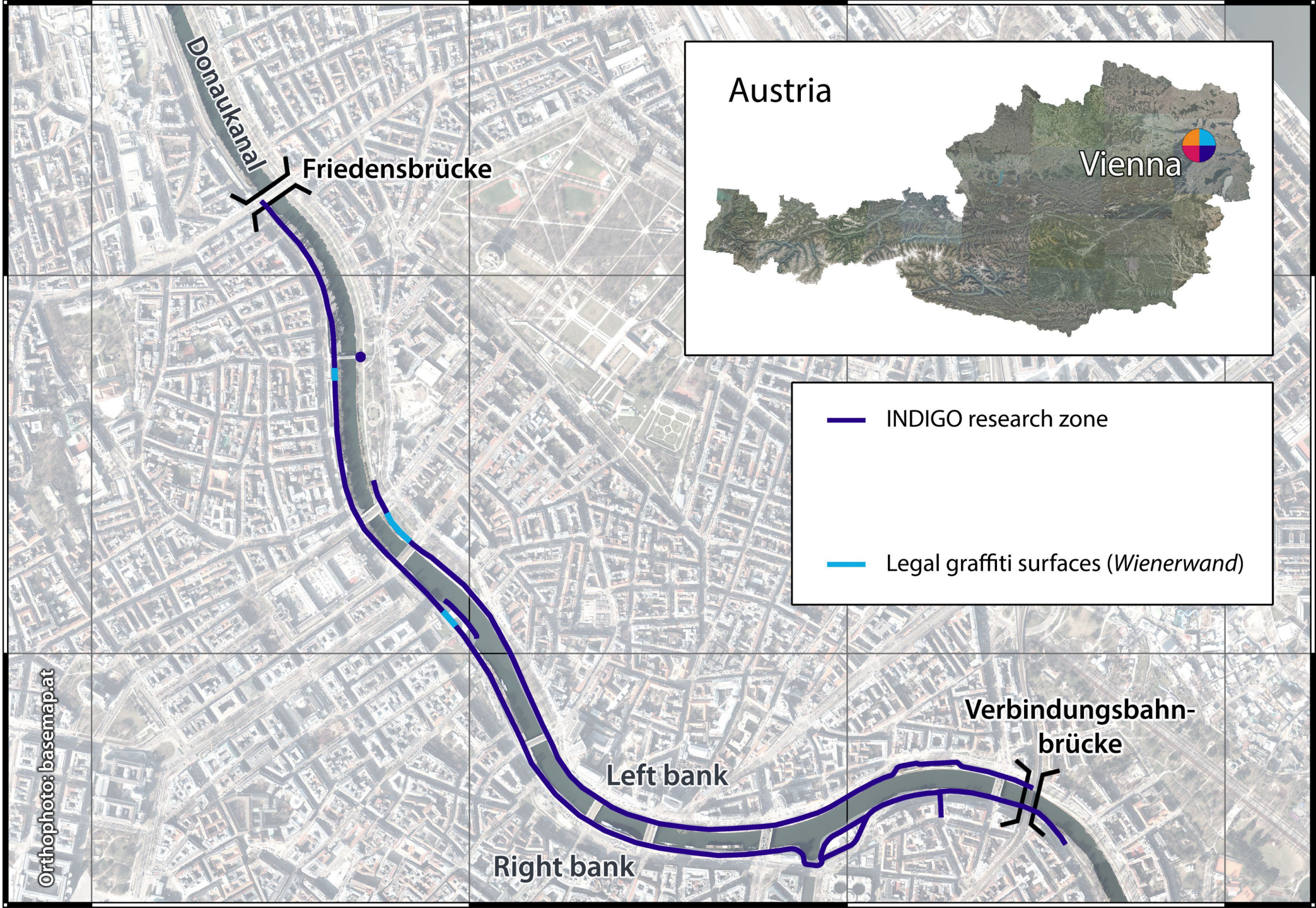
Orthophoto: basemap.at

LEGAL SURFACES

0.3 km

MONITORED SURFACES

12.9 km



Austria

Vienna

- INDIGO research zone
- Legal graffiti surfaces (*Wienerwand*)

Orthophoto: basemap.at

**TOTAL
COVERAGE**

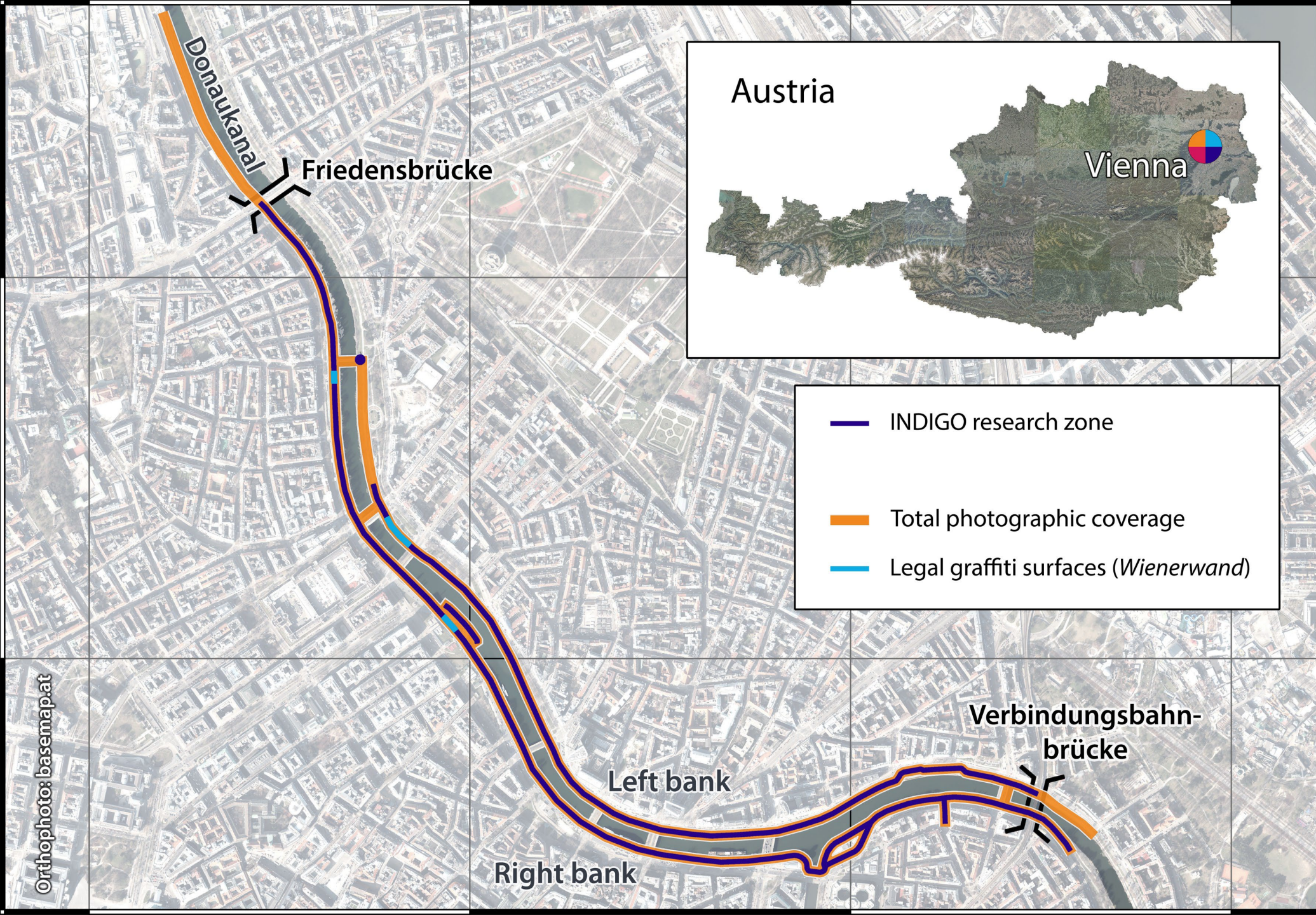
14.0 km

**LEGAL
SURFACES**

0.3 km

**MONITORED
SURFACES**

12.9 km



**TOTAL
COVERAGE**

14.0 km

**LEGAL
SURFACES**

0.3 km

**MONITORED
SURFACES**

12.9 km

Orthophoto: basemap.at

Donaukanal

Friedensbrücke

Left bank

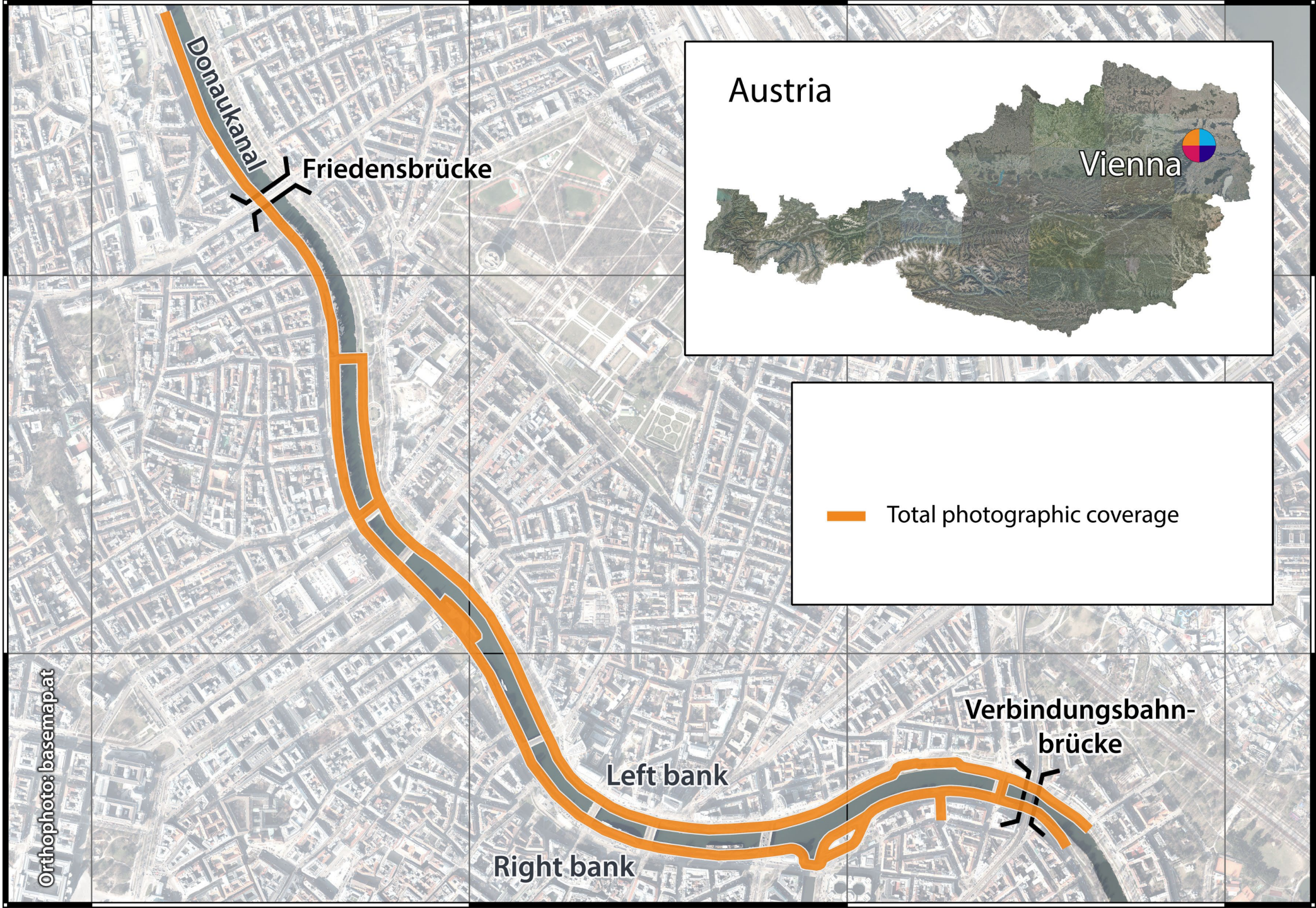
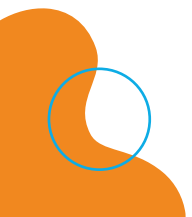
Right bank

Verbindungsbahn-
brücke

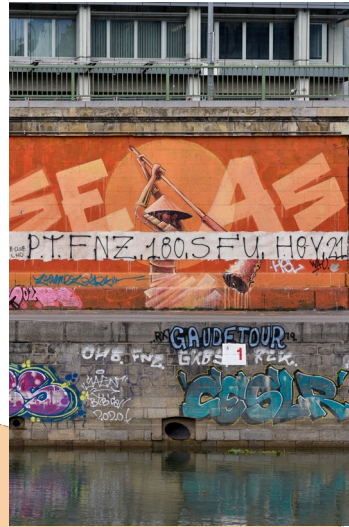
Austria

Vienna

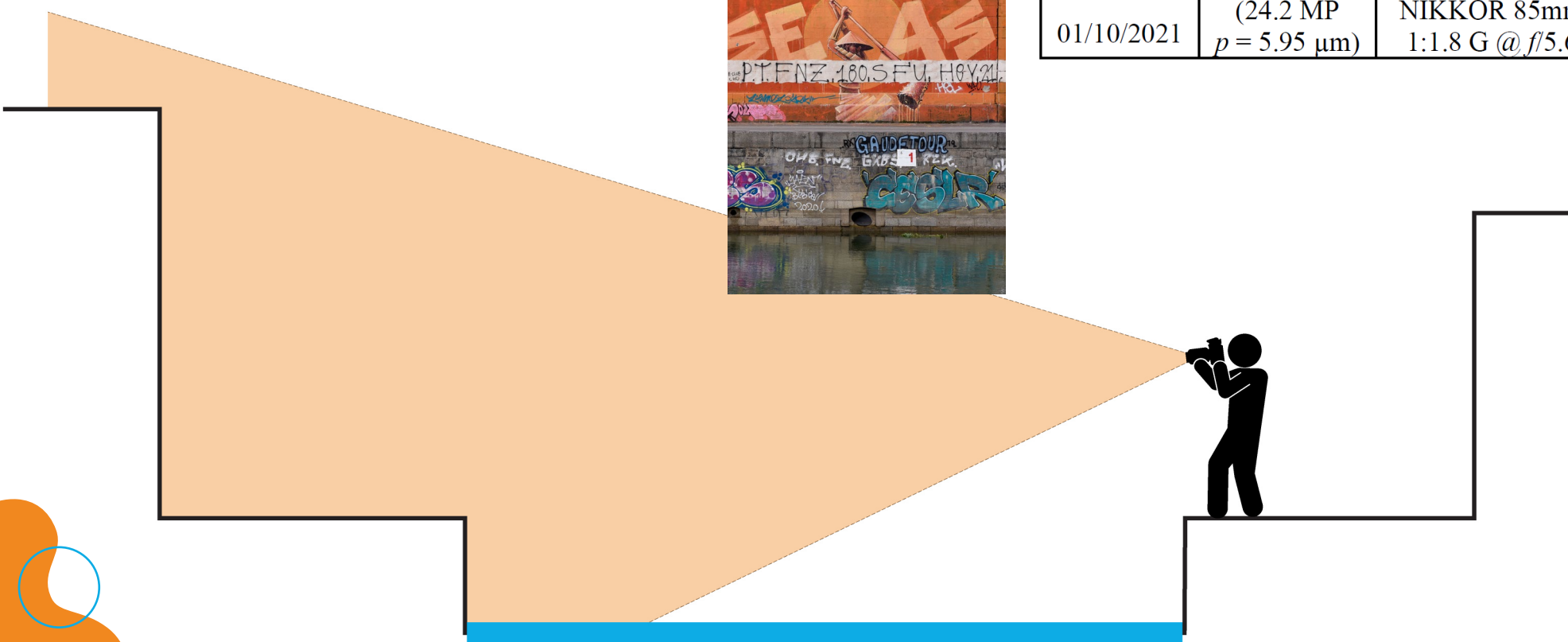
— Total photographic coverage



TOTAL coverage



Date	Camera	Lens	Mean GSD	Acquisition time	Image count
30/09/2021	Nikon D750 (24.2 MP)	Nikon AF-S NIKKOR 85mm	3.6 mm	3 h 45 min	2065
01/10/2021	$p = 5.95 \mu\text{m}$	1:1.8 G @ $f/5.6$		3 h 20 min	2544



TOTAL coverage

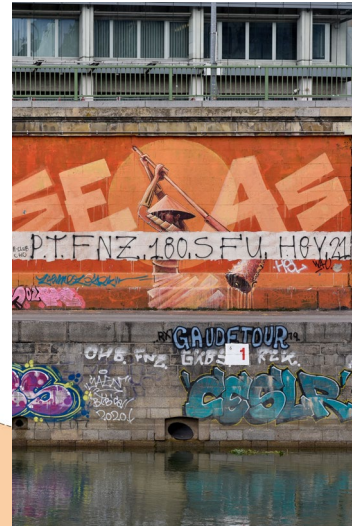


Date	Camera	Lens	Mean GSD	Acquisition time	Image count
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26/10/2021				7 h	6042
27/10/2021	Nikon Z 7II (45.4 MP $p = 4.33 \mu\text{m}$)	Nikon NIKKOR Z 20mm f/1.8 S @ $f/5.6$	0.9 mm	7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608



TOTAL coverage



Date	Camera	Lens	Mean GSD	Acquisition time	Image count
30/09/2021	Nikon D750 (24.2 MP $p = 5.95 \mu\text{m}$)	Nikon AF-S NIKKOR 85mm 1:1.8 G @ $f/5.6$	3.6 mm	3 h 45 min	2065
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27/10/2021				7 h 45 min	6591
28/10/2021				3 h 40 min	2856
29/10/2021				7 h	6608
Total				32 h 30 min	26706



TOTAL coverage



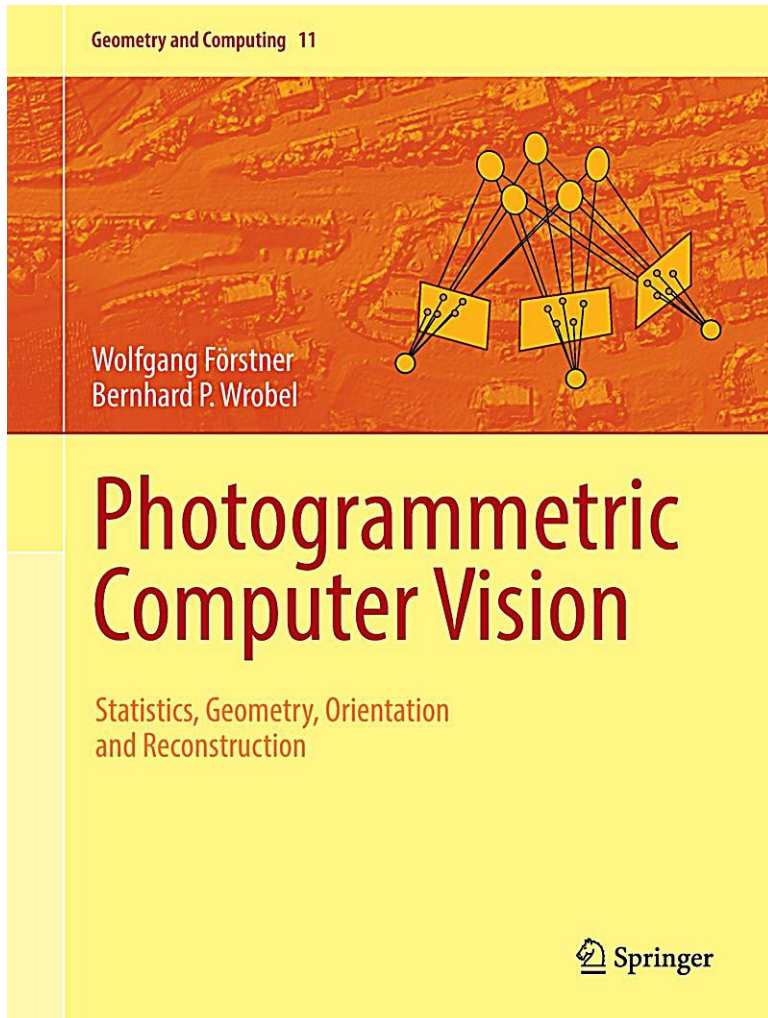
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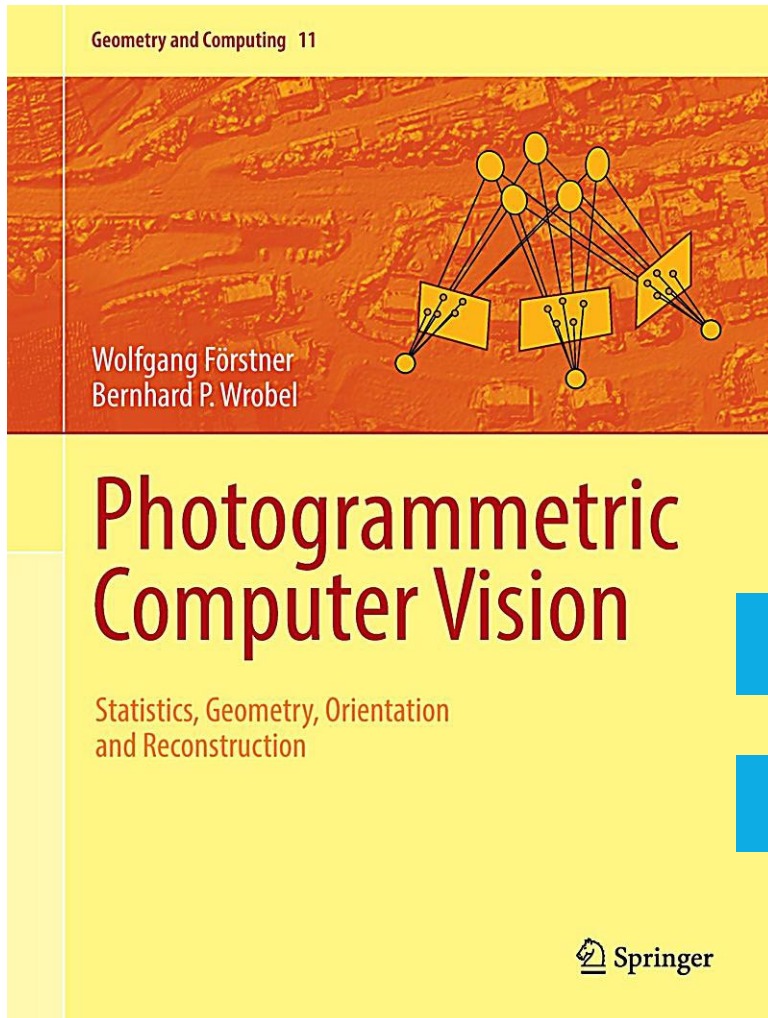
↓
processing



PHOTOGRAMMETRIC computer vision



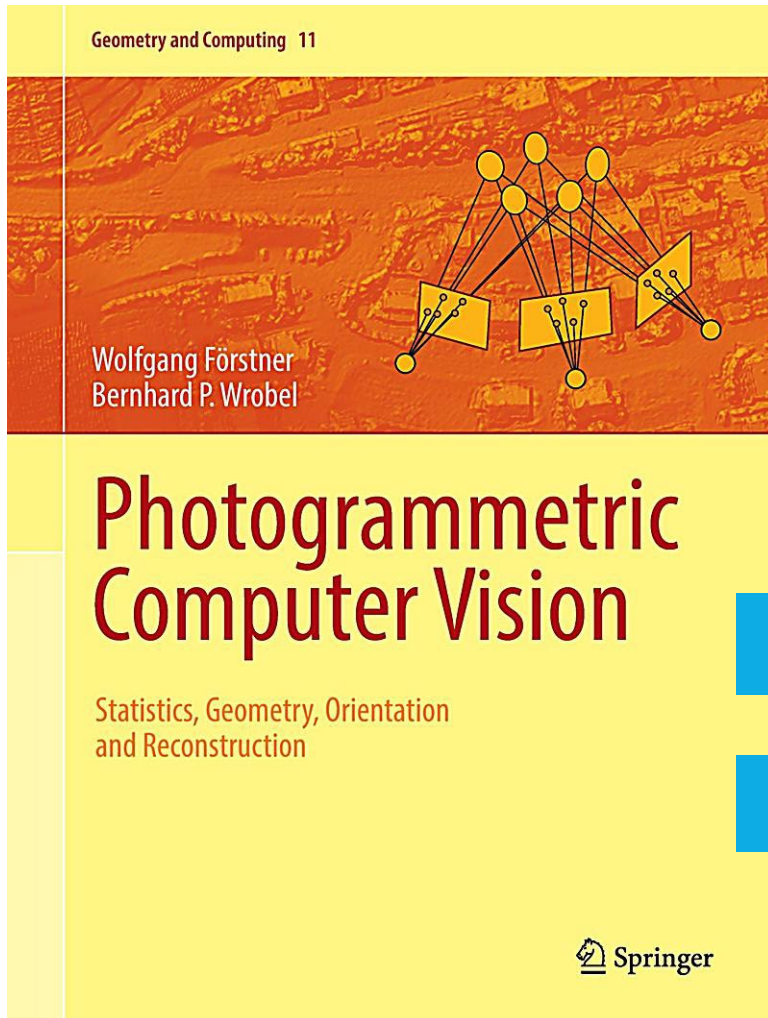
PHOTOGRAMMETRIC **computer vision**



Structure from Motion

Multi-View Stereo

PHOTOGRAMMETRIC **computer vision**

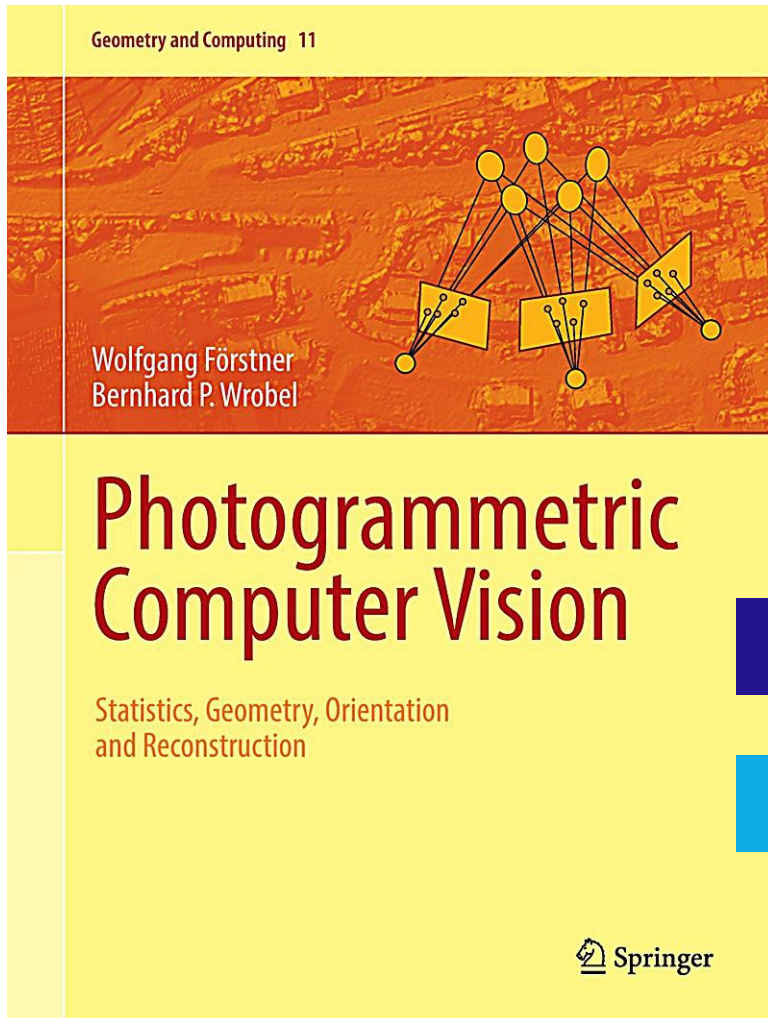


 **Metashape**

Structure from Motion

Multi-View Stereo

PHOTOGRAMMETRIC **computer vision**



 **Metashape**

Structure from Motion

Multi-View Stereo

STRUCTURE from motion



STRUCTURE from motion



DETECT *FEATURES*

STRUCTURE from motion



DETECT *FEATURES*

STRUCTURE from motion



DETECT *FEATURES*

STRUCTURE from motion

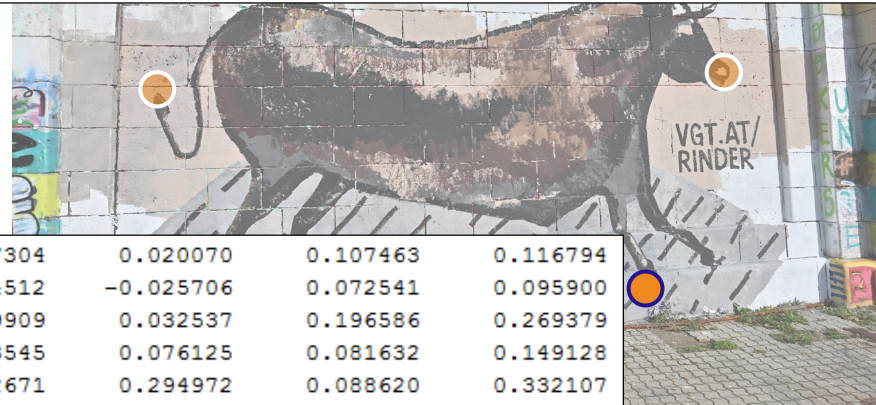


DESCRIBE *FEATURES*

STRUCTURE from motion



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-0.028680	-0.054708	0.122665	0.153017	0.028871	-0.012555	0.095984	0.088053
0.015120	0.027794	0.116166	0.107026	0.027754	0.077151	0.281207	0.426664
-0.084432	0.037411	0.258167	0.278575	0.031956	0.001815	0.108572	0.100973
0.044885	-0.009998	0.117392	0.116673	0.051583	-0.056531	0.278835	0.255680
-0.062802	0.094772	0.227900	0.241899	0.009492	0.058900	0.122209	0.134463
0.011744	-0.015147	0.049275	0.063480	0.040967	-0.047647	0.116258	0.123337
-0.028446	-0.028242	0.145872	0.128276	-0.000557	-0.013686	0.074246	0.073226



-0.023005	-0.007396	0.067406	0.070548	-0.047304	0.020070	0.107463	0.116794
-0.002762	0.007330	0.205253	0.144043	0.034512	-0.025706	0.072541	0.095900
-0.053031	0.025935	0.117892	0.117847	-0.059909	0.032537	0.196586	0.269379
-0.021751	0.058599	0.207912	0.277615	0.023545	0.076125	0.081632	0.149128
0.022910	0.144103	0.068890	0.186169	-0.012671	0.294972	0.088620	0.332107
0.032126	0.311892	0.112505	0.371900	0.014572	0.152932	0.050433	0.177491
0.003959	0.017503	0.011449	0.025512	0.001314	0.007357	0.017403	0.023415
-0.000710	0.003055	0.019640	0.025681	-0.002357	-0.002299	0.010456	0.010393

DESCRIBE *FEATURES*

STRUCTURE from motion



MATCH DESCRIPTORS

STRUCTURE from motion



MATCH DESCRIPTORS

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



MATCH *DESCRIPTORS*

STRUCTURE from motion



TIE POINTS



STRUCTURE from motion



TIE POINTS



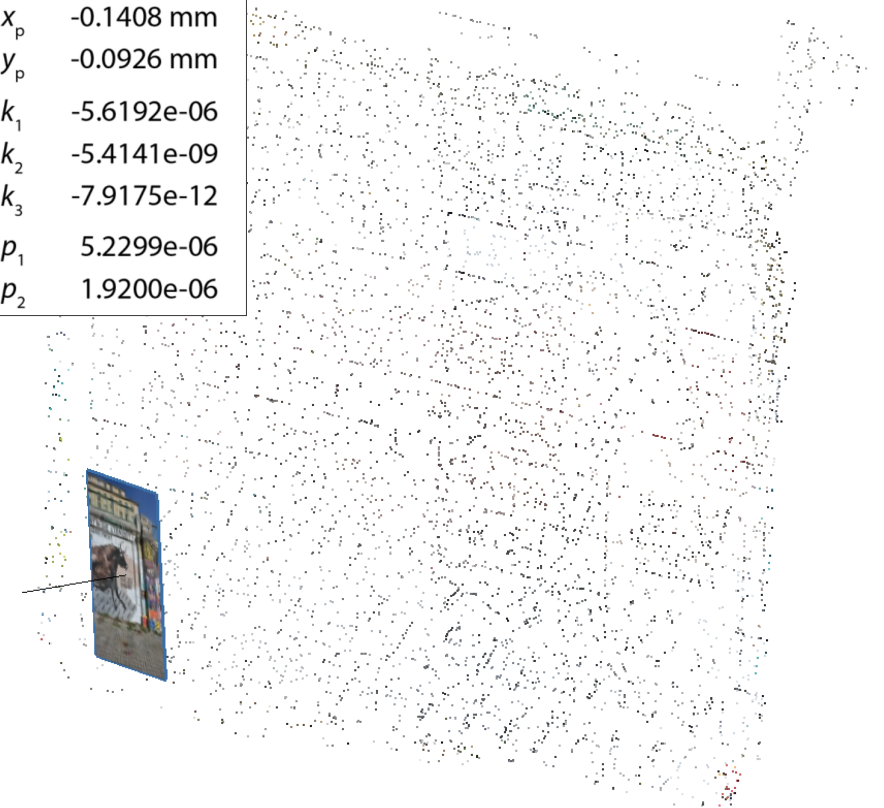
ESTIMATE *CAMERA EXTERIOR ORIENTATION*

STRUCTURE from motion



TIE POINTS

principal distance	c	20.1546 mm
principal point location	x_p	-0.1408 mm
	y_p	-0.0926 mm
radial distortion parameters	k_1	-5.6192e-06
	k_2	-5.4141e-09
	k_3	-7.9175e-12
decentering distortion parameters	p_1	5.2299e-06
	p_2	1.9200e-06



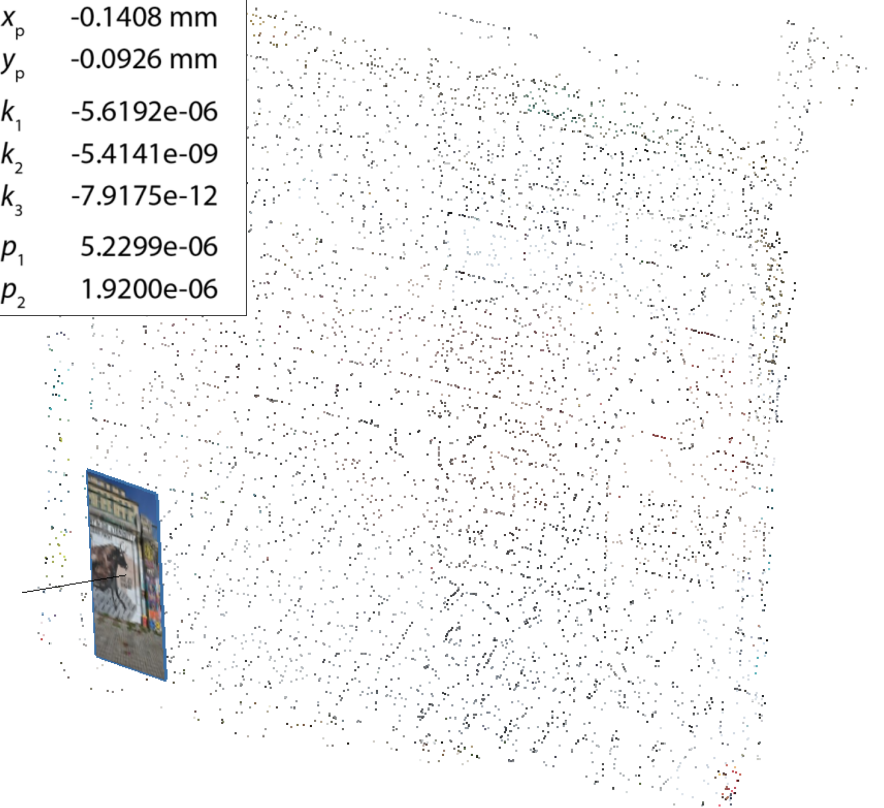
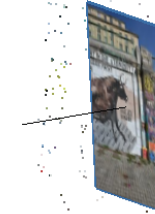
ESTIMATE *CAMERA EXTERIOR ORIENTATION*
ESTIMATE *CAMERA INTERIOR ORIENTATION*

STRUCTURE from motion



TIE POINTS

principal distance	c	20.1546 mm
principal point location	x_p	-0.1408 mm
	y_p	-0.0926 mm
radial distortion parameters	k_1	-5.6192e-06
	k_2	-5.4141e-09
	k_3	-7.9175e-12
decentering distortion parameters	p_1	5.2299e-06
	p_2	1.9200e-06



3D POINTS

ESTIMATE *CAMERA EXTERIOR ORIENTATION*
ESTIMATE *CAMERA INTERIOR ORIENTATION*

STRUCTURE from motion



TIE POINTS

principal distance	c	20.1546 mm
principal point location	x_p	-0.1408 mm
	y_p	-0.0926 mm
radial distortion parameters	k_1	-5.6192e-06
	k_2	-5.4141e-09
	k_3	-7.9175e-12
decentering distortion parameters	p_1	5.2299e-06
	p_2	1.9200e-06



STRUCTURE

3D POINTS

ESTIMATE *CAMERA EXTERIOR ORIENTATION*
ESTIMATE *CAMERA INTERIOR ORIENTATION*

STRUCTURE and from motion



TIE POINTS

principal distance	c	20.1546 mm
principal point location	x_p	-0.1408 mm
	y_p	-0.0926 mm
radial distortion parameters	k_1	-5.6192e-06
	k_2	-5.4141e-09
	k_3	-7.9175e-12
decentering distortion parameters	p_1	5.2299e-06
	p_2	1.9200e-06



STRUCTURE

3D POINTS

ESTIMATE *CAMERA EXTERIOR ORIENTATION*
ESTIMATE *CAMERA INTERIOR ORIENTATION*

STRUCTURE from motion

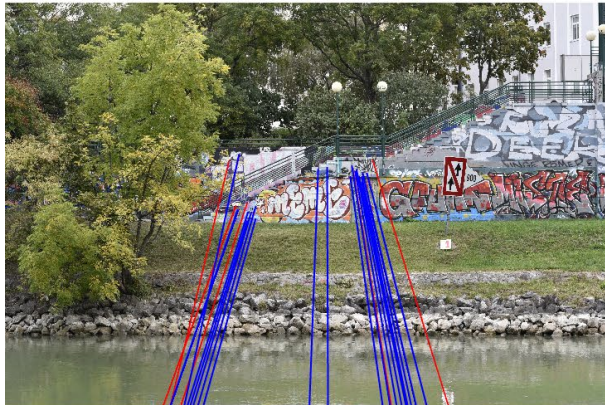


CAMERA EXTERIOR ORIENTATION
CAMERA INTERIOR ORIENTATION

3D POINTS

CAMERA orientation

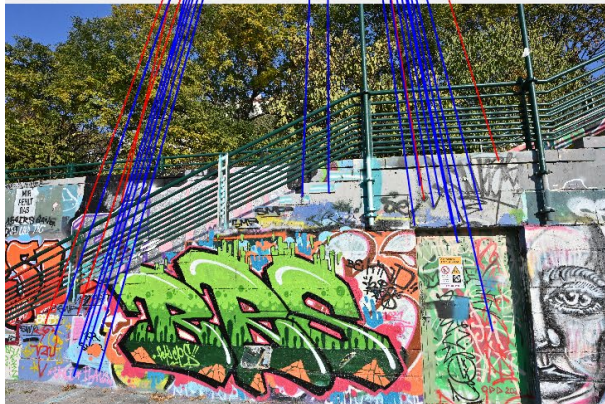
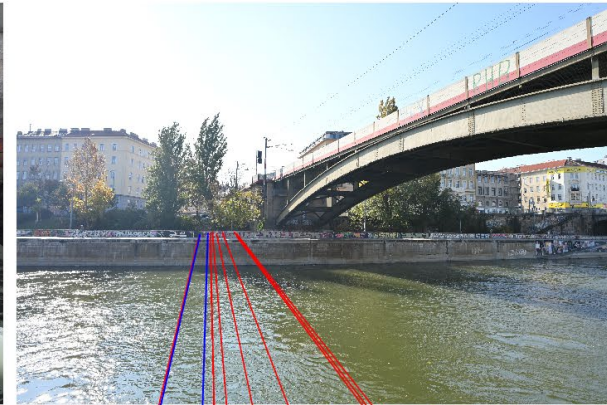
Nikon D750 + 85 mm
30-09-2021



Nikon D750 + 85 mm
30-09-2021



Nikon Z7 II + 20 mm
28-10-2021



Nikon Z7 II + 20 mm
29-10-2021

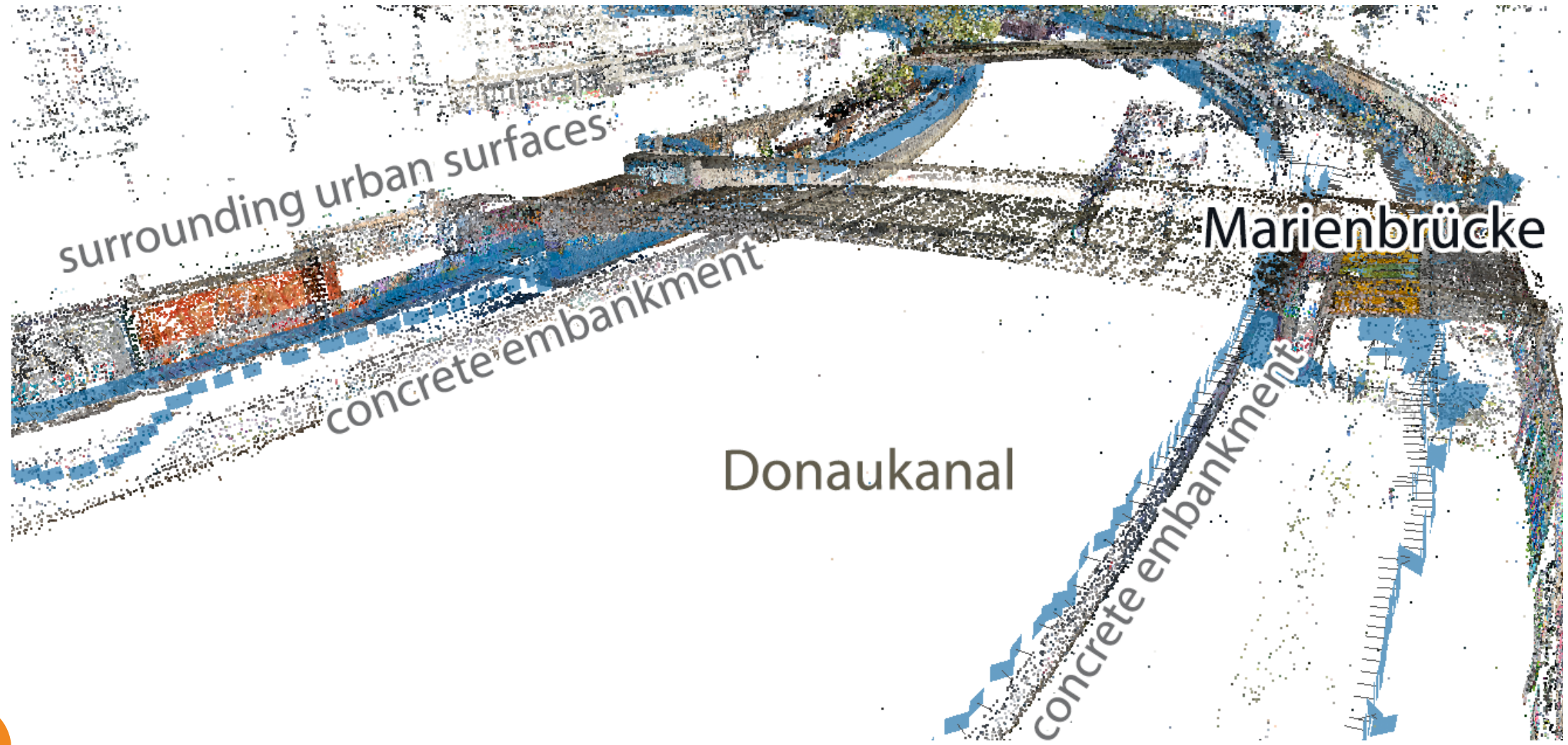


Nikon D750 + 85 mm
01-10-2021

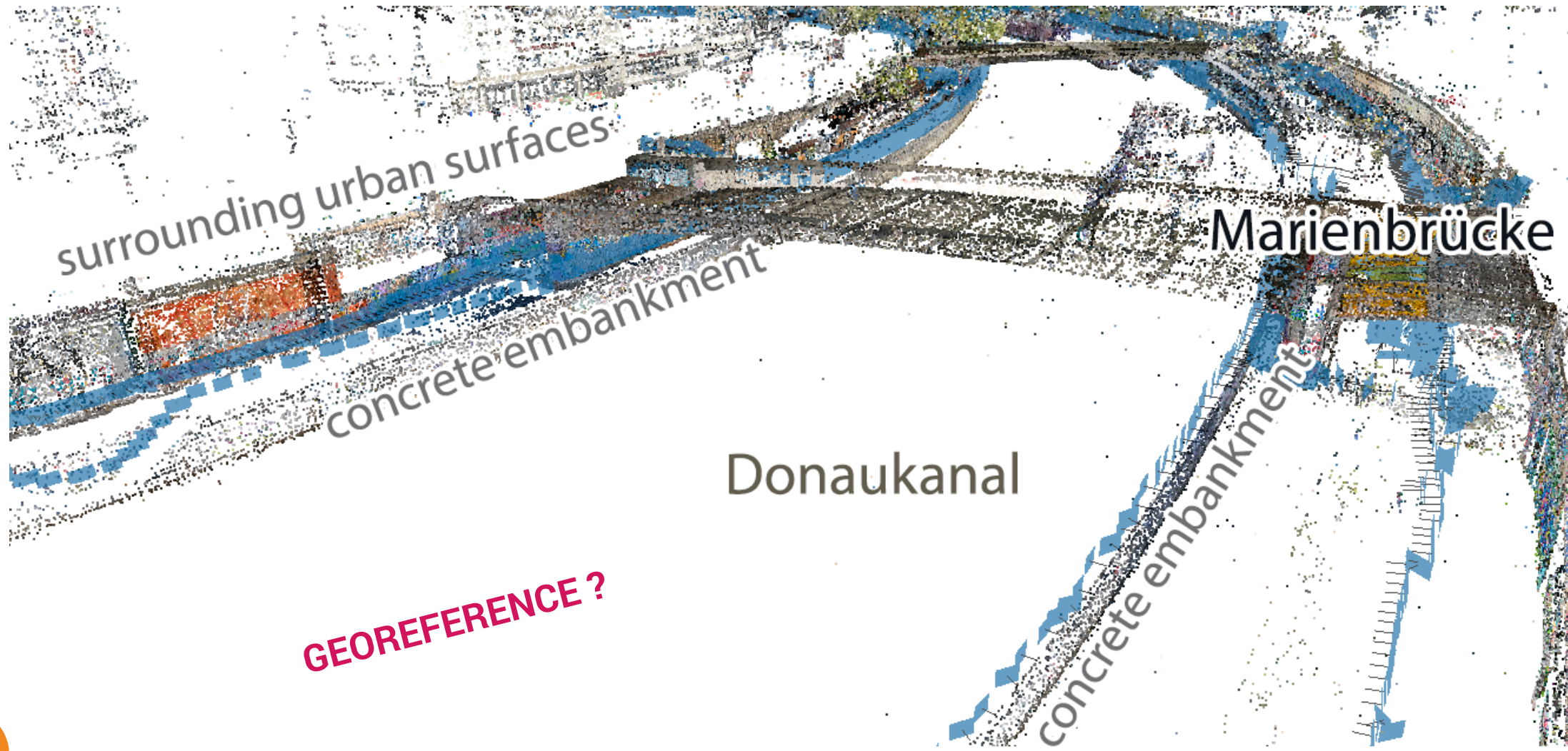


Nikon Z7 II + 20 mm
26-10-2021

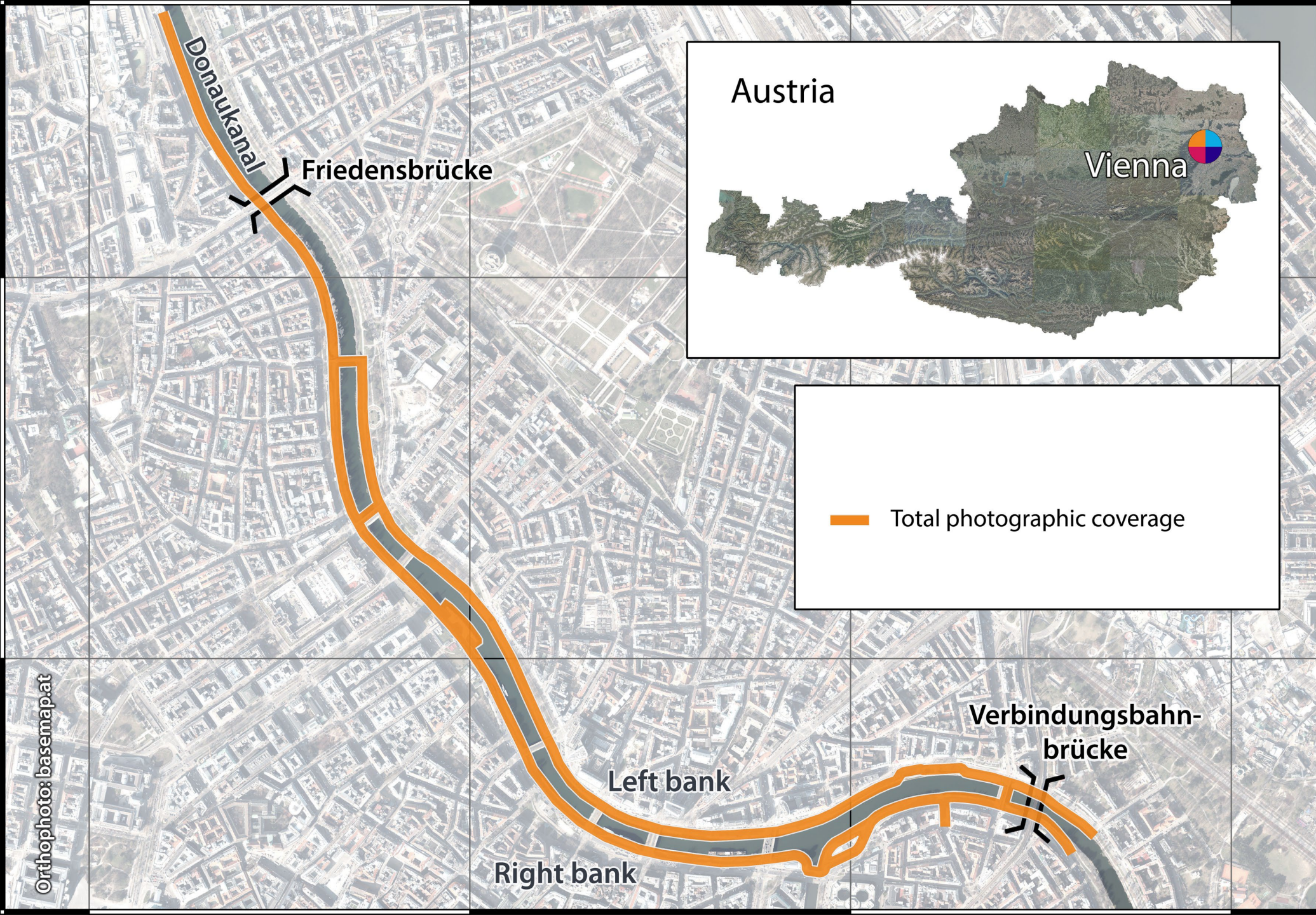
CAMERA orientation



CAMERA orientation



**TOTAL
COVERAGE**
14.0 km

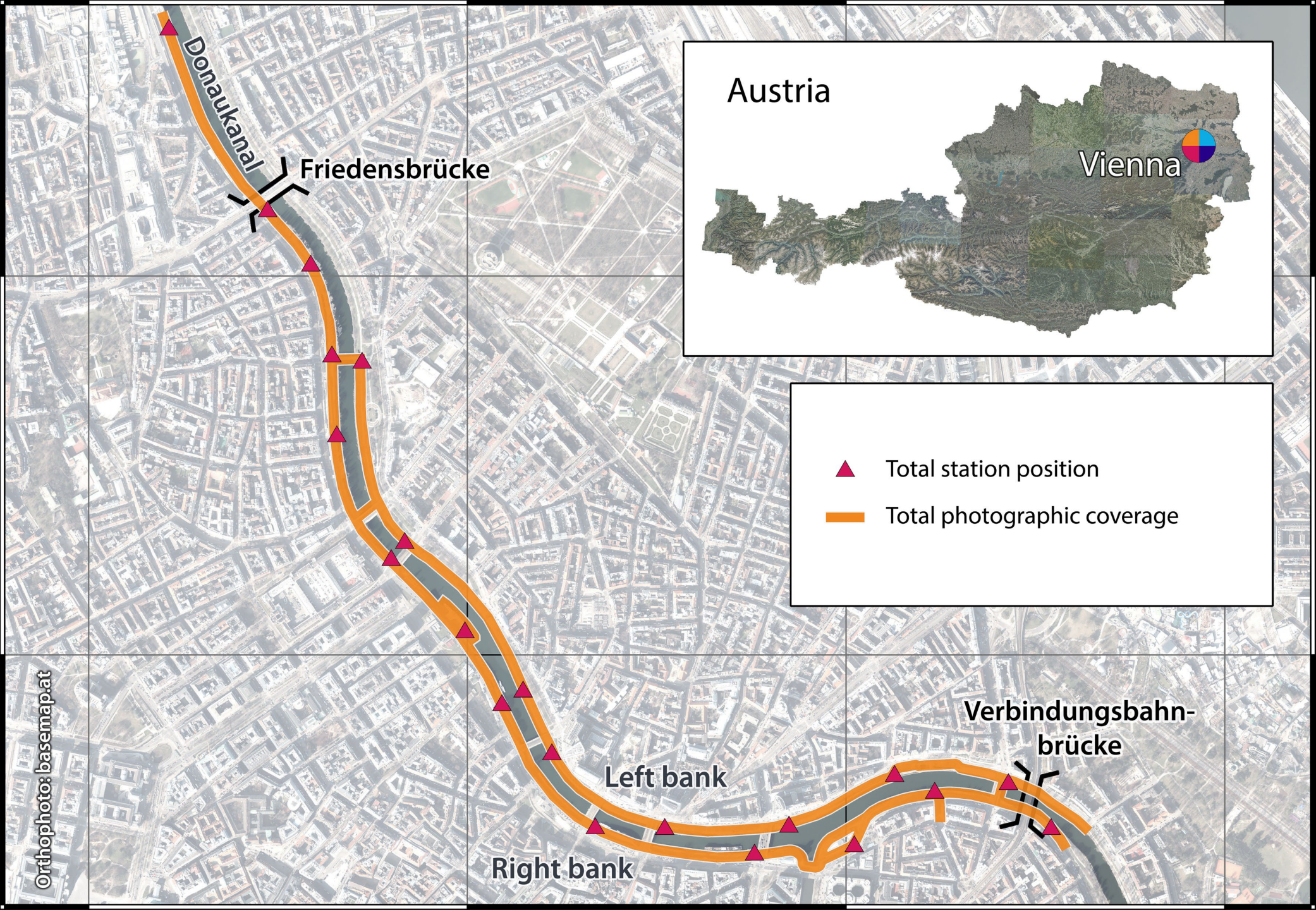


**TOTAL
COVERAGE**

14.0 km

**TOTAL STATION
POSITIONS**

21



**TOTAL
COVERAGE**

14.0 km

**TOTAL STATION
POSITIONS**

21



**TOTAL
COVERAGE**

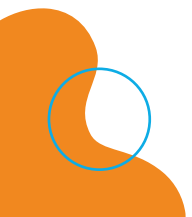
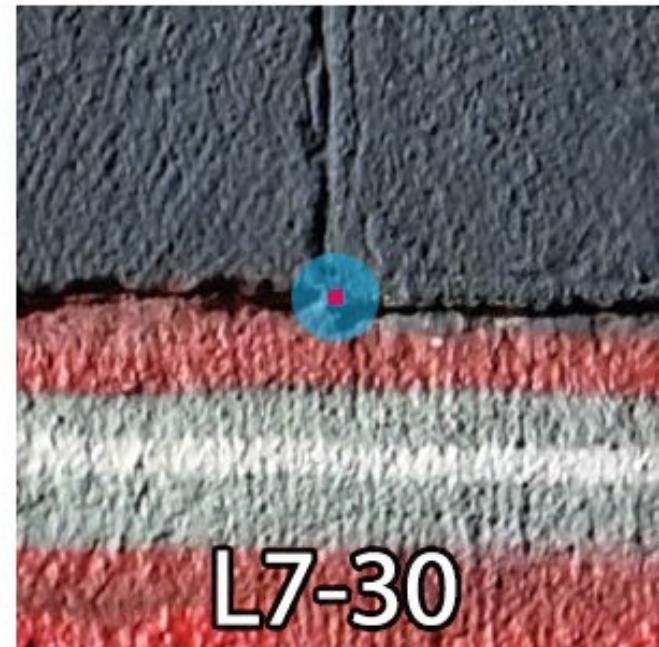
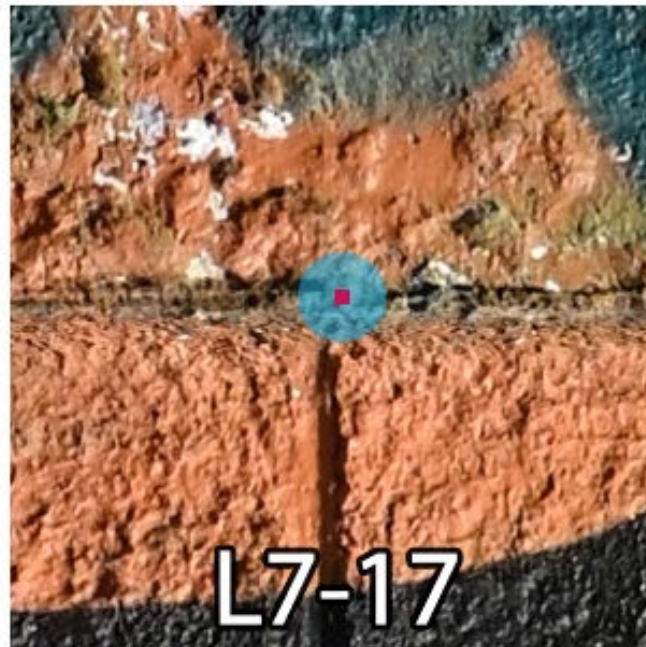
14.0 km

**TOTAL STATION
POSITIONS**

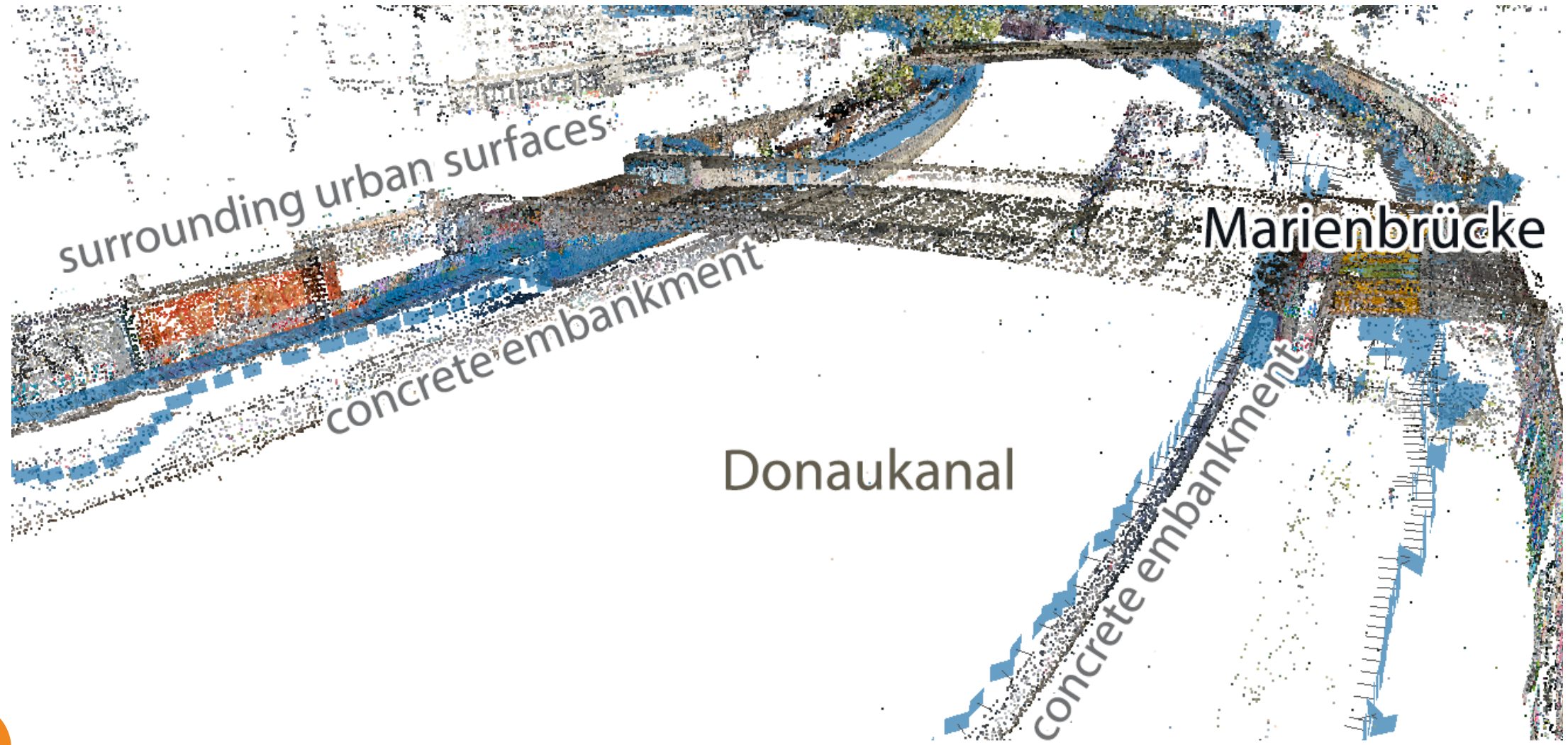
21

**GRAFFITI-SCAPE
POINTS**

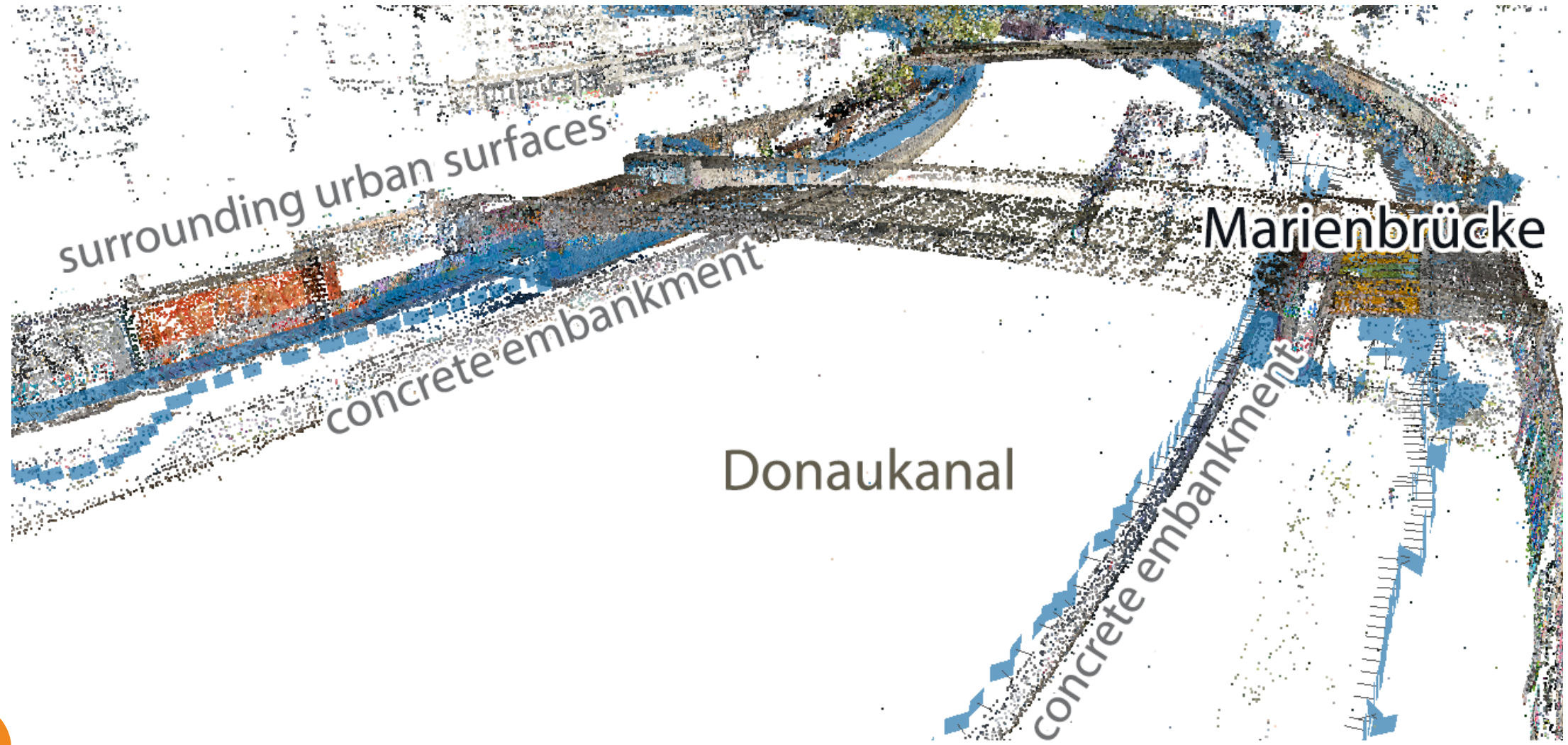
624



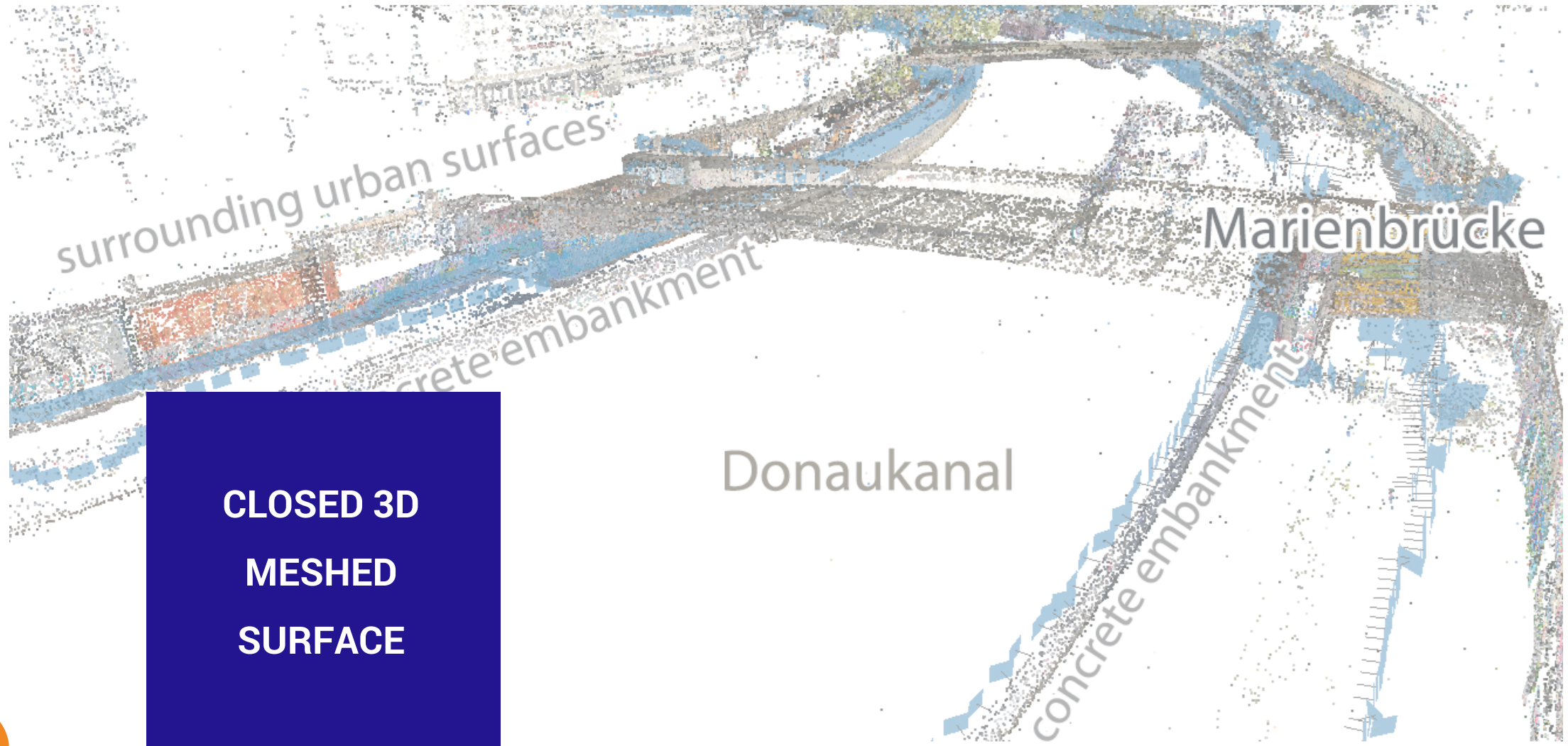
CAMERA orientation



THREE purposes

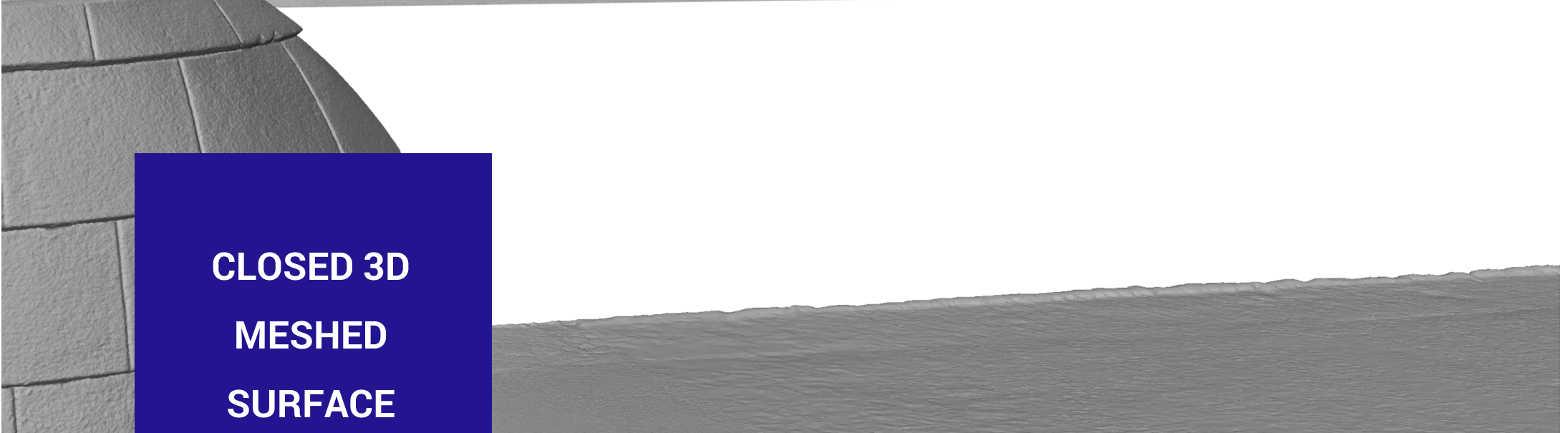
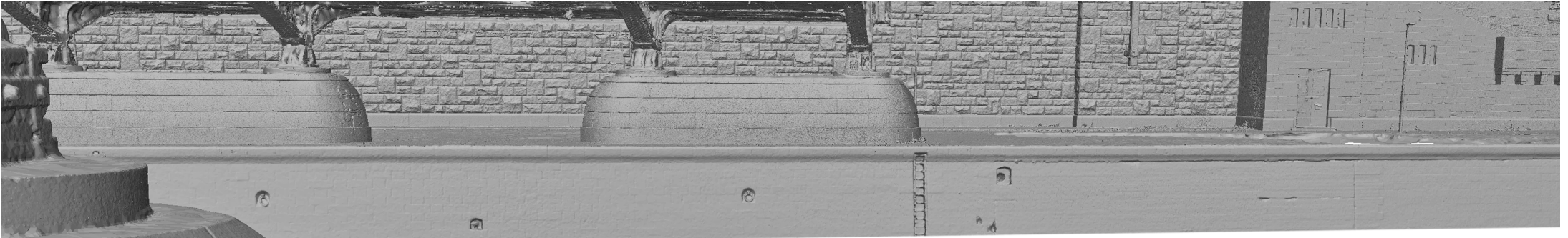


THREE purposes



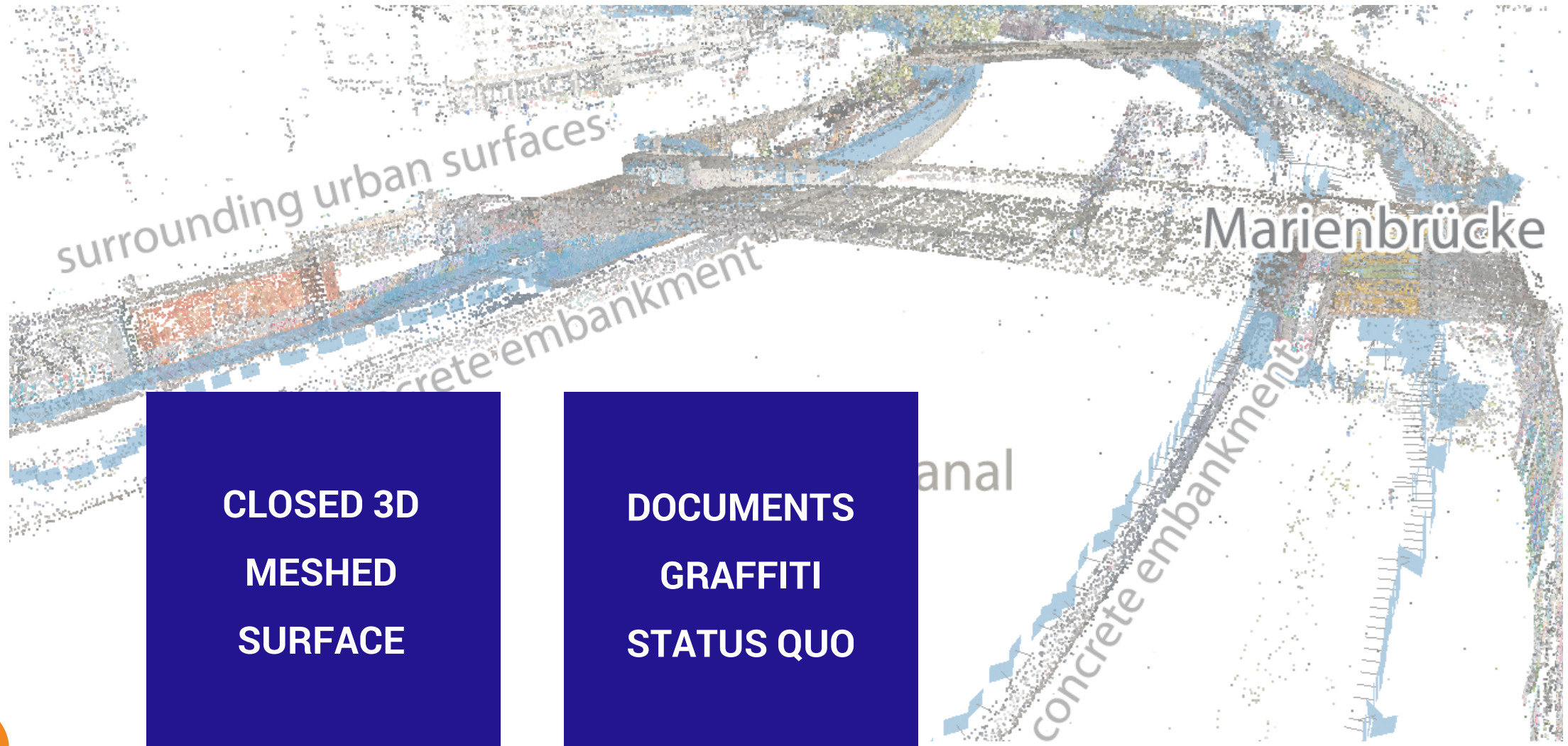
CLOSED 3D
MESHED
SURFACE

THREE purposes



CLOSED 3D
MESHED
SURFACE

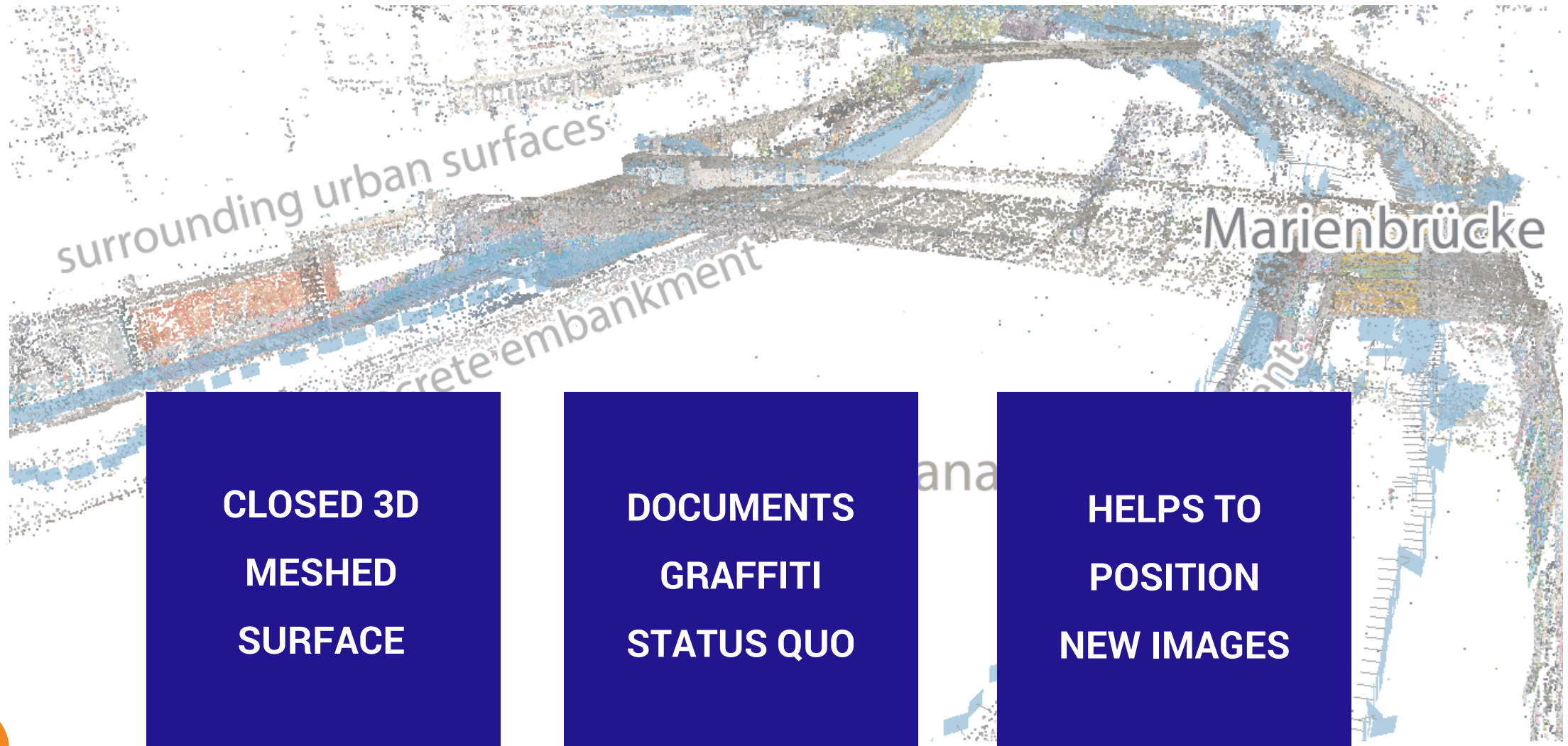
THREE purposes



CLOSED 3D
MESHED
SURFACE

DOCUMENTS
GRAFFITI
STATUS QUO

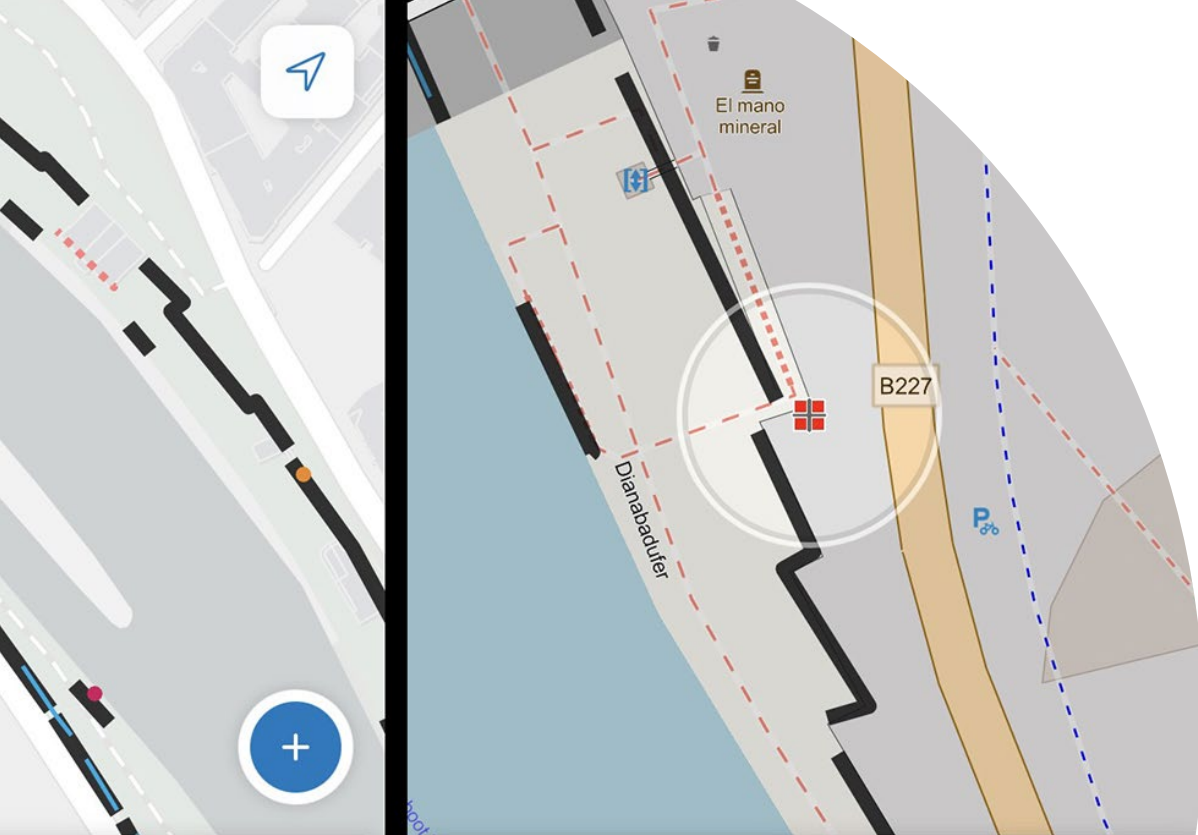
THREE purposes



CLOSED 3D
MESHED
SURFACE

DOCUMENTS
GRAFFITI
STATUS QUO

HELPS TO
POSITION
NEW IMAGES



nd, Flex ✕
5,8 km

Als Anlage

INDIGO - Monitoring - Graffiti ⋮

48,214117°N 16,375703°O

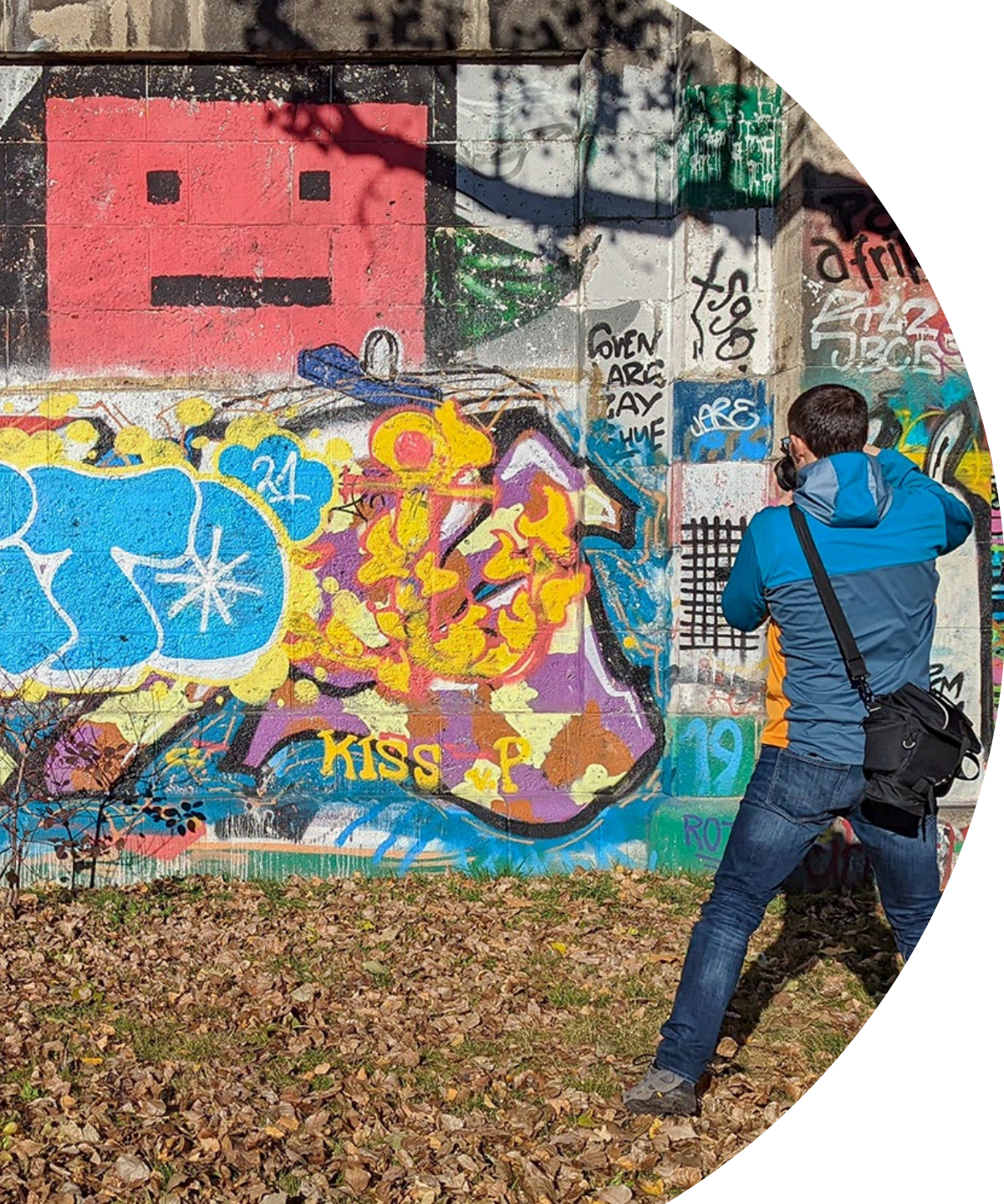
Punkt aktualisieren

Foto aufnehmen Anfügen

Notes

FOLLOW-UP photography

Instagram + monitoring app



FOLLOW-UP **photography**

Instagram + monitoring app

2 photographers



FOLLOW-UP **photography**

Instagram + monitoring app

2 photographers

2 cameras + 2 spectrometers + 2 tablets

identically programmed



FOLLOW-UP **photography**

Instagram + monitoring app

2 photographers

2 cameras + 2 spectrometers + 2 tablets

identically programmed

fixed acquisition procedure

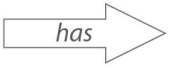
Hardware



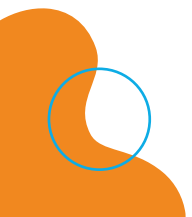
'Follow-up' workflow



Output



Purpose



Hardware

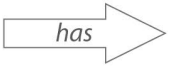


'Follow-up' workflow

Check the map



Output



Purpose

Hardware



'Follow-up' workflow

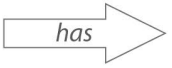
Check the map



Move to closest new graffito



Output



Purpose

Hardware

relies on

'Follow-up' workflow

generates

Output

has

Purpose



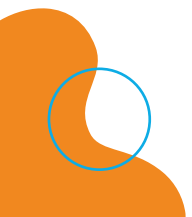
Check the map



Move to closest new graffito



Focus on ColorChecker



Hardware

← *relies on*

'Follow-up' workflow

→ *generates*

Output

→ *has*

Purpose



Check the map



Move to closest new graffito



Focus on ColorChecker



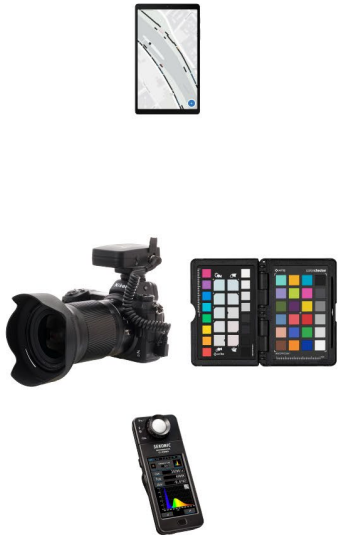
Photograph ColorChecker

1 ColorChecker photo



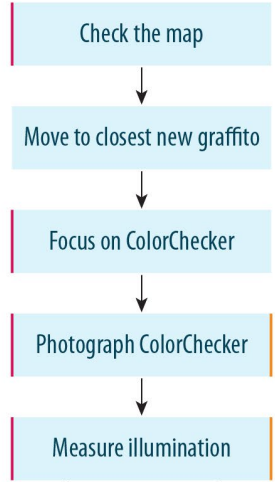
1. Subdivide photo series

Hardware



← relies on

'Follow-up' workflow



→ generates

Output

1 ColorChecker photo



1 illumination spectrum



→ has

Purpose

1. Subdivide photo series
2. Establish link with spectrometer file
3. Generate correct photo colours (backup)

Generate correct photo colours

Hardware



← relies on

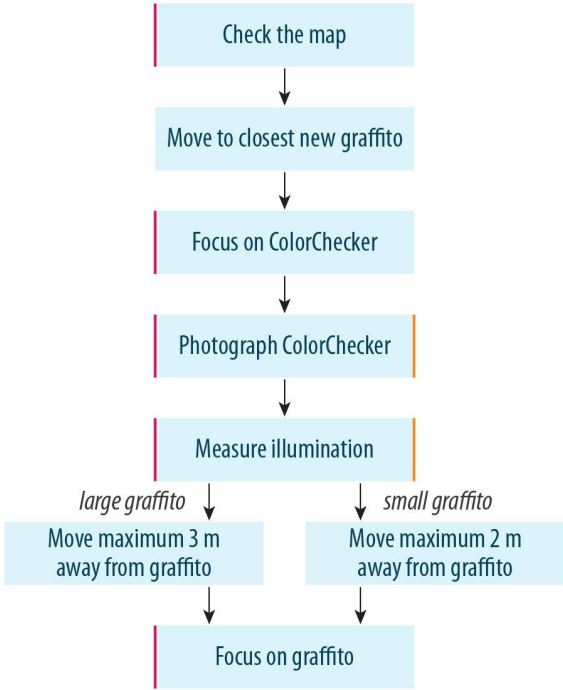
'Follow-up' workflow

→ generates

Output

→ has

Purpose



1 ColorChecker photo



1 illumination spectrum



1. Subdivide photo series
2. Establish link with spectrometer file
3. Generate correct photo colours (backup)

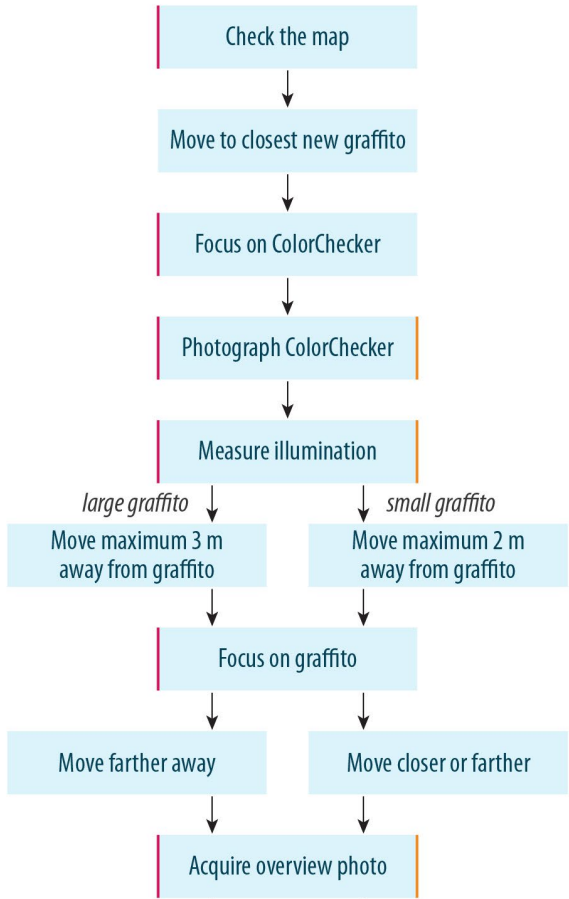
Generate correct photo colours

Hardware



← relies on

'Follow-up' workflow



→ generates

Output

1 ColorChecker photo



1 illumination spectrum



1 overview photo



→ has

Purpose

- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

Generate correct photo colours

- 1. Extract graffito outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

Hardware



← relies on

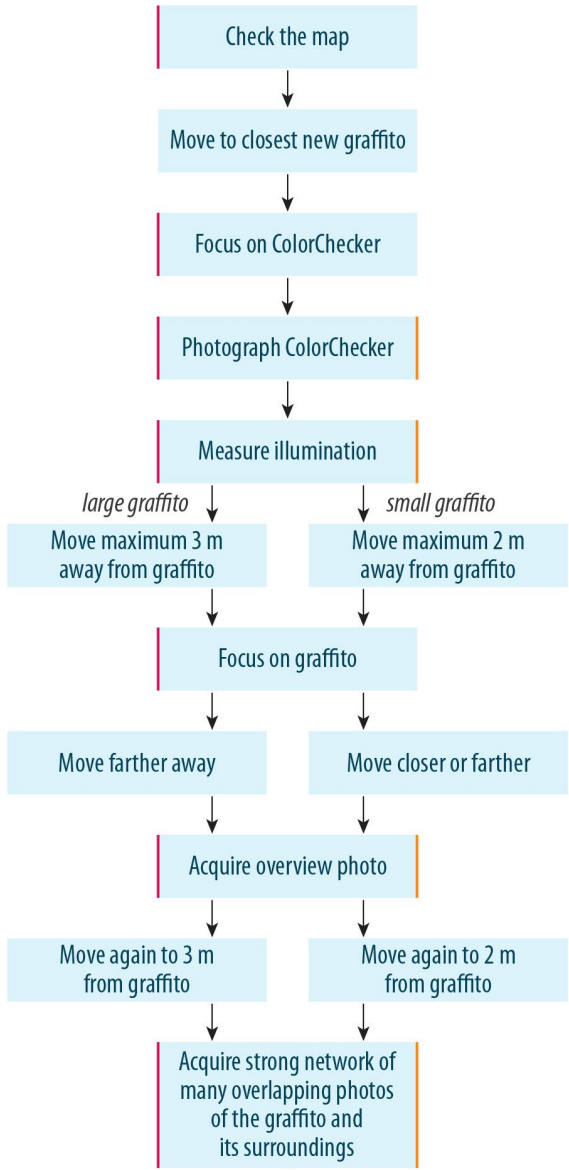
'Follow-up' workflow

→ generates

Output

→ has

Purpose



1 ColorChecker photo



1 illumination spectrum



1 overview photo



[5, ∞[detailed graffiti photos



- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

Generate correct photo colours

- 1. Extract graffiti outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

- 1. Estimate interior & exterior camera orientations
- 2. Produce 3D model texture
- 3. Generate orthophoto mosaic

Hardware



← relies on

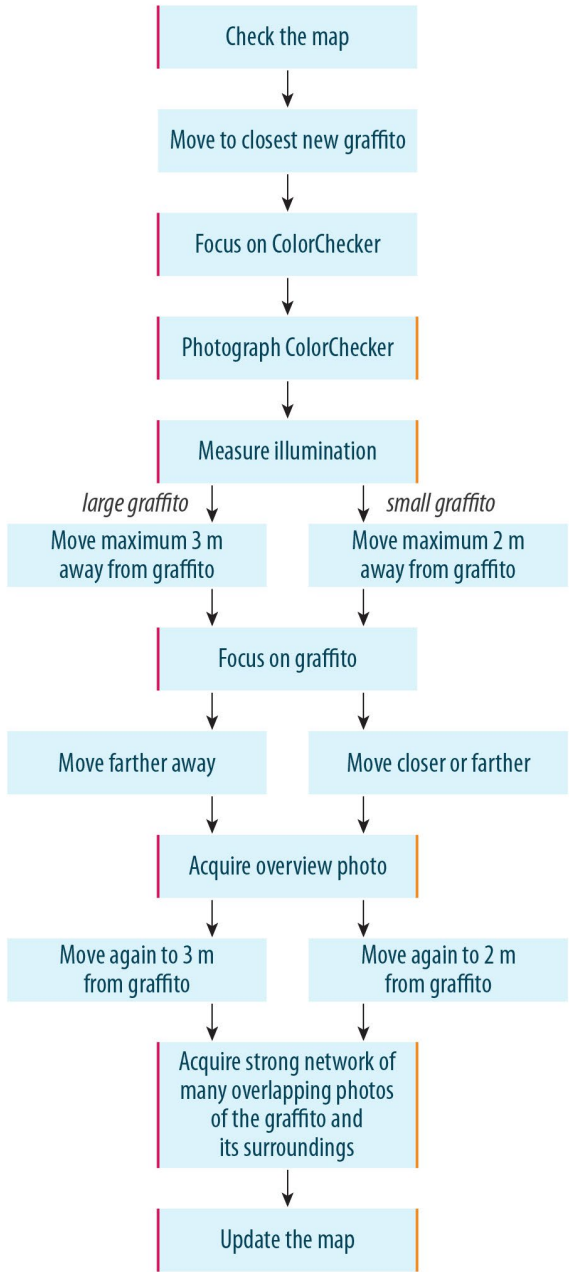
'Follow-up' workflow

→ generates

Output

→ has

Purpose



1 ColorChecker photo



1 illumination spectrum



- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

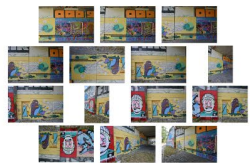
Generate correct photo colours

1 overview photo



- 1. Extract graffiti outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

[5, ∞[detailed graffiti photos



- 1. Estimate interior & exterior camera orientations
- 2. Produce 3D model texture
- 3. Generate orthophoto mosaic

Updated monitoring map

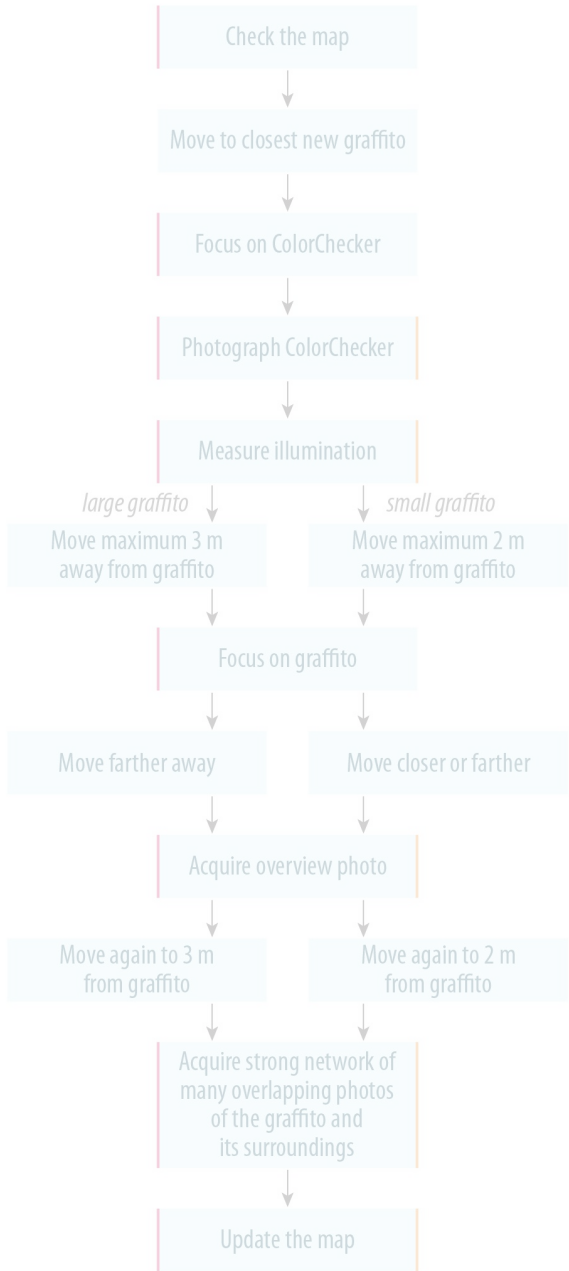
Guide follow-up photography

Hardware



← relies on

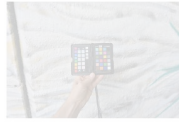
'Follow-up' workflow



→ generates

Output

1 ColorChecker photo



1 illumination spectrum



1 overview photo



[5, ∞[detailed graffiti photos



Updated monitoring map

→ has

Purpose

- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

Generate correct photo colours

- 1. Extract graffiti outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

- 1. Estimate interior & exterior camera orientations
- 2. Produce 3D model texture
- 3. Generate orthophoto mosaic

Guide follow-up photography

Hardware

relies on

'Follow-up' workflow

generates

Output

has

Purpose



Check the map

Move to closest new graffiti

Focus on ColorChecker

Photograph ColorChecker

Measure illumination

large graffiti

Move maximum 3 m away from graffiti

small graffiti

Move maximum 2 m away from graffiti

Focus on graffiti

Move farther away

Move closer or farther

Acquire overview photo

Move again to 3 m from graffiti

Move again to 2 m from graffiti

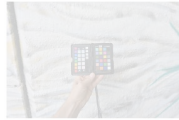
Acquire strong network of many overlapping photos of the graffiti and its surroundings



Update the map



1 ColorChecker photo



1 illumination spectrum



- 1. Subdivide photo series
- 2. Establish link with spectrometer file
- 3. Generate correct photo colours (backup)

Generate correct photo colours

1 overview photo



- 1. Extract graffiti outlines
- 2. Generate tour overview photos
- 3. Estimate interior & exterior camera orientations

[5, ∞[detailed graffiti photos



- 1. Estimate interior & exterior camera orientations
- 2. Produce 3D model texture
- 3. Generate orthophoto mosaic

Updated monitoring map

Guide follow-up photography

ACCURATE photo coordinates



ACCURATE photo coordinates



Scene2Map NTRIP-Client

NTRIP CLIENT ACTIVATION Data

OFF **POSITION** 3d

RTK STATUS NO

Status

WiFi Network Client Access Data

This NTRIP Client requires access to an Internet enabled Network!

If access fails, an accesspoint will be created ("NTRIP_Client_" with PW:"NTRIP")

Address: Save

Password:

NTRIP Caster Settings

Network Name: Save

Port:

Mountpoint:

Username:

Password:

Send my Position

(Required if your Caster provides VRS (Virtual Reference Station))

Repeat time: 1 sec. 2 sec. 10 sec. 20 sec. Apply

Restart NTRIP client for changes to take effect Restart

@Martin Wieser 2022

IMAGE positioning

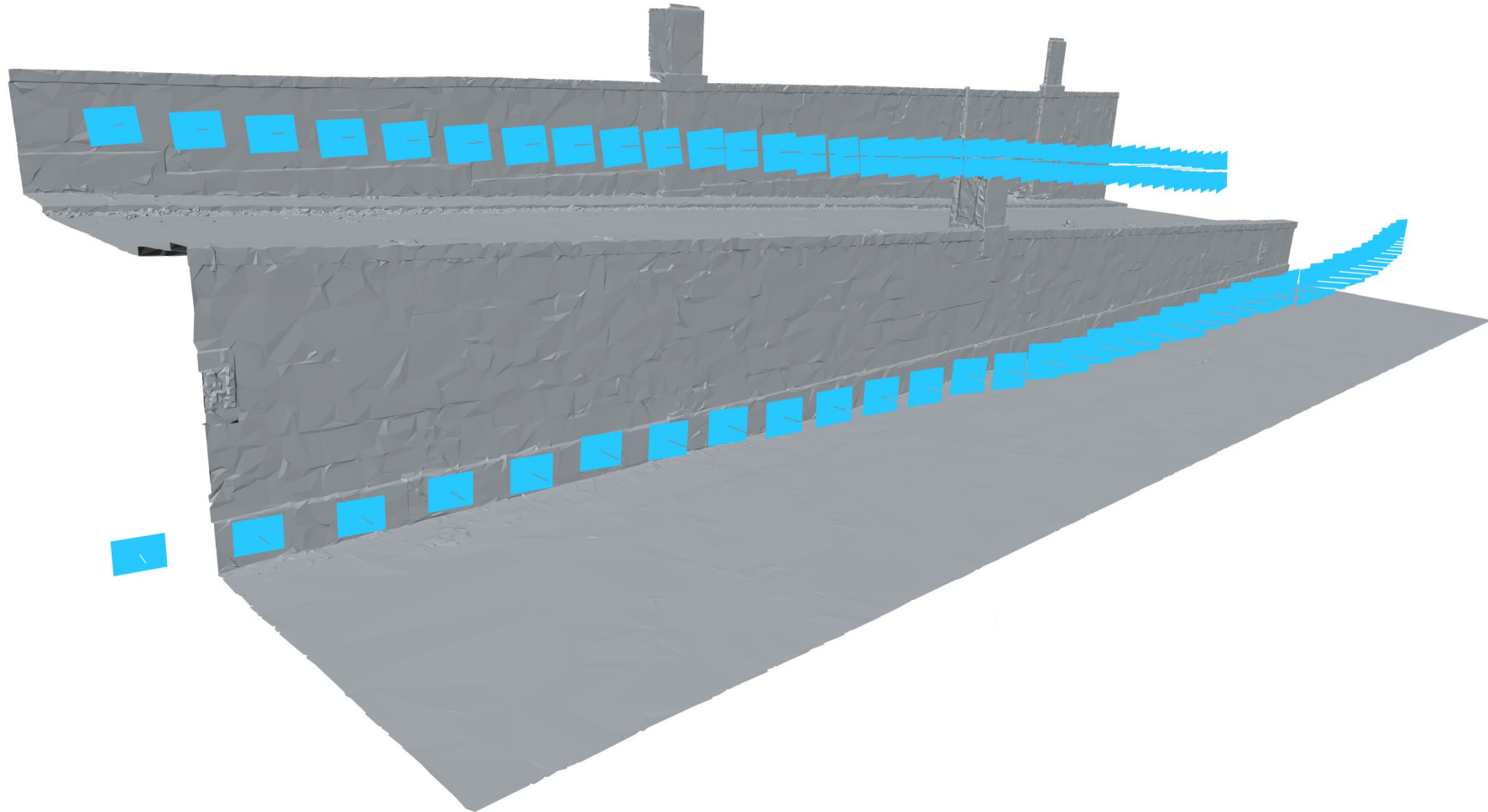


Illustration by Benjamin Wild

IMAGE positioning

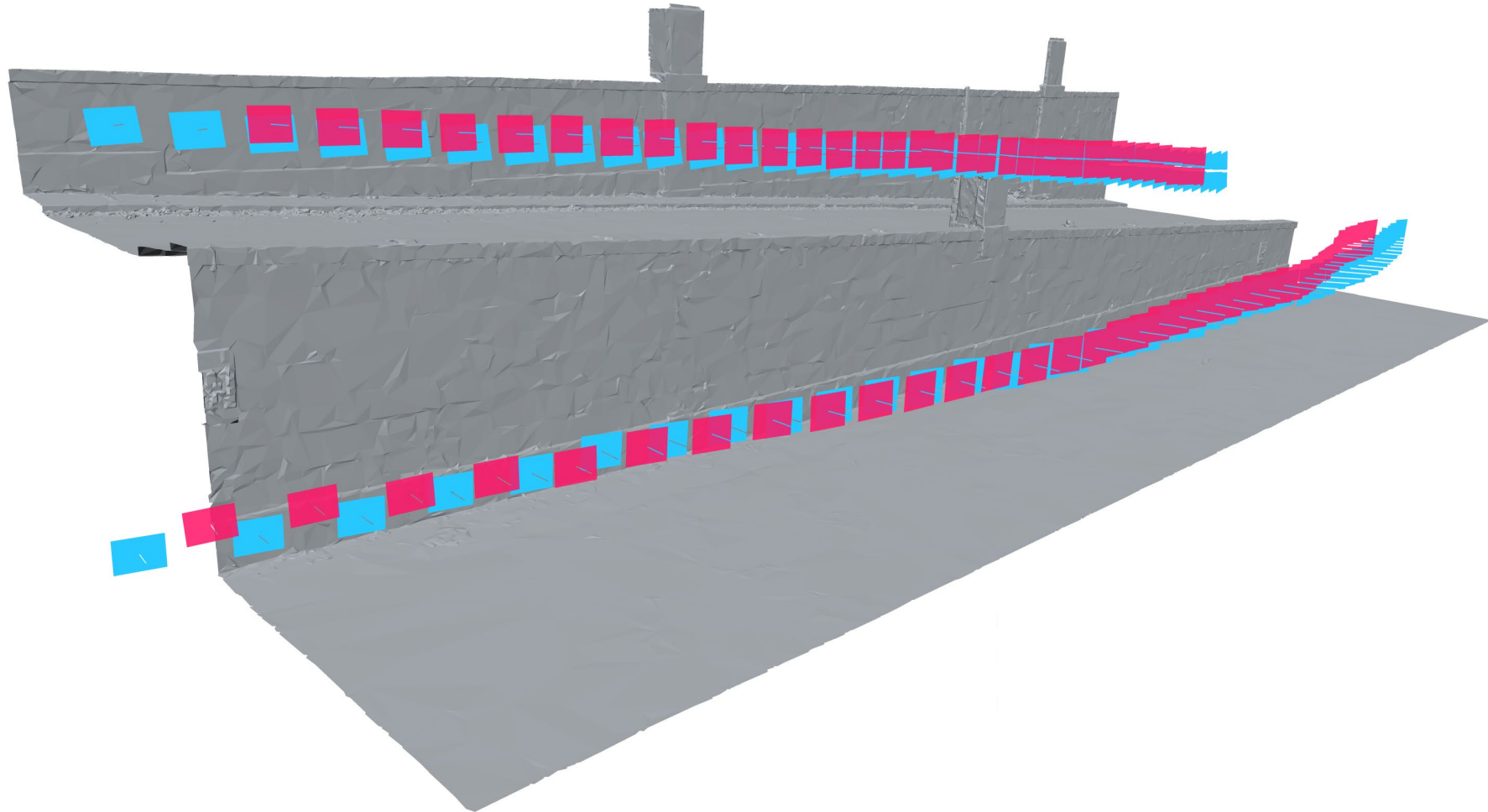
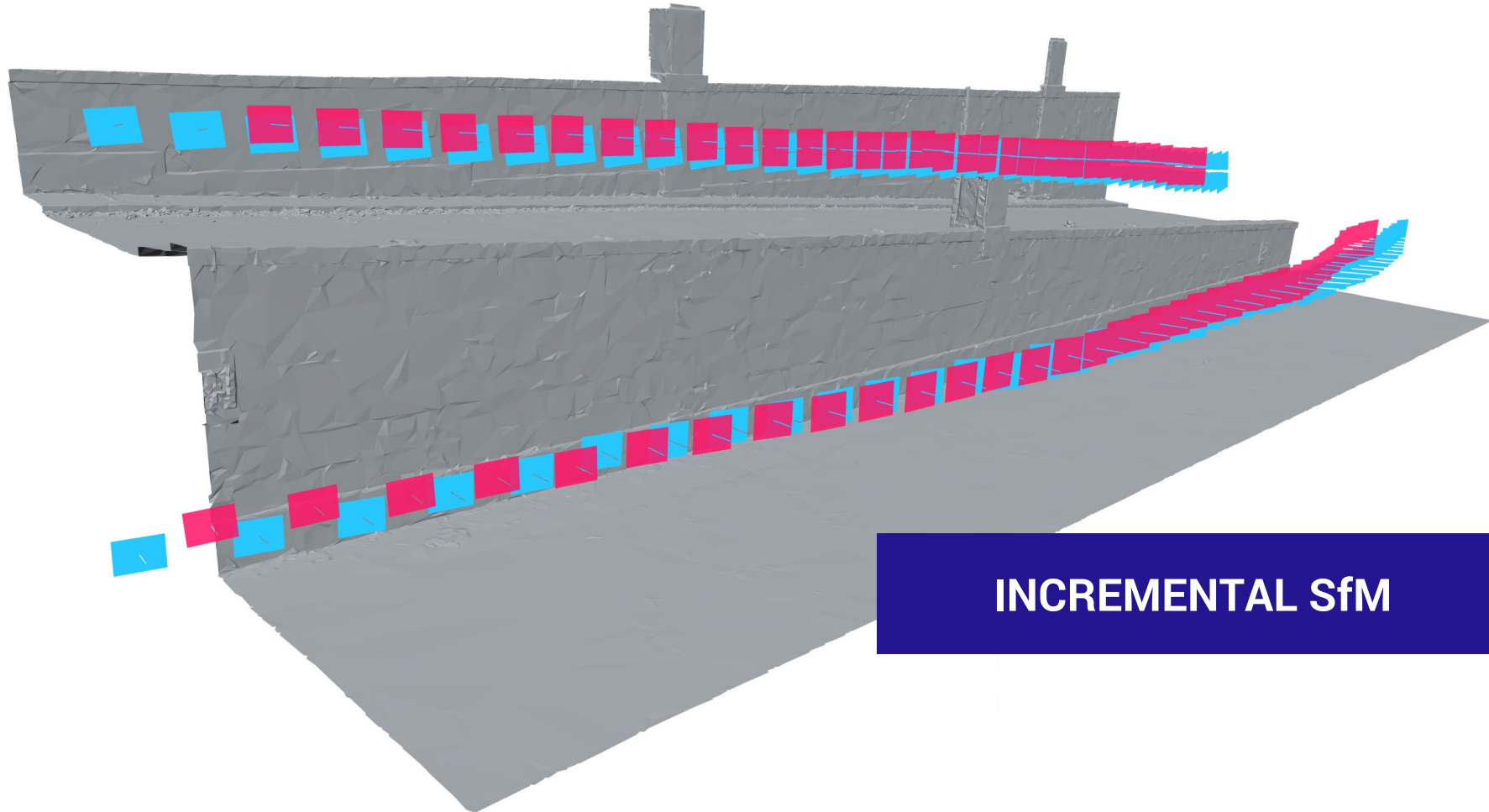


Illustration by Benjamin Wild

IMAGE positioning



INCREMENTAL SfM

Illustration by Benjamin Wild

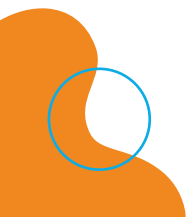
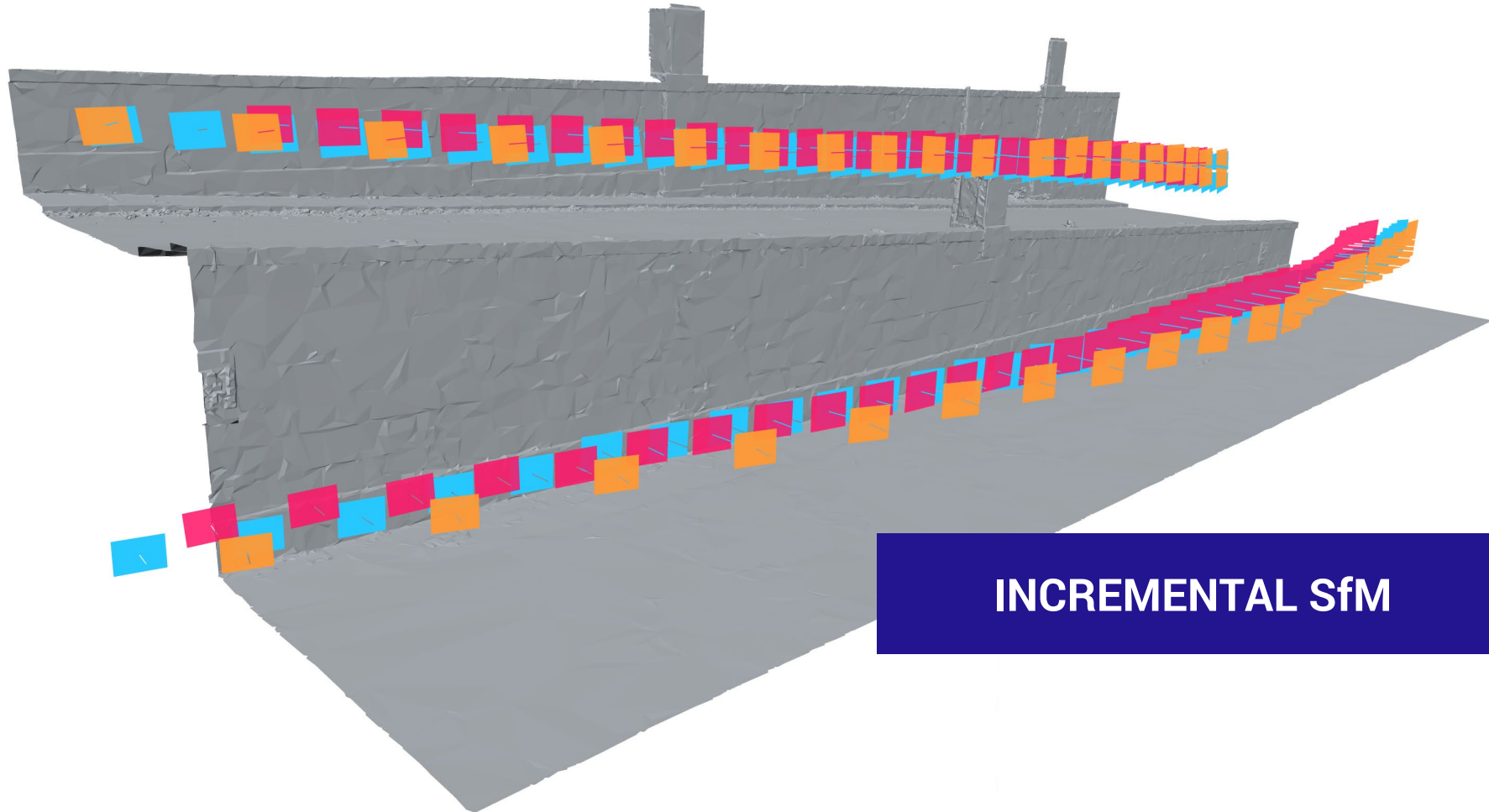


IMAGE positioning



INCREMENTAL SfM

Illustration by Benjamin Wild

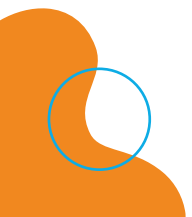


IMAGE positioning

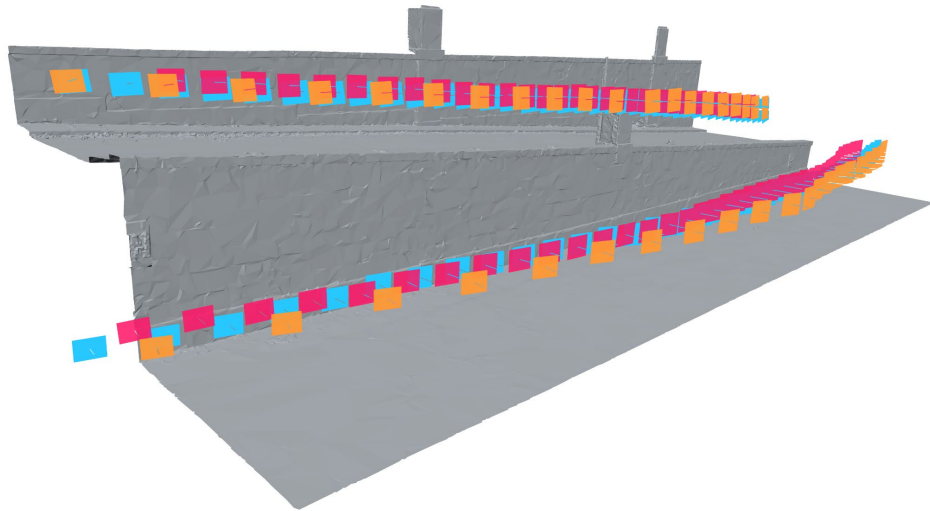
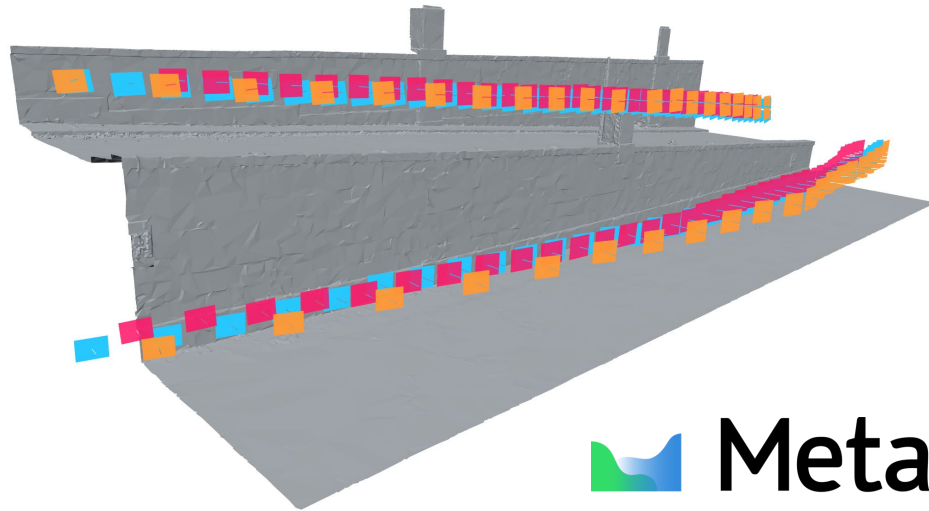


IMAGE positioning



 Metashape





INDIGO Toolbox

1. Choose graffito directory to be processed

2. Run

AUTOGRAF

position-accurate pixels



main 1 branch 0 tags

Go to file Code

bewild96 Update README.md	75d27bb 15 days ago	24 commits
Heritage_ClassificationResults	Add files via upload	2 months ago
images	Add files via upload	last month
src	Add files via upload	2 months ago
LICENSE	Initial commit	2 months ago
README.md	Update README.md	15 days ago

README.md



Short Description

AUTOGRAF (AUTomated Orthorectification of GRAffiti photos) is an open-source python-based Metashape add-on which enables the automated orthorectification of graffiti photos at a specific site of interest. It employs state-of-the-art photogrammetric computer vision techniques to allow highly accurate georeferencing and orthorectification of large numbers of photographs. A paper detailing AUTOGRAF's methodology will soon be submitted to Heritage (an MDPI journal).

AUTOGRAF is developed as part of the INDIGO project (In-ventory and DI-sseminate G-raffiti along the d-O-naukanal) carried out by the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology in close collaboration with the GEO Department of TU Wien University.

How to set up AUTOGRAF

Before AUTOGRAF can be used, the following preparatory steps [1-3] need to be performed:

1 - Install Agisoft's Metashape

About

AUTomatic Orthorectification of GRAffiti photos

photographs graffiti orthorectification

Readme

GPL-3.0 license

6 stars

1 watching

0 forks

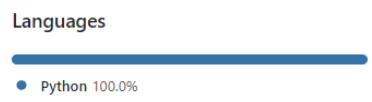
Releases

No releases published

Packages

No packages published

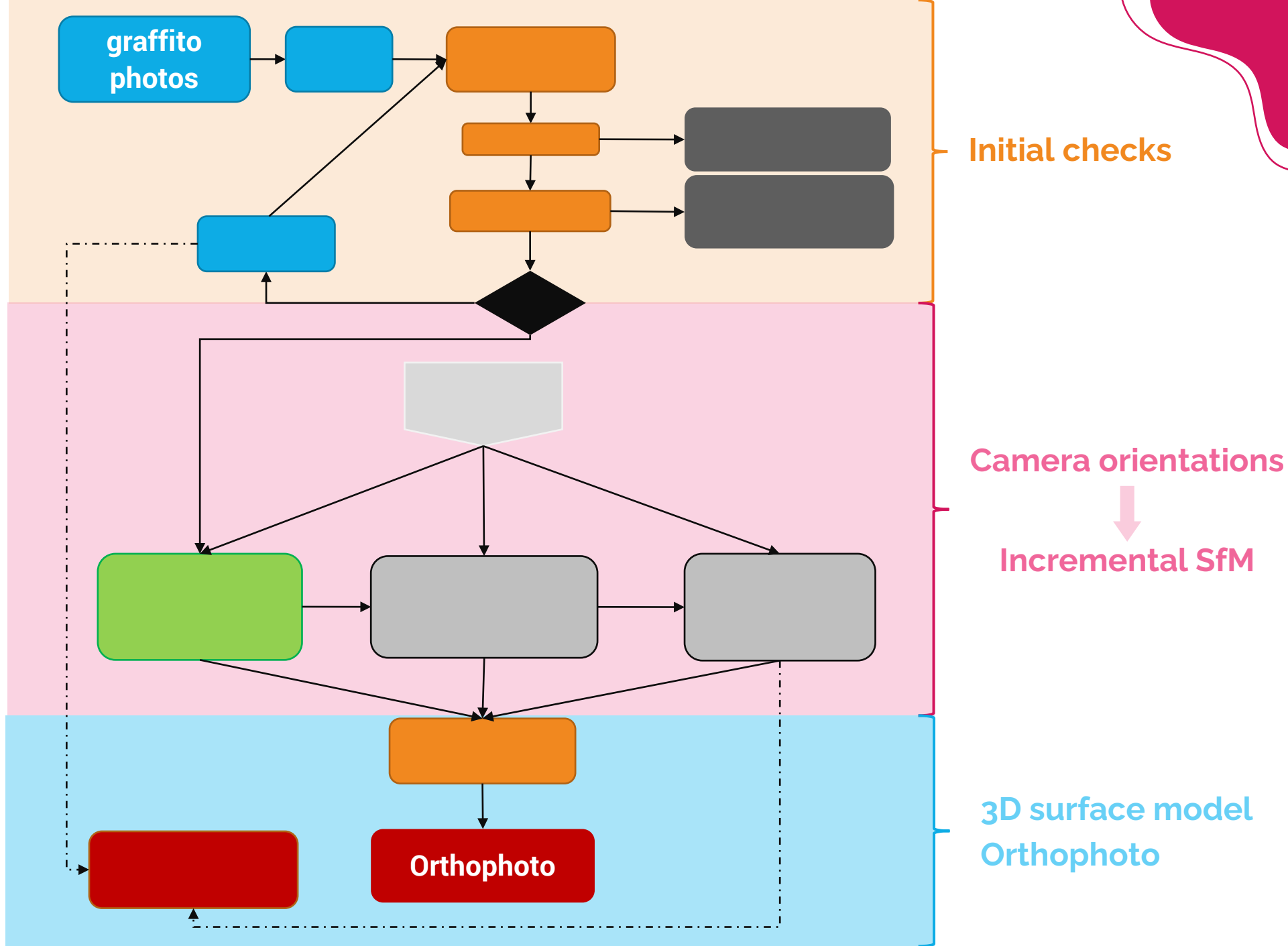
- ### Contributors 2
- bewild96
 - BeyondConventionalBoundaries Geert ...

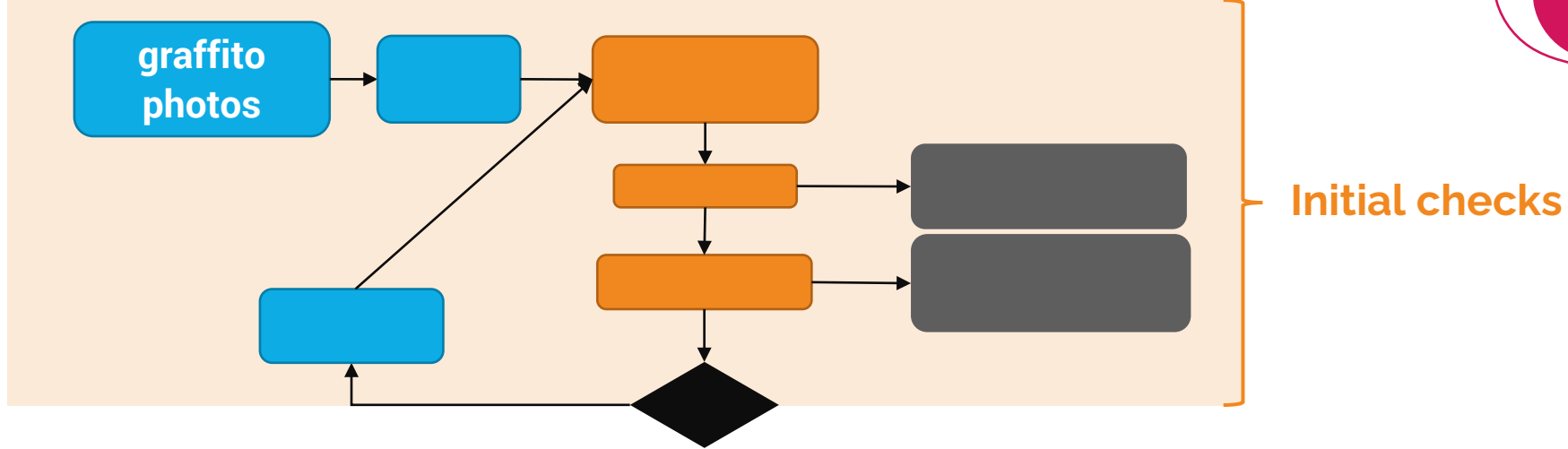


AUTOGRAF

position-accurate pixels







INDIGO_2021-12-28_Z7II-B_0292.jpg



INDIGO_2021-12-28_Z7II-B_0293.jpg



INDIGO_2021-12-28_Z7II-B_0294 - Copy.jpg



INDIGO_2021-12-28_Z7II-B_0294.jpg



INDIGO_2021-12-28_Z7II-B_0295.jpg



INDIGO_2021-12-28_Z7II-B_0296.jpg



INDIGO_2021-12-28_Z7II-B_0296a.jpg



INDIGO_2021-12-28_Z7II-B_0297.jpg

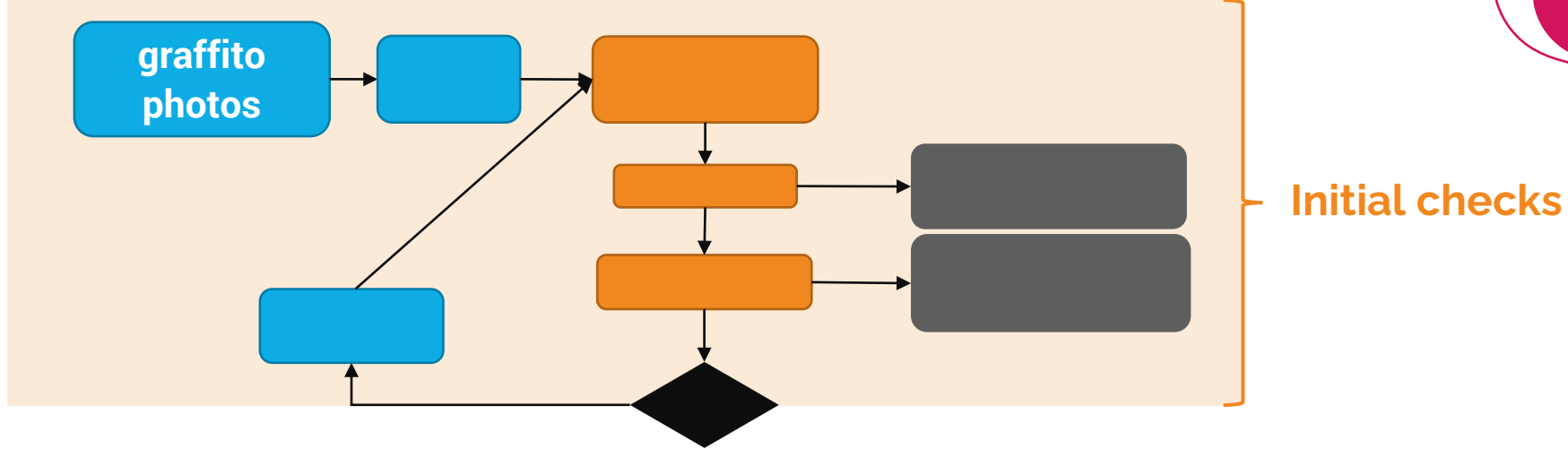


INDIGO_2021-12-28_Z7II-B_0298.jpg



INDIGO_2021-12-28_Z7II-B_0300.jpg





INDIGO_2021-12-28_Z7II-B_0292.jpg



INDIGO_2021-12-28_Z7II-B_0293.jpg



INDIGO_2021-12-28_Z7II-B_0294 - Copy.jpg



INDIGO_2021-12-28_Z7II-B_0294.jpg



INDIGO_2021-12-28_Z7II-B_0295.jpg



INDIGO_2021-12-28_Z7II-B_0296.jpg



INDIGO_2021-12-28_Z7II-B_0296a.jpg



INDIGO_2021-12-28_Z7II-B_0297.jpg

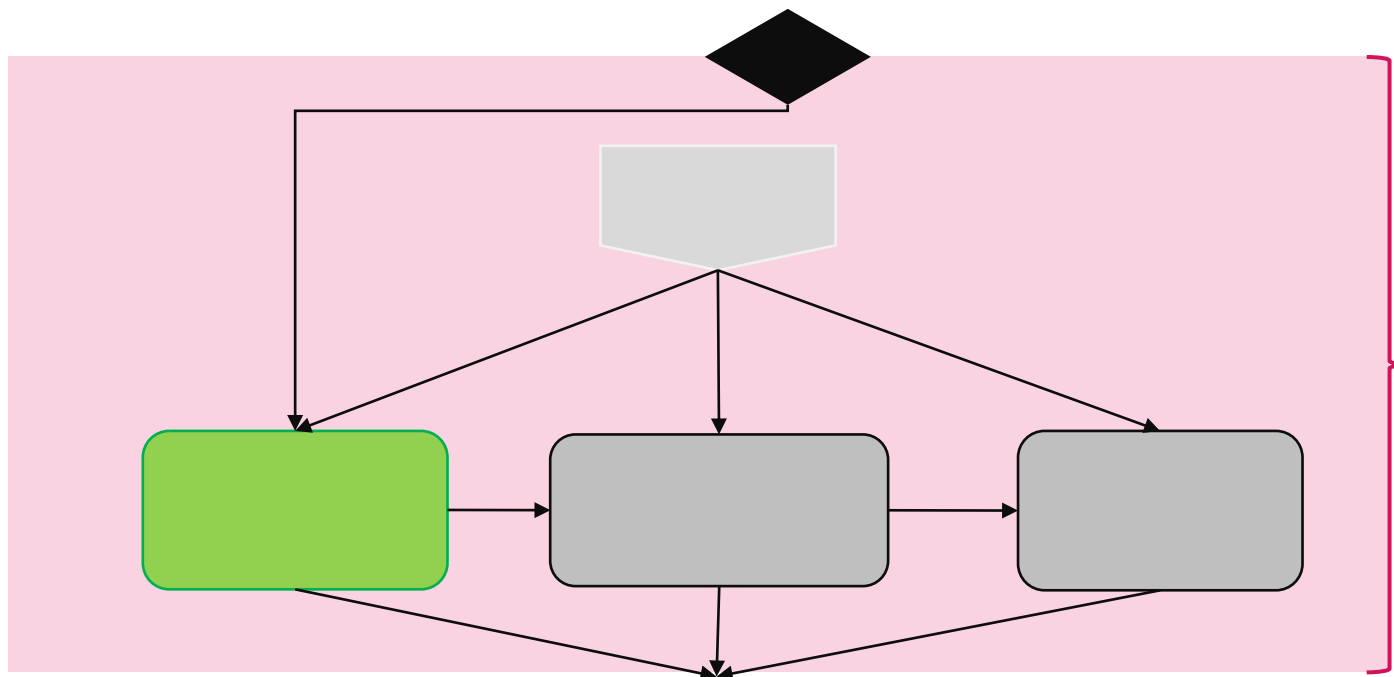


INDIGO_2021-12-28_Z7II-B_0298.jpg



INDIGO_2021-12-28_Z7II-B_0300.jpg

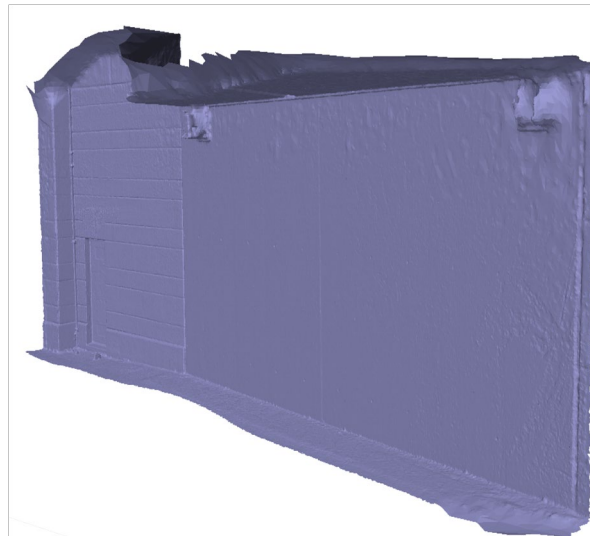




Camera orientations



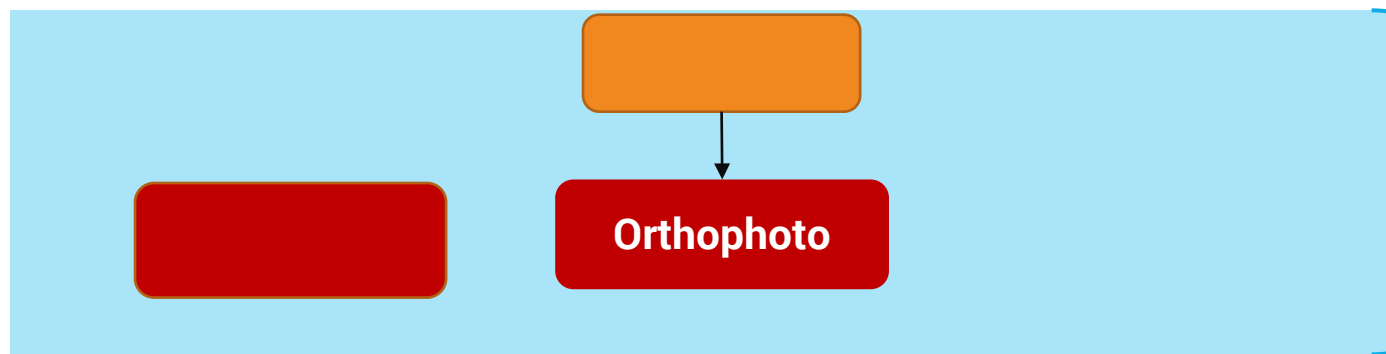
Incremental SfM



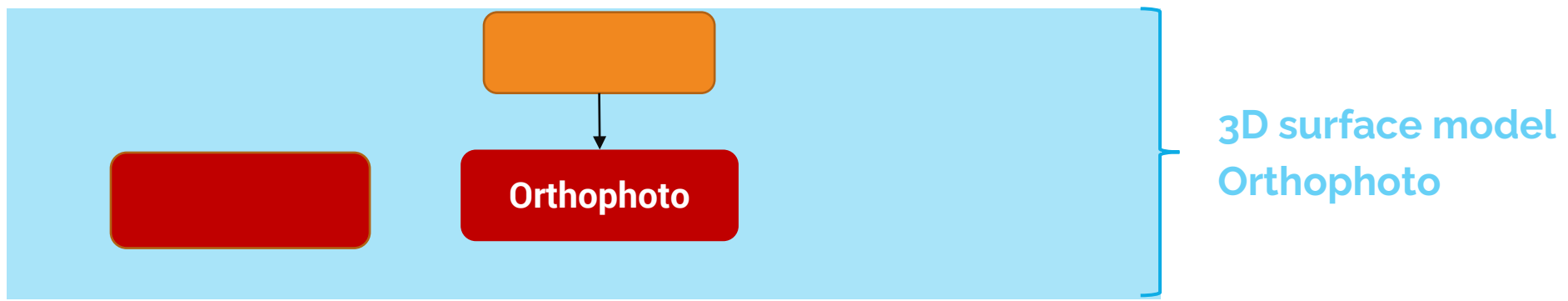
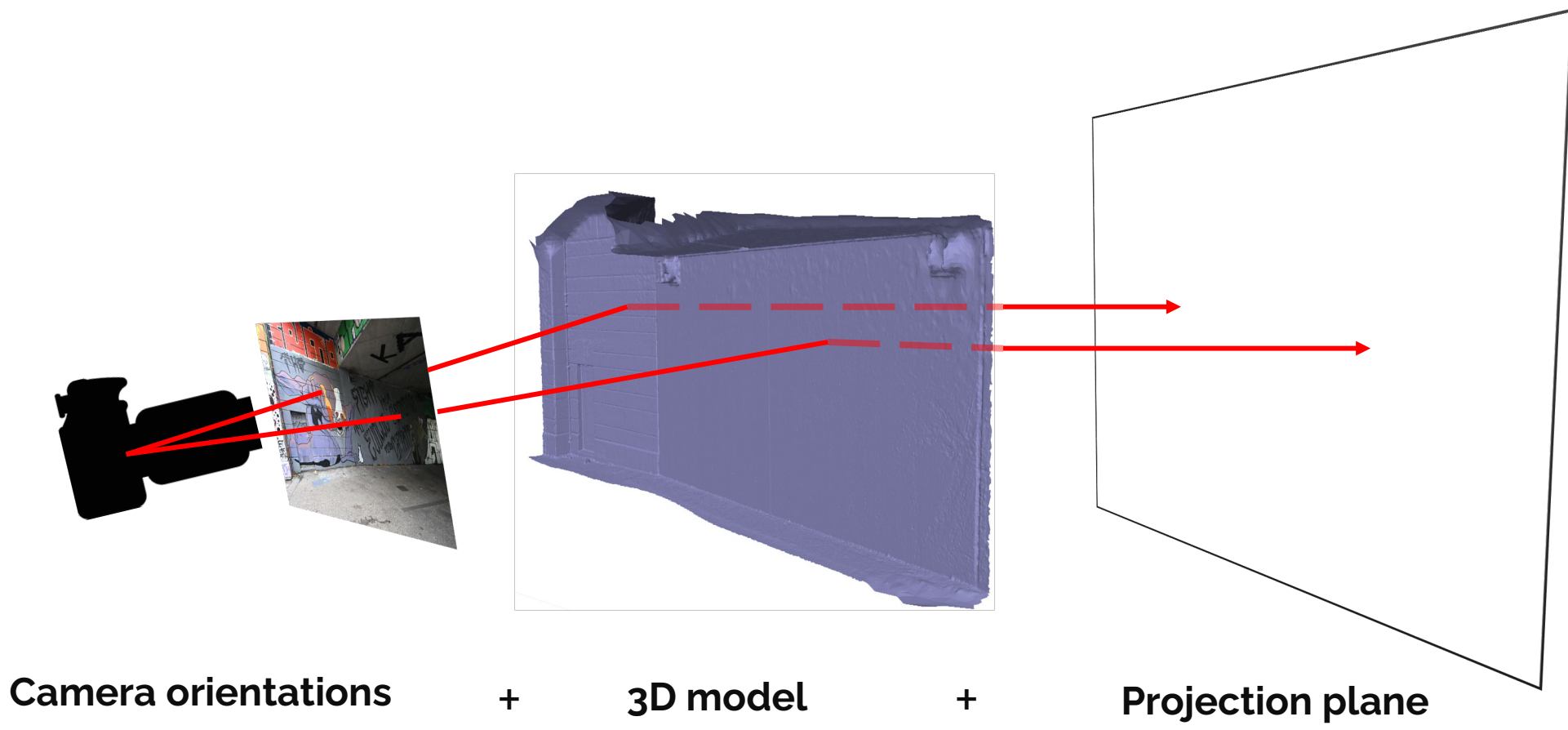
Camera orientations

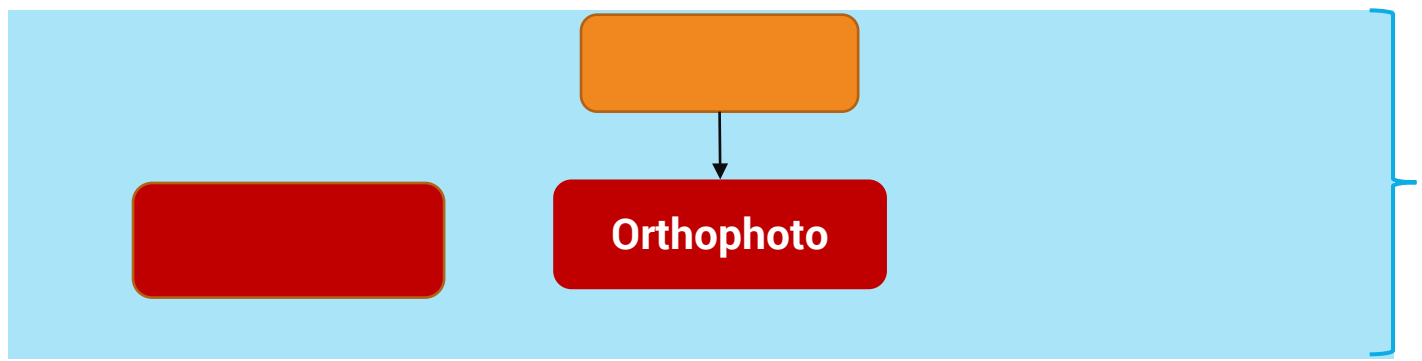
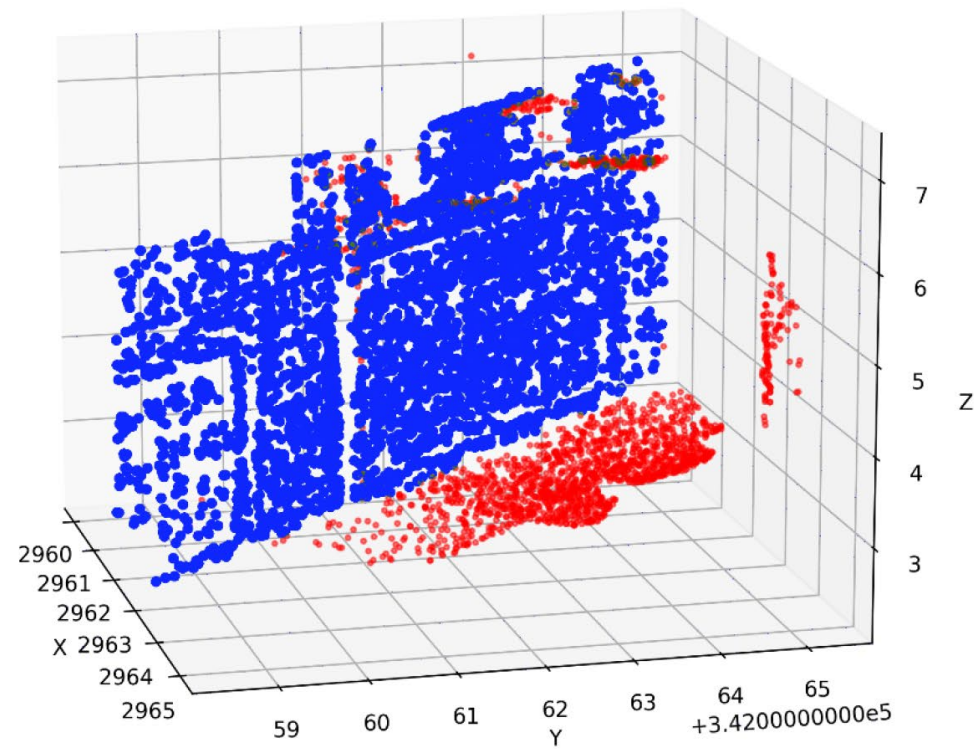
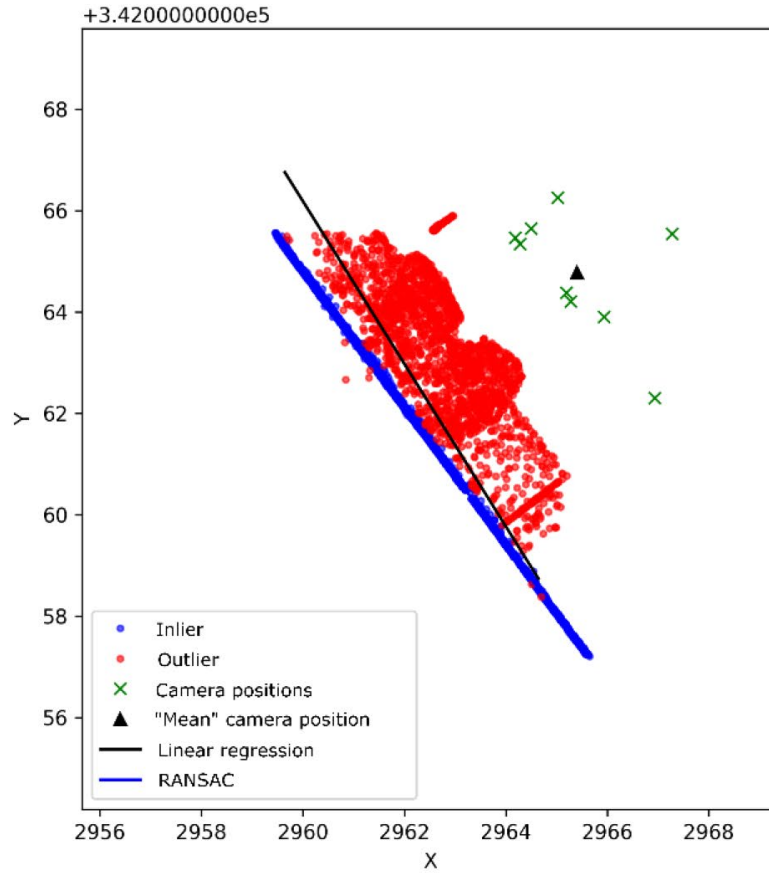
+

3D model

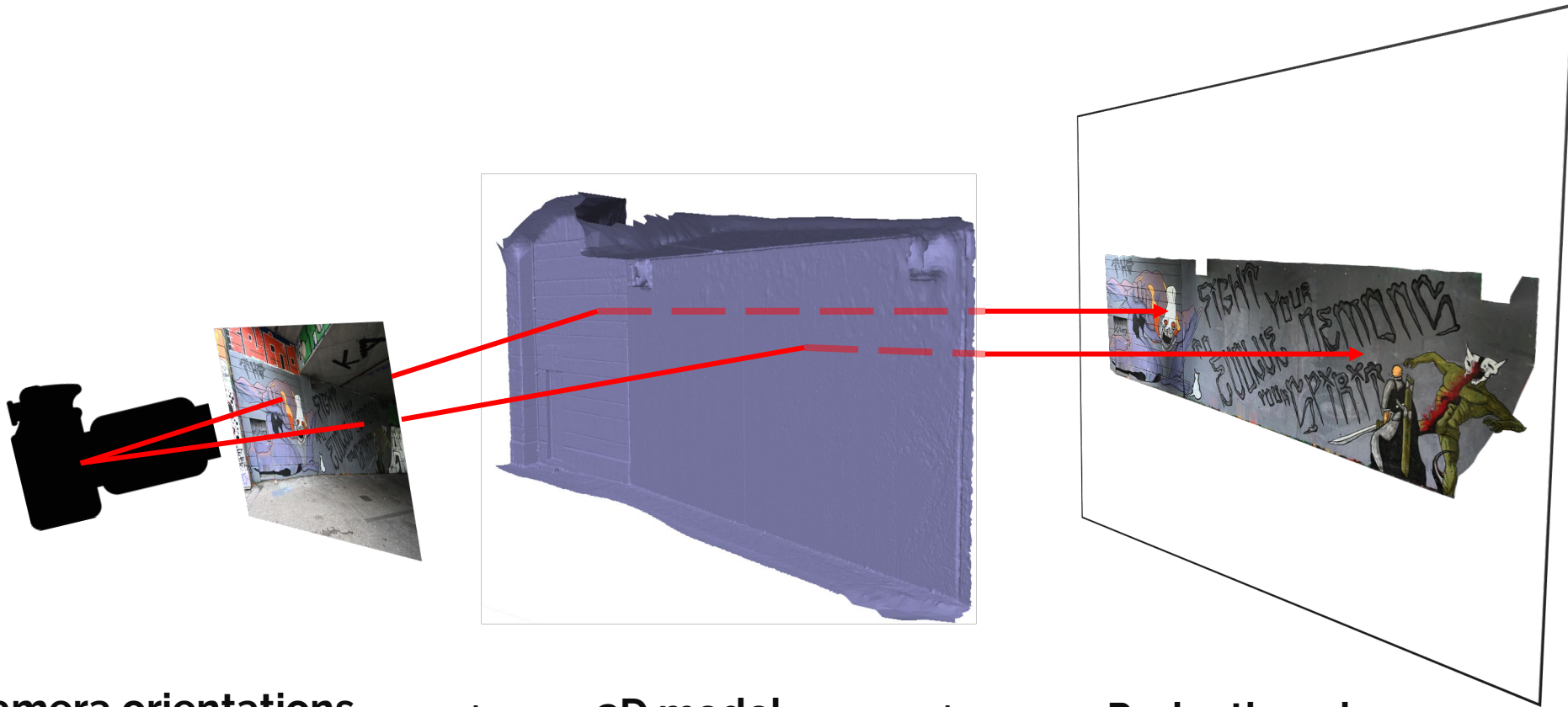


3D surface model
Orthophoto





3D surface model
Orthophoto



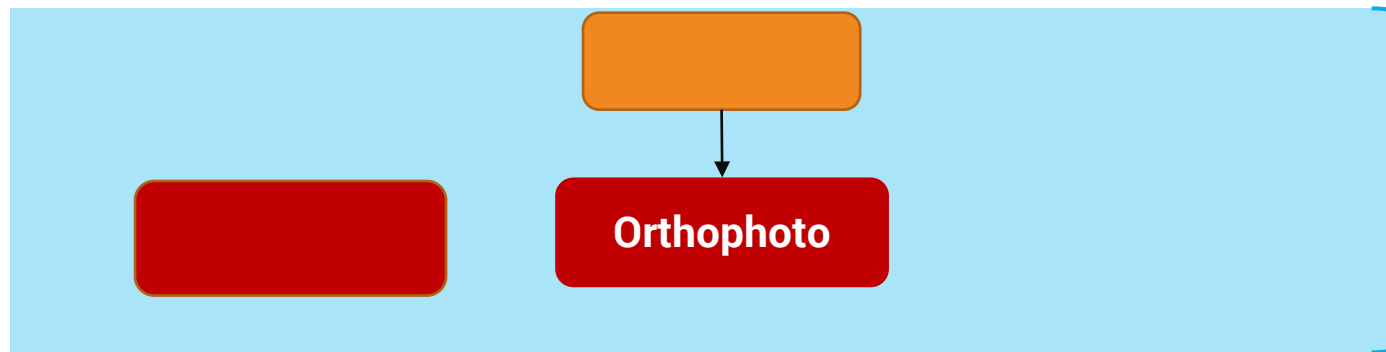
Camera orientations

+

3D model

+

Projection plane



3D surface model
Orthophoto

AUTOGRAF

AUTOGRAF

position-accurate pixels



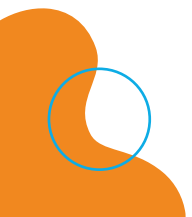
AUTOGRAF

AUTOGRAF

position-accurate pixels



GRAFFITI monitoring



GRAFFITI monitoring

BASEMAP

ESRI ArcGIS Field Maps
areas with overview photos
cloud-based | tablets



GRAFFITI **monitoring**

BASEMAP

ESRI ArcGIS Field Maps
areas with overview photos
cloud-based | tablets



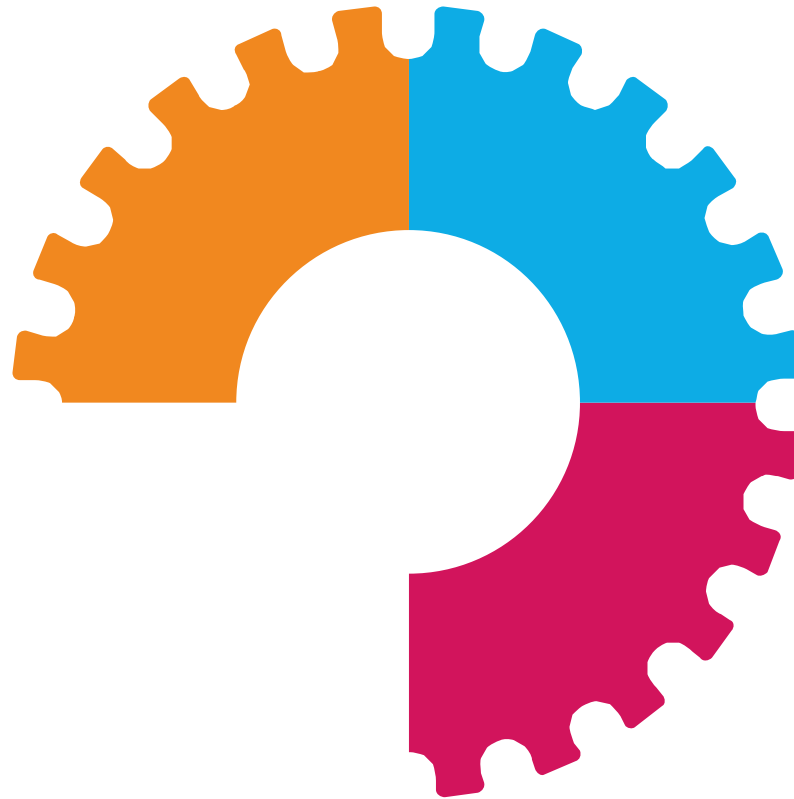
MONITOR

check social media
memory
hashtags + form (unused)

GRAFFITI monitoring

BASEMAP

ESRI ArcGIS Field Maps
areas with overview photos
cloud-based | tablets



MONITOR

check social media
memory
hashtags + form (unused)

ADD TO APP

point: "not photographed"

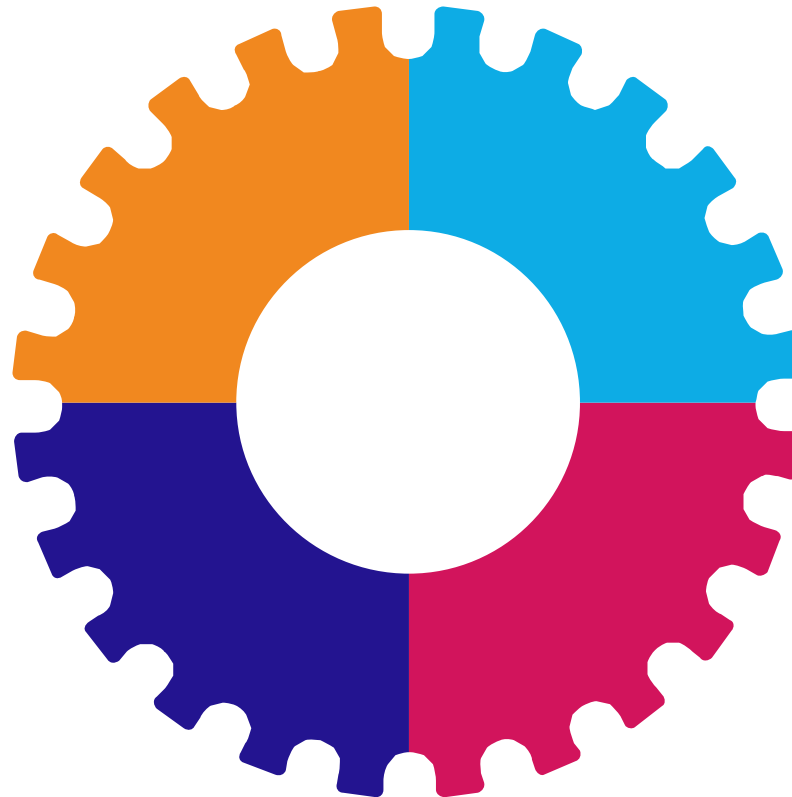
GRAFFITI monitoring

BASEMAP

ESRI ArcGIS Field Maps
areas with overview photos
cloud-based | tablets

DOCUMENT

± 10 photos
spectrometer reading
change status point
new overview photo



MONITOR

check social media
memory
hashtags + form (unused)

ADD TO APP

point: "not photographed"



CHANGE
detection



CHANGE **detection**

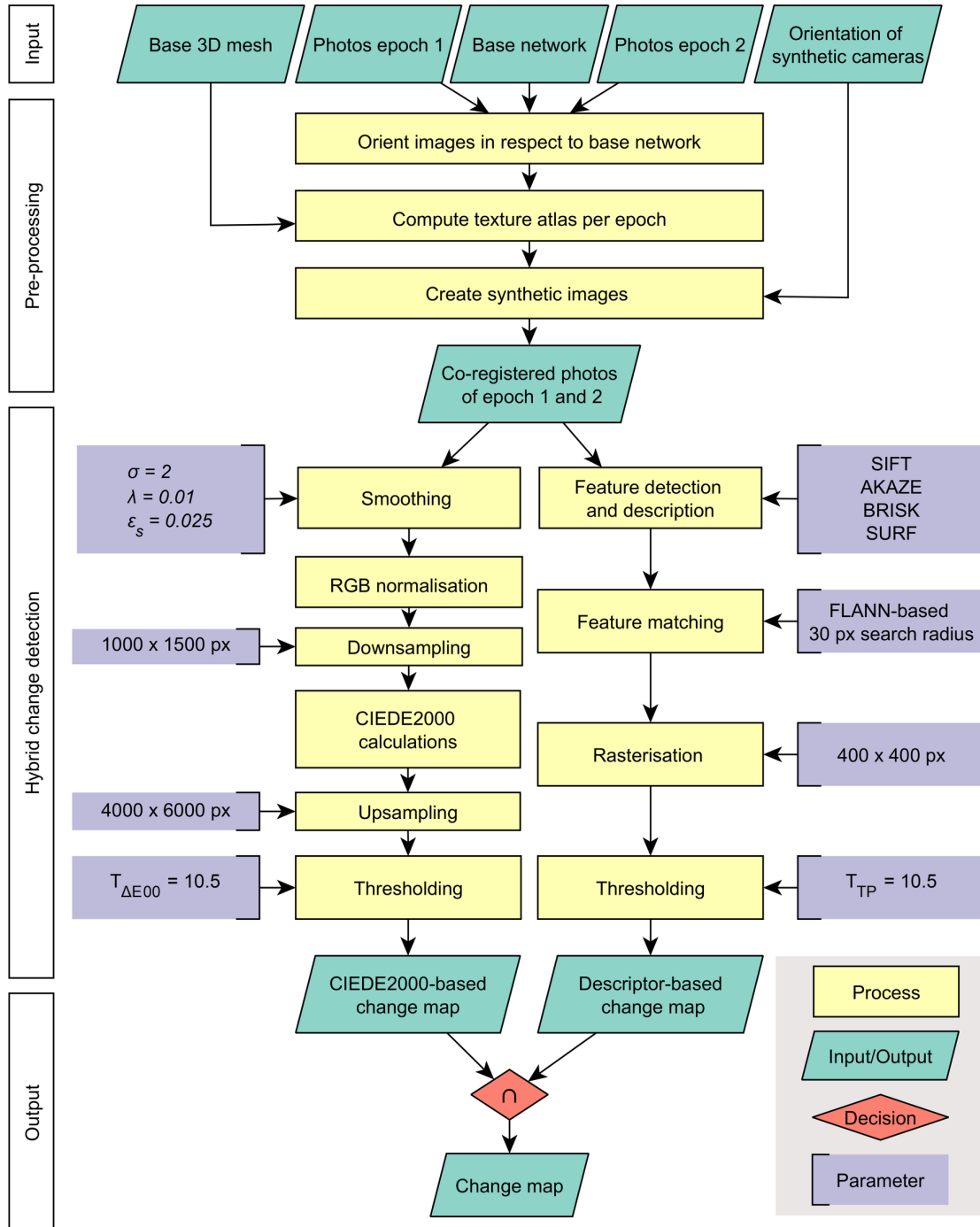


CHANGE
detection



CHANGE detection





CHANGE detection



CHANGE detection



CHANGE detection





CHANGE detection





CHANGE detection





CHANGE detection





CHANGE detection

Published October 11, 2023 | Version 1.0.0

Dataset 


INDIGO Change Detection Reference Dataset

Wild, Benjamin¹ ; Verhoeven, Geert² ; Muszyński, Rafal³ ; Pfeifer, Norbert¹ 

Show affiliations

Citation

Style

Wild, B., Verhoeven, G., Muszyński, R., & Pfeifer, N. (2023). INDIGO Change Detection Reference Dataset (1.0.0) [Data set]. TU Wien. <https://doi.org/10.48436/ajj4e-v4864> 



Description

The INDIGO Change Detection Reference Dataset

Description

This graffiti-centred change detection dataset was developed in the context of **INDIGO**, a research project focusing on the documentation, analysis and dissemination of graffiti along Vienna's Donaukanal. The dataset aims to support the development and assessment of change detection algorithms.

The dataset was collected from a test site approximately 50 meters in length along Vienna's Donaukanal during 11 days between 2022/10/21 and 2022/12/01. Various cameras with different settings were used, resulting in a total of 29 data collection sessions or "epochs" (see "EpochIds.jpg" for details). Each epoch contains 17 images generated from 29 distinct 3D models with different textures. In total, the dataset comprises 6,902 unique image pairs, along with corresponding reference change maps. Additionally, exclusion masks are provided to ignore parts of the scene that might be irrelevant, such as the background.

COLLECTED photos



COLLECTED photos



TOTAL
COVERAGE

2

COLLECTED photos



TOTAL
COVERAGE

2

TC PHOTOS

26.7 k

42.0 k

COLLECTED photos



TOTAL
COVERAGE

2

FOLLOW-UP

106

TC PHOTOS

26.7 k

42.0 k

COLLECTED photos



TOTAL
COVERAGE

2

FOLLOW-UP

106

TC PHOTOS

26.7 k

42.0 k

FU PHOTOS

94.6 k

SOME results

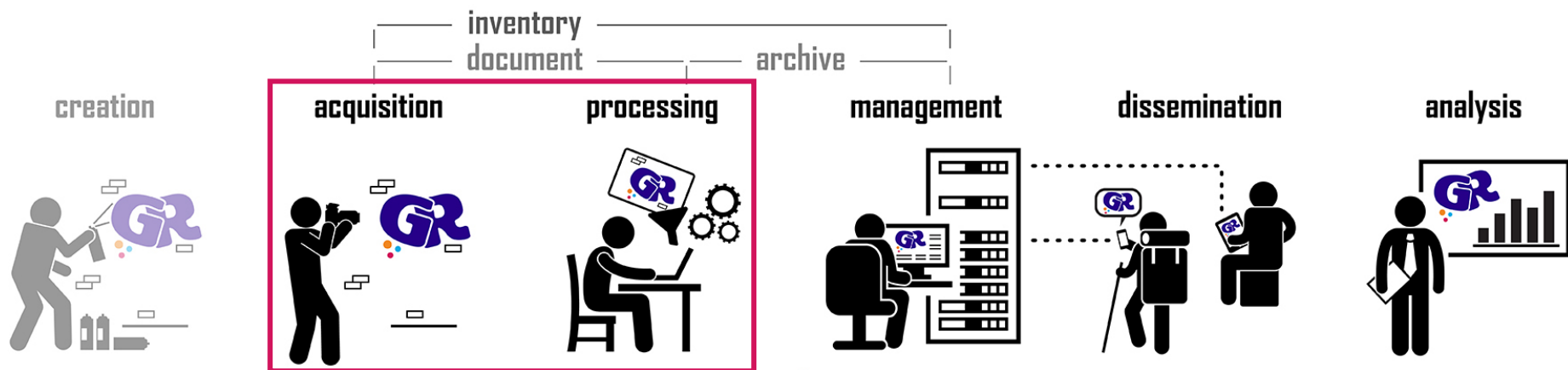
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars



SOME results

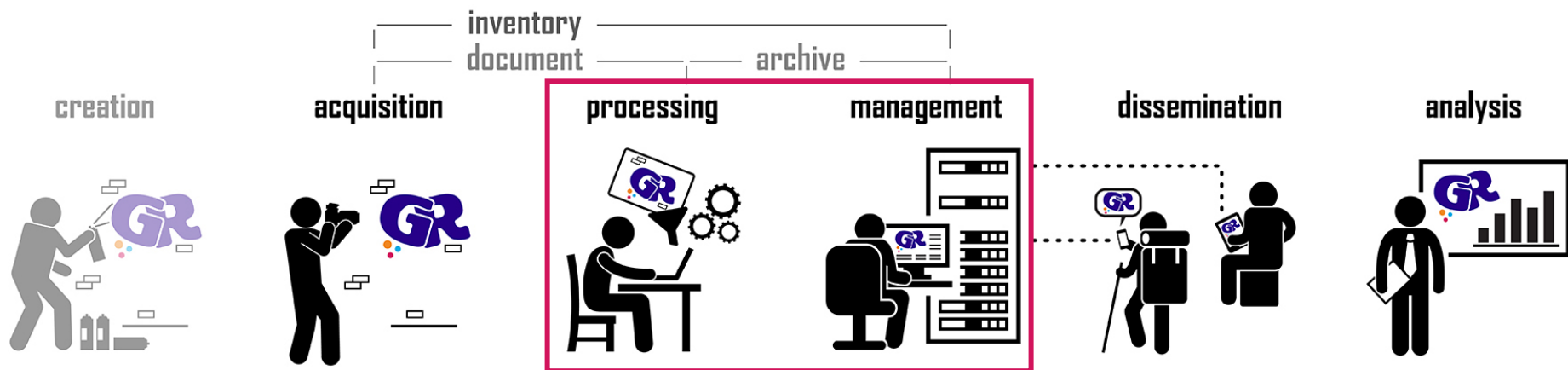
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars



MOMENTS of creation

16 June 2023 @ 10:25 CET

MOMENTS of creation



16 June 2023 @ 10:25 CET

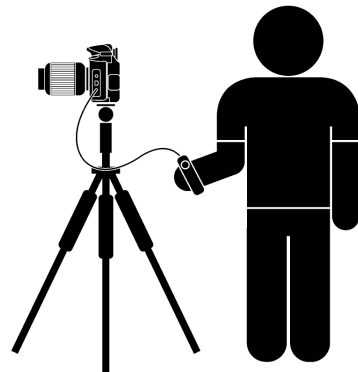
MOMENTS of creation



16 June 2023 @ 10:25 CET



© Sophie Hay



MOMENTS of creation

date + time



© Sophie Hay



16 June 2023 @ 10:25 CET



date + time

MOMENTS of creation

creation event
date + time



© Sophie Hay



16 June 2023 @ 10:25 CET



date + time
creation event

MOMENTS of creation

photo | graffiti
creation event
date + time



16 June 2023 @ 10:25 CET



date + time
creation event
photo | graffiti

MOMENTS of creation

photo | graffiti
creation event
date + time



© Sophie Hay



16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti

MOMENTS of creation

photo | graffiti
creation event
date + time



between AD 41 & AD 79



16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti

MOMENTS of creation

photo | graffiti
creation event
date + time



between AD 41 & AD 79



12 days ± 2 days

16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti

MOMENTS of creation

photo | graffiti
creation event
date + time



between AD 41 & AD 79

1963 years \pm 19 years



12 days \pm 2 days

16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti

MOMENTS of creation

related to temporal fuzziness
photo | graffiti
creation event
date + time



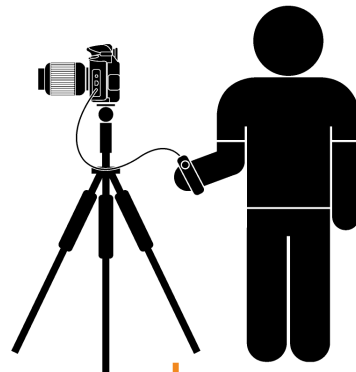
between AD 41 & AD 79

1963 years \pm 19 years



12 days \pm 2 days

16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti
related to temporal fuzziness

MOMENTS of creation

*extended
temporal uncertainty*

*related to temporal fuzziness
photo | graffiti
creation event
date + time*



between AD 41 & AD 79

1963 years \pm 19 years

12 days \pm 2 days



16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
*creation event
photo | graffiti
related to temporal fuzziness*

temporal uncertainty
narrow

MOMENTS of creation

visibility (interrupted)
extended
temporal uncertainty

related to temporal fuzziness
photo | graffiti
creation event
date + time



© Sophie Hay

between AD 41 & AD 79

1963 years ± 19 years

12 days ± 2 days



16 June 2023 @ 10:25 CET



between 02 & 06 June 2023



date + time
creation event
photo | graffiti
related to temporal fuzziness

temporal uncertainty
narrow
visibility

INDIGO METADATA

real graffiti
vs
digital derivatives

MOMENTS of creation

visibility (interrupted)
extended
temporal uncertainty

related to temporal fuzziness
photo | graffiti
creation event
date + time



© Sophie Hay

between AD 41 & AD 79

1963 years ± 19 years

12 days ± 2 days



16 June 2023 @ 10:25 CET



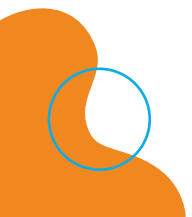
between 02 & 06 June 2023



date + time
creation event
photo | graffiti
related to temporal fuzziness

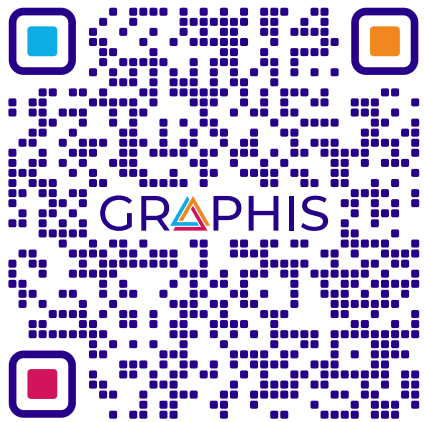
temporal uncertainty
narrow
visibility

CREATING location



CREATING location

GRAPHIS



The screenshot displays the GRAPHIS software interface. At the top, the title bar shows 'MENU' on the left and 'GRAPHIS' on the right. The main workspace features a central image of a graffiti wall with a central figure holding a gun, surrounded by various tags and text like 'INGUTI WE TRUST'. To the left of the image is a sidebar with several sections: 'Database statistics' showing 1 image, 0 circles, 0 rectangles, and 0 polygons; 'Region appearance' with icons for different shapes and colors; 'Region operations' with icons for selection and deletion; and a welcome message for 'GEERT VERHOEVEN'.

On the right side, there is a 'User information' panel with fields for 'Name' (Geert Verhoeven) and 'Identifier' (0000-0003-4825-9604). Below this is a 'Region' creation form with fields for 'Region Identifier', 'Region Name', 'Region Role', 'Identifier', 'Name' (set to 'cropping'), and 'Region Content Type'. At the bottom right, there are tabs for 'Region Creator', 'Description', and 'Transcription', with corresponding input fields.

CREATING location

GRAPHIS

The screenshot displays the GRAPHIS web application interface. The main window shows a photograph of a graffiti-covered wall with a yellow polygonal region highlighting a specific piece of graffiti. The interface includes a left sidebar with navigation and tool options, a central image viewer, and a right sidebar for configuration and user information.

Database statistics

- Nr. of images: 1
- Circles: 0
- Rectangles: 0
- Polygons: 1

Region appearance

- Color: Orange, Green, Blue
- Stroke: Solid, Dashed, Dotted

Region operations

- Tools: Circle, Square, Polygon, Move, Rotate, Delete

User information

- Name: Geert Verhoeven
- Identifier: 0000-0003-4825-9604

Region configuration

- Region Identifier: INDIGO_20230412_G0001
- Region Name: graffiti
- Region Role: Identifier: <https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/mainSubjectArea>, Name: main subject area
- Region Content Type: Identifier: <https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/graffiti>, Name: graffiti

Region Creator

- Identifier: 0000-0003-4825-9604
- Name: Geert Verhoeven
- Role: <https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/imgRegCreator>

Welcome GEERT VERHOEVEN.
Enjoy working with GRAPHIS
New database was created:
PolygonTest.sqlite
Importing images
Start to import 1 images

CREATING location

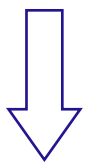
GRAPHIS
2D polygon (pixel coordinates)

The screenshot displays the GRAPHIS web application interface. At the top, the title bar shows 'MENU' on the left and 'GRAPHIS' on the right. The main content area features a central image of a graffiti wall with a yellow polygon overlaid on a central figure. The file name 'INDIGO_2023-04-12_Z7ii-B_0685.jpg' is displayed above the image. Below the image is a thumbnail with a '1' icon. On the left side, there are three toolbars: 'Database statistics' (showing 1 image, 0 circles, 0 rectangles, 1 polygon), 'Region appearance' (with icons for circle, square, and pentagon), and 'Region operations' (with icons for selection, zoom, and delete). A welcome message for 'GEERT VERHOEVEN' is visible in the bottom left. On the right side, there are several panels: 'User information' (Name: Geert Verhoeven, Identifier: 0000-0003-4825-9604), 'Region' (Region Identifier: INDIGO_20230412_G0001, Region Name: graffiti), 'Region Role' (Identifier: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/mainSubjectArea, Name: main subject area), and 'Region Content Type' (Identifier: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/graffiti, Name: graffiti). At the bottom right, there are tabs for 'Region Creator', 'Description', and 'Transcription', with the 'Region Creator' tab active, showing Identifier: 0000-0003-4825-9604, Name: Geert Verhoeven, and Role: https://vocabs.acdh.oeaw.ac.at/graphis-imgreg/imgRegCreator.

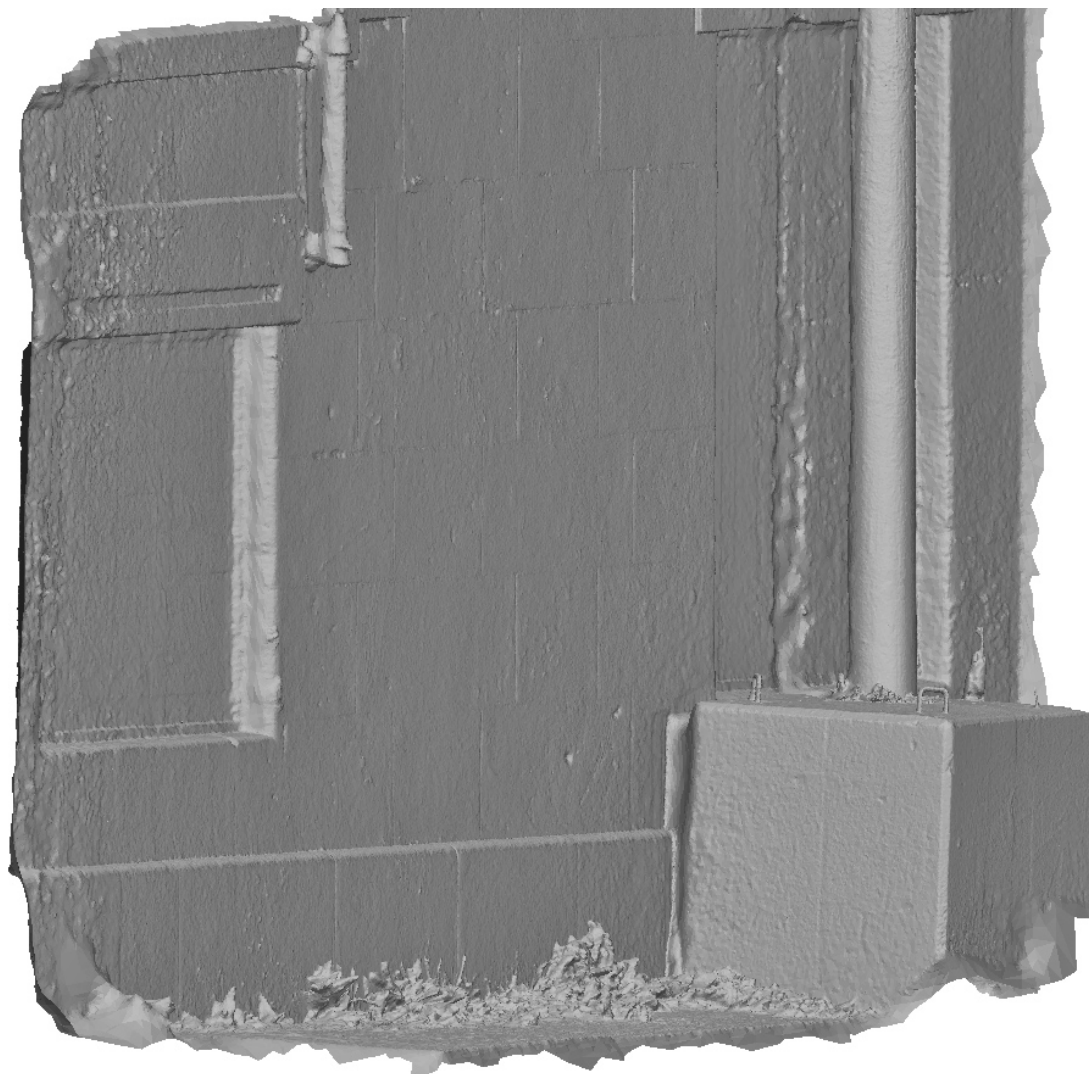
CREATING location

GRAPHIS

2D polygon (pixel coordinates)



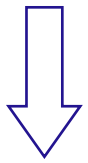
AUTOGRAF



CREATING location

GRAPHIS

2D polygon (pixel coordinates)



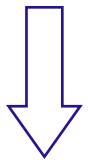
AUTOGRAF



CREATING **location**

GRAPHIS

2D polygon (pixel coordinates)



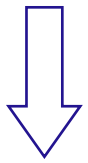
AUTOGRAF



CREATING **location**

GRAPHIS

2D polygon (pixel coordinates)



AUTOGRAF

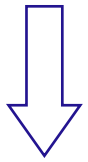
3D polyline (real-world coordinates)



CREATING location

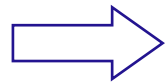
GRAPHIS

2D polygon (pixel coordinates)



AUTOGRAF

3D polyline (real-world coordinates)

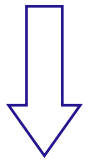


2D polygon (pseudo real-world coordinates)

CREATING location

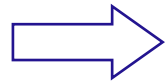
GRAPHIS

2D polygon (pixel coordinates)



AUTOGRAF

3D polyline (real-world coordinates)



2D polygon (pseudo real-world coordinates)

?

STORING location

GRAPHIS

2D polygon (pixel coordinates)

AUTOGRAF

3D polyline (real-world coordinates)

STORING location

XMP metadata

GRAPHIS

2D polygon (pixel coordinates)

AUTOGRAF

3D polyline (real-world coordinates)

STORING location

XMP metadata

GRAPHIS

2D polygon (pixel coordinates)

GeoJSON

AUTOGRAF

3D polyline (real-world coordinates)

STORING location

XMP metadata

GRAPHIS

2D polygon (pixel coordinates)

GeoJSON

AUTOGRAF

3D polyline (real-world coordinates)

```
"type": "FeatureCollection",
"features": [
  {
    "type": "Feature",
    "properties": {
    },
    "geometry": {
      "type": "Polygon",
      "coordinates": [
        [
          [16.369211789142078, 48.220322928177943, 47.592282951099342],
          [16.369218883807932, 48.220332028088414, 49.952191243997014],
          [16.369262616499576, 48.220260963475802, 49.899587087985907],
          [16.369256646544585, 48.220262672660212, 47.281441048933353],
          [16.369211789142078, 48.220322928177943, 47.592282951099342]
        ]
      ]
    }
  }
]
```

STORING **time**

XMP metadata

GRAPHIS

2D polygon (pixel coordinates)

GeoJSON

AUTOGRAF

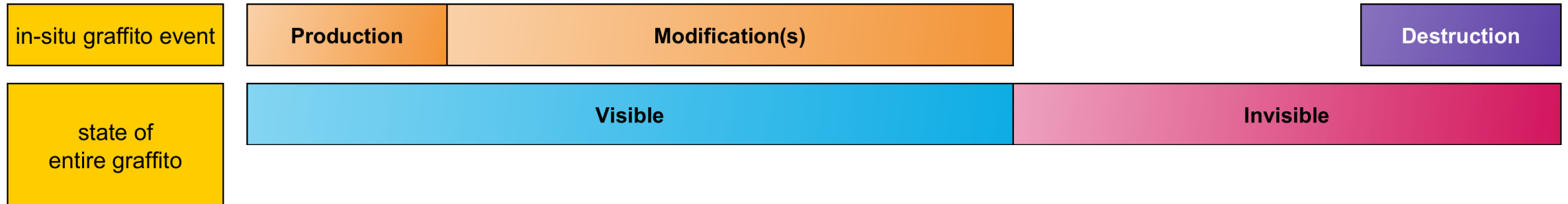
3D polyline (real-world coordinates)

```
"type": "FeatureCollection",
"features": [
  {
    "type": "Feature",
    "properties": {
    },
    "geometry": {
      "type": "Polygon",
      "coordinates": [
        [
          [16.369211789142078, 48.220322928177943, 47.592282951099342],
          [16.369218883807932, 48.220332028088414, 49.952191243997014],
          [16.369262616499576, 48.220260963475802, 49.899587087985907],
          [16.369256646544585, 48.220262672660212, 47.281441048933353],
          [16.369211789142078, 48.220322928177943, 47.592282951099342]
        ]
      ]
    }
  }
]
```

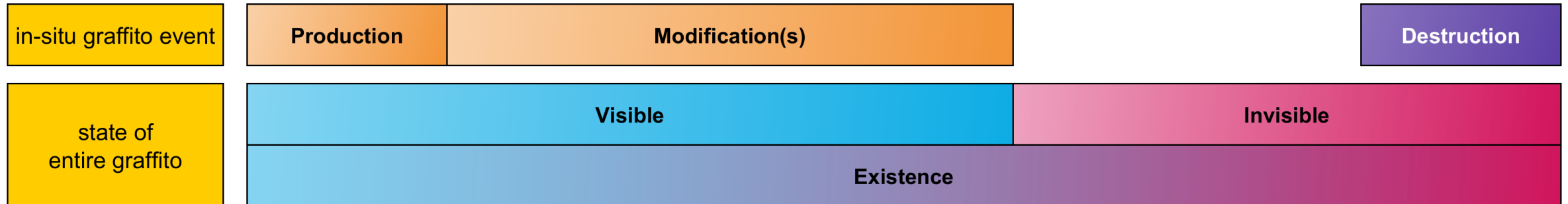
STORING **time**



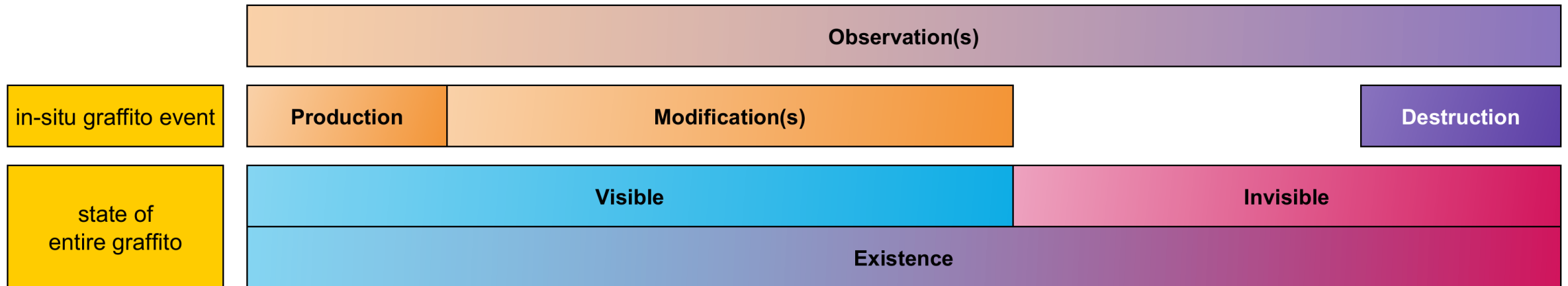
STORING **time**



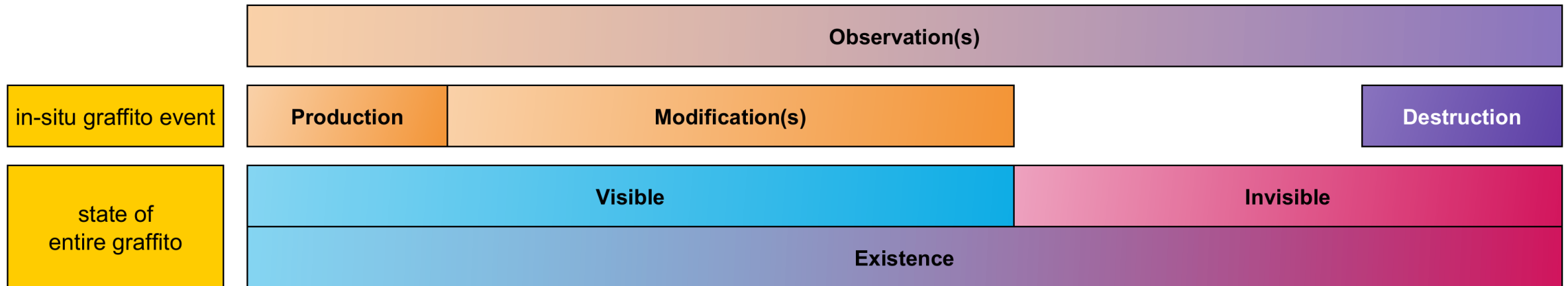
STORING **time**



STORING **time**



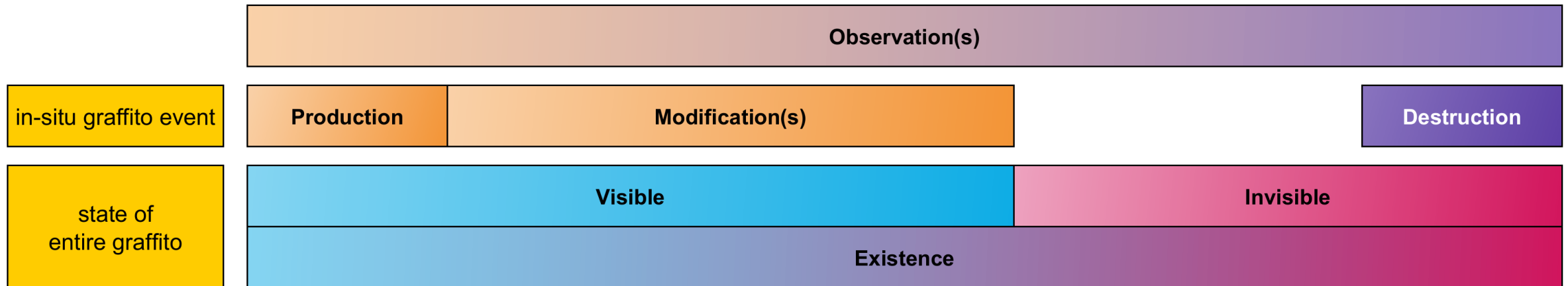
STORING **time**



```
"type": "Feature",
"properties": {
  "polygon_ID": "INDIGO_2023-03-16_Z7ii_0016 + string made by GRAPHIS",
  "polygon_state": "initial or derived",
  "polygon_creation": "manual, semi-automatic or automatic",
  "graffito_ID": "INDIGO_20230316_G0016",
  "observation": { ... },
  "production": { ... },
```

```
"modification": [ ... ],
"destruction": { ... },
"visible": { ... },
"invisible": { ... },
"existence": { ... }
```

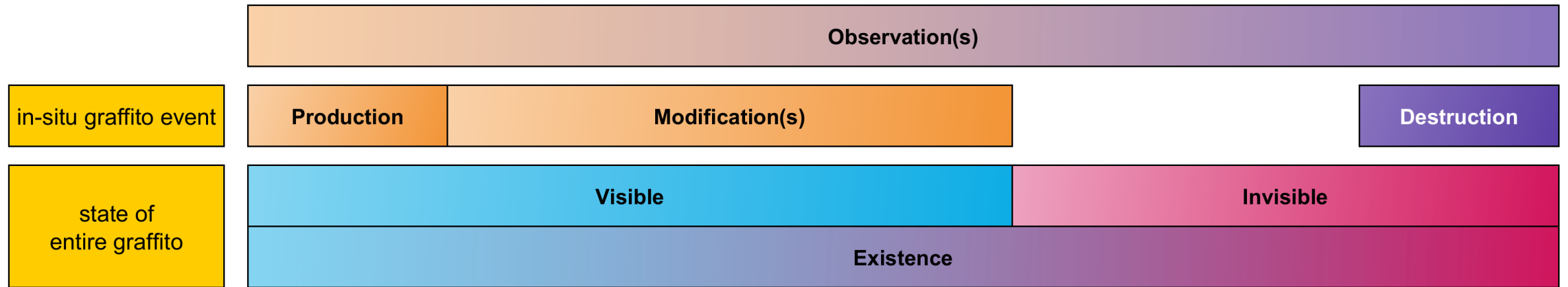
STORING **time**



```
"type": "Feature",
"properties": {
  "polygon_ID": "INDIGO_2023-03-16_Z7ii_0016 + string made by GRAPHIS",
  "polygon_state": "initial or derived",
  "polygon_creation": "manual, semi-automatic or automatic",
  "graffito_ID": "INDIGO_20230316_G0016",
  "observation": { ... },
  "production": { ... },
```

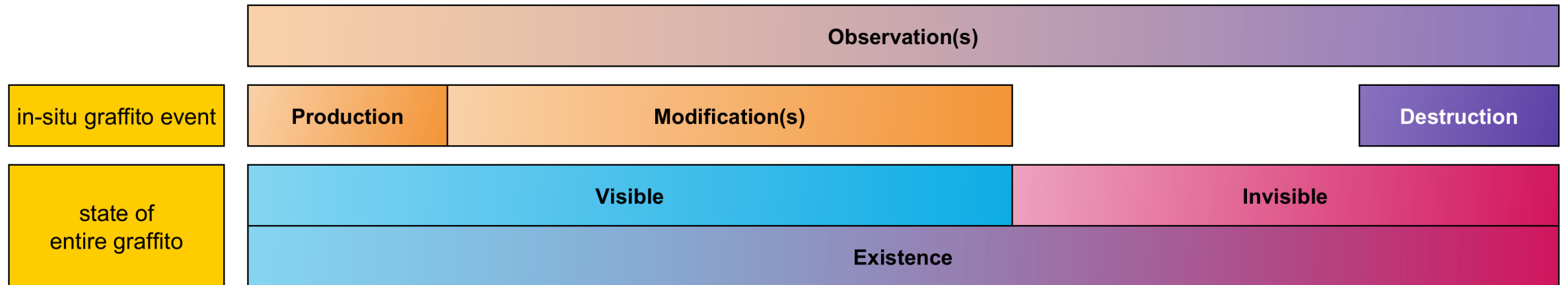
```
"modification": [ ... ],
"destruction": { ... },
"visible": { ... },
"invisible": { ... },
"existence": { ... }
```

STORING **time**



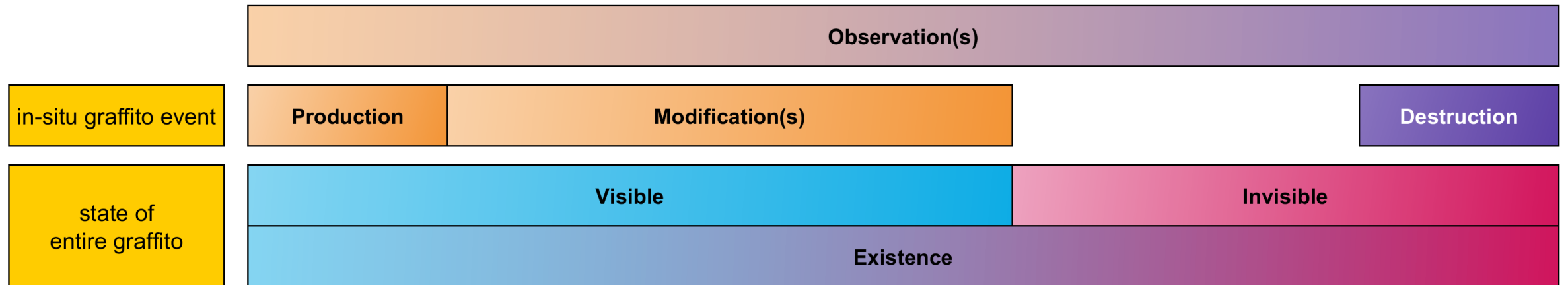
```
"visible": {  
  "start": {  
    "end": {  
      "span": {
```

STORING **time**



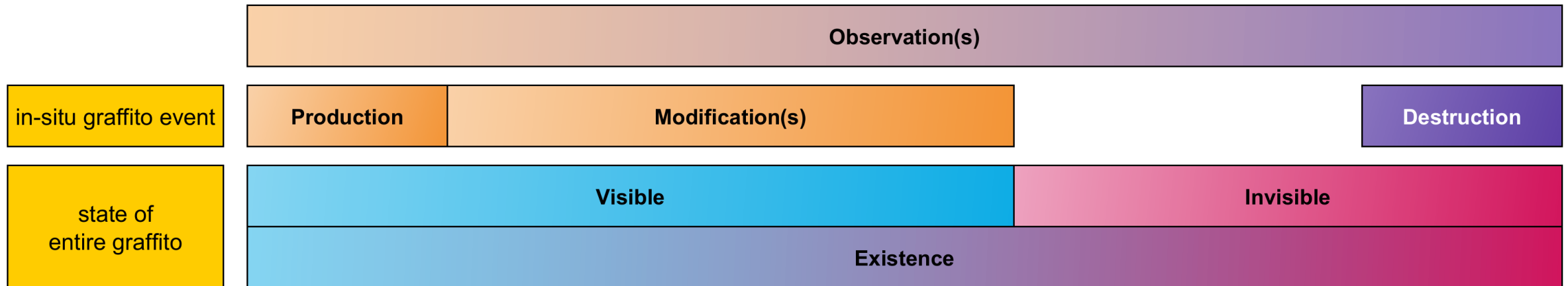
```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "span": {
```

STORING **time**



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {
```

STORING **time**



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING **time**



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```


STORING **time**



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest":  
    "earliest_source":  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest": "2022-09-05T10:20",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest":  
    "earliest_source":  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest": "2022-09-05T10:20",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest": "2022-09-14T09:45",  
    "earliest_source": "photoTour",  
    "latest":  
    "latest_source":  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest": "2022-09-05T10:20",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest": "2022-09-14T09:45",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-21T17:05",  
    "latest_source": "photoTour"  
  },  
  "span": {  
    "minimum":  
    "maximum":  
  }  
}
```


STORING time



```
"visible": {  
  "start": {  
    "earliest": "2022-09-05T10:20",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest": "2022-09-14T09:45",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-21T17:05",  
    "latest_source": "photoTour"  
  },  
  "span": {  
    "minimum": "PT45H9M",  
    "maximum":  
  }  
}
```

STORING time



```
"visible": {  
  "start": {  
    "earliest": "2022-09-05T10:20",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-12T12:36",  
    "latest_source": "photoTour"  
  },  
  "end": {  
    "earliest": "2022-09-14T09:45",  
    "earliest_source": "photoTour",  
    "latest": "2022-09-21T17:05",  
    "latest_source": "photoTour"  
  },  
  "span": {  
    "minimum": "PT45H9M",  
    "maximum": "PT390H45M"  
  }  
}
```

SOME results

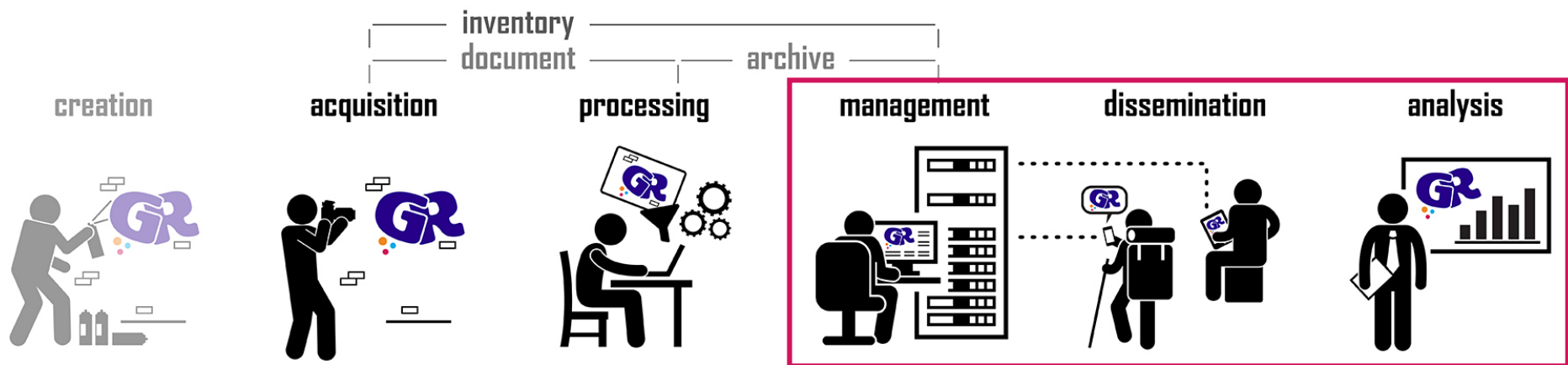
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI ***TERMINOLOGY***

GRAFFITI *CHARACTERISATION*

5
research
pillars



UNIFORM terminology

TERMINOLOGY & HIERARCHY



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?

Graffiti

|__ Street Art



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?

Graffiti

|__ Street Art

Street Art

|__ Graffiti



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?

Graffiti

|__ Street Art

Street Art

|__ Graffiti

Graffiti | Street Art



UNIFORM terminology

TERMINOLOGY & HIERARCHY

Graffiti ? Street Art ?

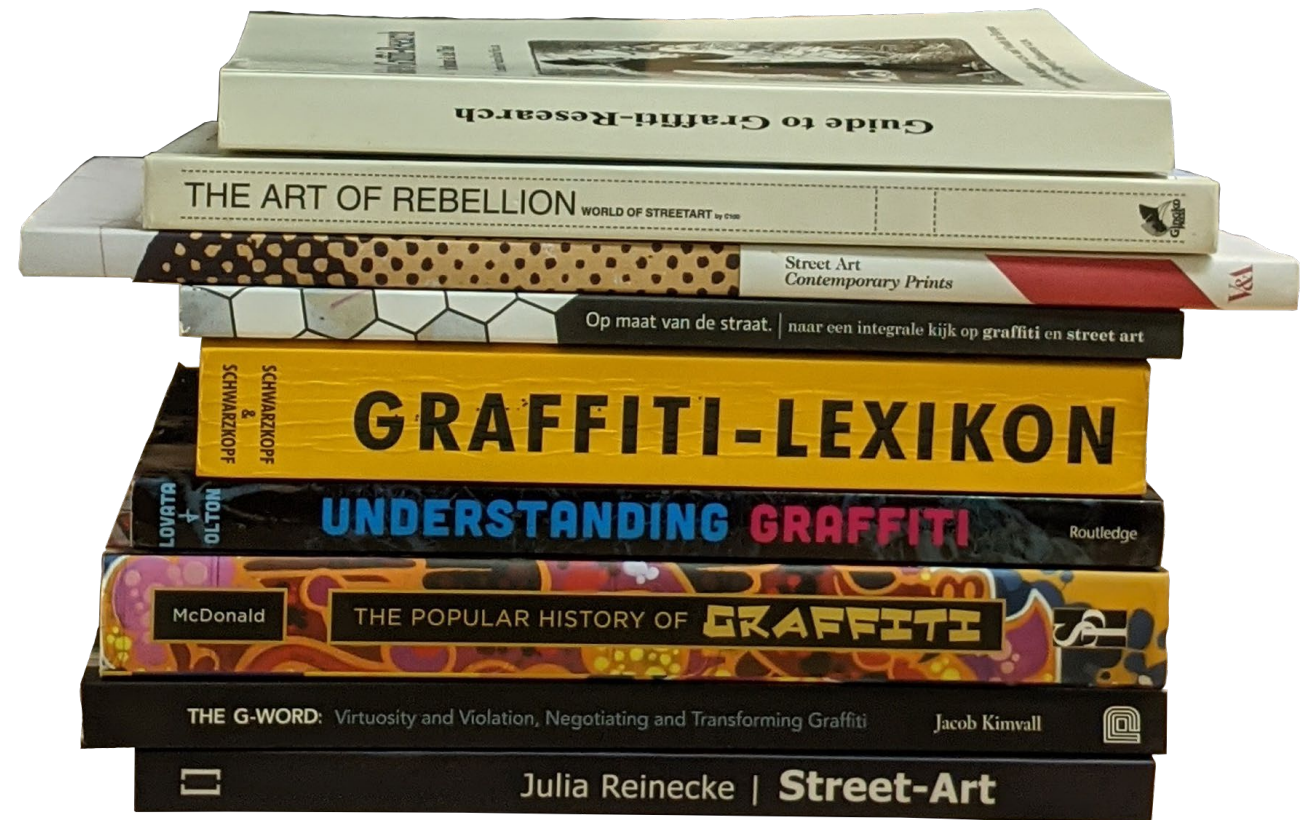
Graffiti

|__ Street Art

Street Art

|__ Graffiti

Graffiti | Street Art



GRAFFITI thesaurus

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus

Content language English Search

Alphabetical Hierarchy Groups

- Activities <facet>
 - Physical and Mental Activities <hierarchy name>
 - Processes and Techniques <hierarchy name>
- Agents <facet>
 - People <hierarchy name>
- Associated Concepts <facet>
 - Associated Concepts <hierarchy name>
- Objects <facet>
 - Built Environment <hierarchy name>
 - Components <hierarchy name>
 - components (objects parts)
 - components by specific context <guide term>
 - Visual and Verbal Communication <hierarchy name>
- Physical Attributes <facet>
 - Design Elements <hierarchy name>
 - design elements (attributes)
 - motifs
 - @ signs (motif)**
 - anarchy symbols
 - arrows (motif)
 - bubbles (motif)
 - clouds (motif)
 - cracks (motif)
 - crowns (motif)
 - drips (motif)
 - gender signs (motif)
 - glories
 - hearts (motif)
 - natural element motifs
 - smilies (graffiti)
 - swirls (motif)

- Styles and Periods <facet>

Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

PREFERRED TERM **@ signs (motif)**

BROADER CONCEPT motifs

ENTRY TERMS @
at
at-sign
at-signs
@ sign
@-sign
@-signs

BELONGS TO GROUP sign and element

CREATOR Jona Schlegel
Stefan Wogrin

EDITORIAL NOTE The "@ sign (motif)" in graffiti can serve multiple purposes. It can appear as an individual symbol, a decorative element, or most commonly, in conjunction with a social media handle. This motif is a reflection of the digital age and the increasing interplay between online and offline forms of expression. It signifies the graffitiist's presence not only in the physical world but also in the digital sphere, serving as a bridge between their graffiti work and their online identity. As with all motifs in graffiti, it should be understood within its specific cultural and aesthetic context.

URI <https://vocabs.acdh.oeaw.ac.at/indigo/atSignsMotif>

DOWNLOAD THIS CONCEPT: [RDF/XML](#) [TURTLE](#) [JSON-LD](#) Created 5/17/23, last modified 8/3/23

GRAFFITI thesaurus

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus

Content language English Search

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 - crowns (motif)
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 - gender signs (motif)
 - glories
 - hearts (motif)
 - natural element motifs
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- Styles and Periods <facet>

Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

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Hierarchy

GRAFFITI thesaurus

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus

Content language English Search

Alphabetical Hierarchy Groups

- Activities <facet>
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 - Associated Concepts <hierarchy name>
- Objects <facet>
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 - components by specific context <guide term>
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 - anarchy symbols
 - arrows (motif)
 - bubbles (motif)
 - clouds (motif)
 - cracks (motif)
 - crowns (motif)
 - drips (motif)
 - gender signs (motif)
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Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

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URI <https://vocabs.acdh.oeaw.ac.at/indigo/atSignsMotif>

DOWNLOAD THIS CONCEPT: [RDF/XML](#) [TURTLE](#) [JSON-LD](#) Created 5/17/23, last modified 8/3/23

Hierarchy

Synonyms & preferred terms

GRAFFITI thesaurus

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus

Content language English Search

Alphabetical Hierarchy Groups

- Activities <facet>
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 - Processes and Techniques <hierarchy name>
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 - People <hierarchy name>
- Associated Concepts <facet>
 - Associated Concepts <hierarchy name>
- Objects <facet>
 - Built Environment <hierarchy name>
 - Components <hierarchy name>
 - components (objects parts)
 - components by specific context <guide term>
 - Visual and Verbal Communication <hierarchy name>
- Physical Attributes <facet>
 - Design Elements <hierarchy name>
 - design elements (attributes)
 - motifs
 - @ signs (motif)**
 - anarchy symbols
 - arrows (motif)
 - bubbles (motif)
 - clouds (motif)
 - cracks (motif)
 - crowns (motif)
 - drips (motif)
 - gender signs (motif)
 - glories
 - hearts (motif)
 - natural element motifs
 - smilies (graffiti)
 - swirls (motif)

- Styles and Periods <facet>

Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

PREFERRED TERM **@ signs (motif)**

BROADER CONCEPT motifs

ENTRY TERMS @
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DOWNLOAD THIS CONCEPT: [RDF/XML](#) [TURTLE](#) [JSON-LD](#) Created 5/17/23, last modified 8/3/23

Hierarchy

Synonyms & preferred terms

URI

GRAFFITI thesaurus

The screenshot shows the INDIGO Graffiti Thesaurus interface. At the top, there is a navigation bar with 'Vocabs', 'Vocabularies', 'About', 'Editor', and 'API'. A search bar is located at the top right, with 'Content language' set to 'English'. The main content area is divided into three tabs: 'Alphabetical', 'Hierarchy', and 'Groups'. The 'Hierarchy' tab is selected, showing a tree view of the thesaurus structure. The tree view includes categories like 'Activities', 'Agents', 'Objects', 'Physical Attributes', and 'Design Elements'. Under 'Design Elements', there is a sub-entry for '@ signs (motif)'. The main content area displays the details for this entry, including its preferred term, broader concept, entry terms, belongs to group, creator, editorial note, and URI. The entry terms list various forms of the '@ sign motif, such as '@', 'at', 'at-sign', 'at-signs', '@ sign', '@-sign', and '@-signs'. The editorial note explains the purpose and usage of the '@ sign motif in graffiti. The URI is provided as 'https://vocabs.acdh.oeaw.ac.at/indigo/atSignsMotif'. At the bottom, there are options to download the entry in RDF/XML, Turtle, or JSON-LD format, and a note about the creation and last modification dates.

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus Content language English Search

Alphabetical Hierarchy Groups

Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

PREFERRED TERM @ signs (motif)

BROADER CONCEPT motifs

ENTRY TERMS @
at
at-sign
at-signs
@ sign
@-sign
@-signs

BELONGS TO GROUP sign and element

CREATOR Jona Schlegel
Stefan Wogrin

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URI https://vocabs.acdh.oeaw.ac.at/indigo/atSignsMotif

DOWNLOAD THIS CONCEPT: RDF/XML TURTLE JSON-LD Created 5/17/23, last modified 8/3/23

Activities <facet>
Physical and Mental Activities <hierarchy name>
Processes and Techniques <hierarchy name>
Agents <facet>
People <hierarchy name>
Associated Concepts <facet>
Associated Concepts <hierarchy name>
Objects <facet>
Built Environment <hierarchy name>
Components <hierarchy name>
components (objects parts)
components by specific context <guide term>
Visual and Verbal Communication <hierarchy name>
Physical Attributes <facet>
Design Elements <hierarchy name>
design elements (attributes)
motifs
@ signs (motif)
anarchy symbols
arrows (motif)
bubbles (motif)
clouds (motif)
cracks (motif)
crowns (motif)
drips (motif)
gender signs (motif)
glories
hearts (motif)
natural element motifs
smilies (graffiti)
swirls (motif)
Styles and Periods <facet>

Hierarchy

Synonyms & preferred terms

URI

Semantic Web

GRAFFITI thesaurus

Vocabs Vocabularies About Editor API Help | Interface language: English

INDIGO Graffiti Thesaurus

Content language English Search

Alphabetical Hierarchy Groups

- Activities <facet>
 - Physical and Mental Activities <hierarchy name>
 - Processes and Techniques <hierarchy name>
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 - People <hierarchy name>
- Associated Concepts <facet>
 - Associated Concepts <hierarchy name>
- Objects <facet>
 - Built Environment <hierarchy name>
 - Components <hierarchy name>
 - components (objects parts)
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 - Visual and Verbal Communication <hierarchy name>
- Physical Attributes <facet>
 - Design Elements <hierarchy name>
 - design elements (attributes)
 - motifs
 - @ signs (motif)**
 - anarchy symbols
 - arrows (motif)
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 - crowns (motif)
 - drips (motif)
 - gender signs (motif)
 - glories
 - hearts (motif)
 - natural element motifs
 - smilies (graffiti)
 - swirls (motif)

- Styles and Periods <facet>

Physical Attributes <facet> > Design Elements <hierarchy name> > design elements (attributes) > motifs > @ signs (motif)

PREFERRED TERM **@ signs (motif)**

BROADER CONCEPT motifs

ENTRY TERMS @
at
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@-signs

BELONGS TO GROUP sign and element

CREATOR Jona Schlegel
Stefan Wogrin

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URI <https://vocabs.acdh.oeaw.ac.at/indigo/atSignsMotif>

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Hierarchy

Synonyms & preferred terms

URI

Semantic Web

Structure → Getty Art & Architecture Thesaurus

SOME results

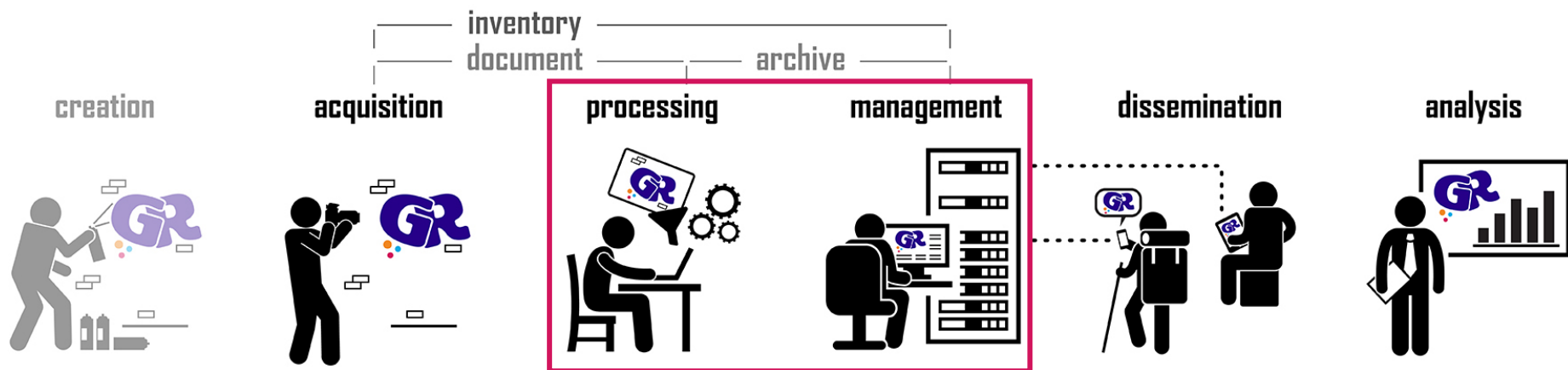
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI ***CHARACTERISATION***

5
research
pillars



COOLPI

COOLPI
colour-accurate pixels



amolada Add files via upload ● ebbf6c3 on Oct 20, 2022 ⌚ 155 commits		
dist	Add files via upload	9 months ago
docs	Add files via upload	9 months ago
graffiti_image_processing	Add files via upload	9 months ago
notebooks	Add files via upload	10 months ago
src	Add files via upload	9 months ago
tests/coolpi-gui-test	Add files via upload	10 months ago
wpp_data	Add files via upload	10 months ago
LICENSE	Initial commit	last year
LICENSE.txt	Add files via upload	9 months ago
MANIFEST.in	Add files via upload	9 months ago
README.md	Add files via upload	9 months ago
pyproject.toml	Add files via upload	9 months ago

☰ README.md

COOLPI

Description

Colour Operations Library for Processing Images (COOLPI) is an open-source toolbox programmed in Python for the treatment of colorimetric and spectral data. It includes classes, methods and functions developed and tested following the colorimetric standards published by the Commission Internationale de l'Éclairage (CIE, 2018).

The COOLPI package has been developed as part of the INDIGO project (IN-ventory and DI-sseminate Graffiti along the d-O-naukanal) carried out by the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology in close collaboration with the GEO Department of TU Wien University.

The achievement of colour-accurate digital images is one of the primary research topics within the INDIGO project. Therefore, the COOLPI package also includes specific procedures for digital image processing and colour correction, particularly from images in RAW format.

About

Colour Operations Library for Processing Images

Readme

GPL-3.0, GPL-3.0 licenses found

4 stars

0 watching

1 fork

Report repository

Releases

No releases published

Packages

No packages published

Contributors 2

amolada Adolfo Molada Tebar

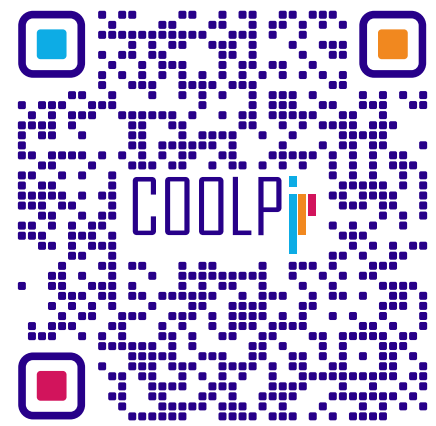
BeyondConventionalBoundaries Geert ...

Languages

Jupyter Notebook 98.1% Python 1.9%

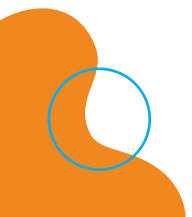
COOLPI

colour-accurate pixels





HUEnique
colour determination



HUEnique



HUEnique **colour determination**

HUEnique



HUEnique **colour determination**

HUEnique



HUEnique **colour determination**

HUEnique



HUEnique **colour determination**

HUEnique

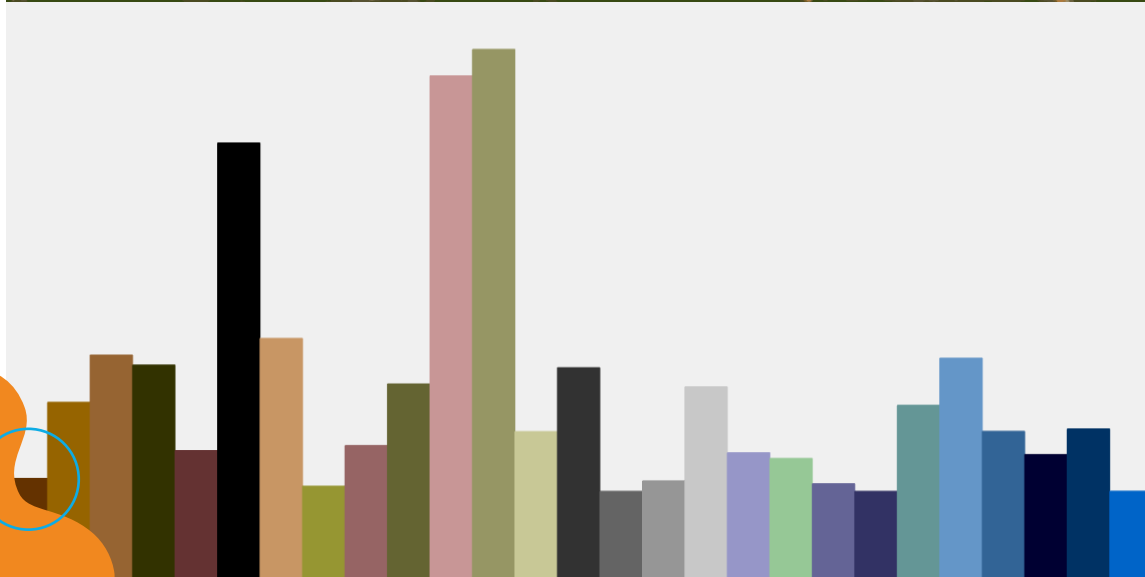


HUEnique colour determination

HUEnique



HUEnique **colour determination**



HUEnique

GRAFFITI styles

This book presents a classification system for graffiti art styles that reflects the expertise of graffiti writers and the work of art historian Erwin Panofsky. Based on Panofsky's theories of iconographical analysis, the classification model is designed to identify the style of a graffiti art piece through its visual characteristics.

Tested by image cataloguers in archives, libraries, and museums, the system assists information professionals in identifying the iconic styles of graffiti art pieces. It also demonstrates the power of Panofsky's theories to provide access to non-representational or abstract art images. The result is a new paradigm for Panofsky's theories that challenges the assumptions of traditional models. This innovative book is a valuable resource for anyone who wants to learn more about graffiti art and for information professionals concerned with both the practical and intellectual issues surrounding image access.

Lisa Gottlieb is a graduate of Wellesley College, the University of Chicago, and the University of Toronto. She is coauthor with Juris Dilevko of *Reading and the Reference Librarian: The Importance to Library Service of Staff Reading Habits* (2004). Her articles have appeared in the *Journal of the American Society for Information Science and Technology*, *American Studies*, *Library Quarterly*, and other journals.

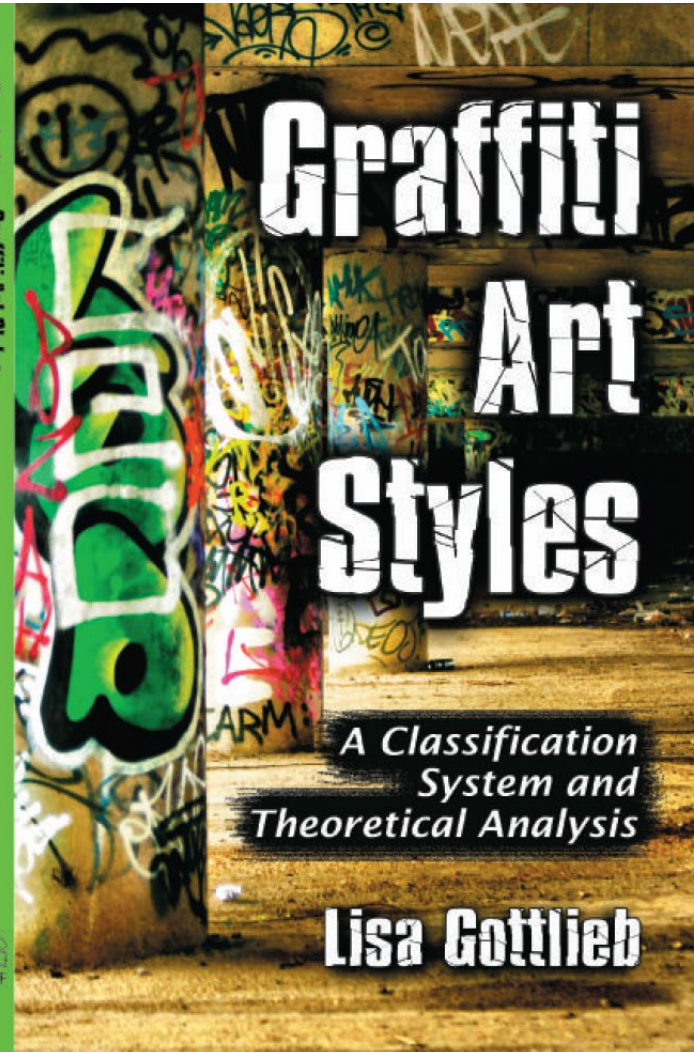


Cover image © 2008 Shutterstock



Gottlieb

Grffiti Art Styles



GRAFFITI styles

Graffiti Styles Visualiser | version 1.0

GUI Info

Gottlieb style Abstract A1C2F3I5J2K2

In addition to the characteristics listed below, Abstract pieces are described by graffiti art experts as "very organic in shape." One expert notes that pieces "might fit the shape of a crescent, a check mark, a wedge, or some other non-quadrilateral." The Abstract style is also known as "Transcend," the name of the crew chiefly associated with this style.

Abstract pieces can have any (or any combination) of the following: Fades (L2), Fill shapes (L3), and Shines (L5); conversely, pieces can have no fill effects whatsoever (L6)

Curent style characteristics

Defining A1C2F3I5J2K2

Predominant B2B3D1E1E3G2

Other H1H2L2L3L5L6M1M2

Gottlieb match **Yes - Abstract**

Legibility

Defining Predom Other

Illegible A1

Partially legible A2

Legible A3

Number of colours

Defining Predom Other

2 colours B1

At least 3 colours B2

At least 5 colours B3

Symmetry

Defining Predom Other

Symmetry C1

Assymetrical C2

Dimensionality

Defining Predom Other

2-dimensional D1

2-dimens. with 3D effects D2

Relief effect D3

3-dimensional D4

Letter outlines

Defining Predom Other

Hard only E1

Implied E2

Interrupted E3

None E4

Linearity

Defini... Predom Other

Curved only F1

Straight only F2

Curved and straight F3

Letter strokes

Defining Predom Other

Uniform G1

Varied G2

Negative space

Defini... Predom Other

Exaggerated H1

Standard H2

Limited H3

Letter overlap

Defining Predom Other

None I1

Minimal I2

Standard I3

Interlocking I4

Intertwined I5

Use of arrows

Defini... Predom Other

Integral J1

Non integral J2

Letter Shape Cons.

Defining Predom Other

Consistent K1

Inconsistent K2

Fill effects

Defining Predom Other

Directional highlights L1

Fades L2

Fill shape L3

Scrub fills L4

Shines L5

None L6

Fill consistency

Defining Predom Other

Consistent M1

Inconsistent M2

SOME results

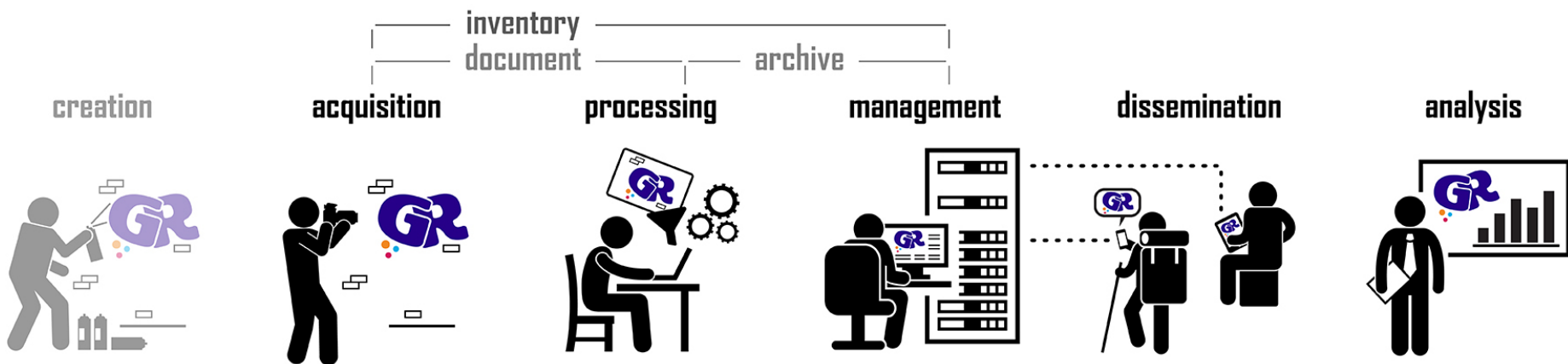
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars



GRAFFITI metadata

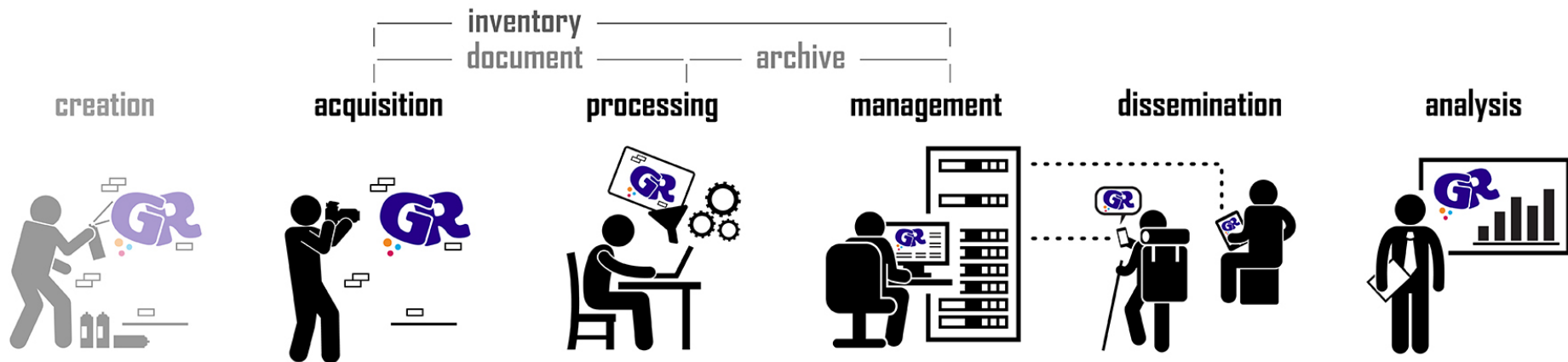
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars



GRAFFITI metadata

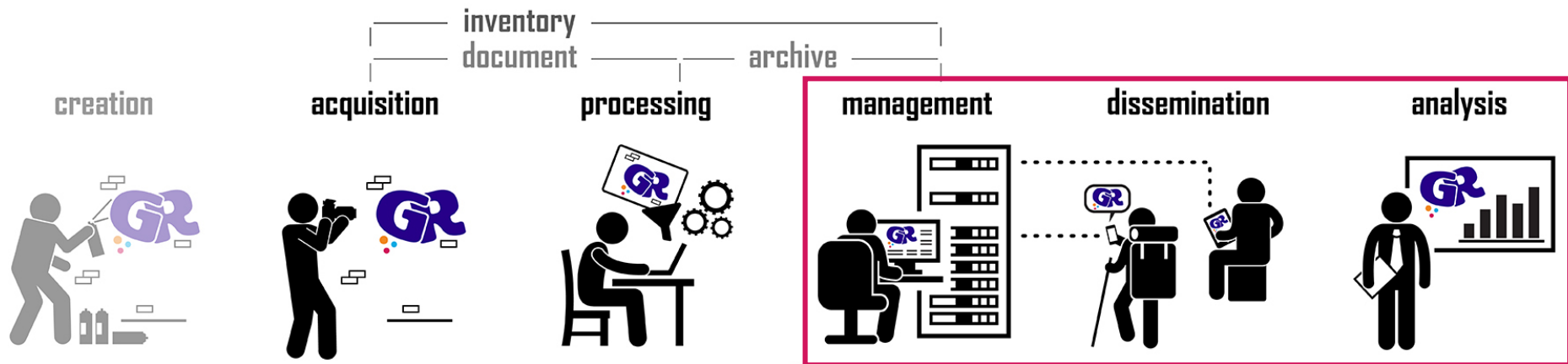
GRAFFITI *LOCATION*

GRAFFITI *TEMPORALITY*

GRAFFITI *TERMINOLOGY*

GRAFFITI *CHARACTERISATION*

5
research
pillars





INDIGO
core division



INDIGO

core division

real graffito
physical resource



INDIGO

core division

real graffiti
physical resource

approximations
digital resources



INDIGO

core division

real graffiti
physical resource

approximations
digital resources

digital photos

textured 3D models

orthophotographs

polygons



INDIGO

core division

real graffiti
physical resource

approximations
digital resources

digital photos

textured 3D models

orthophotographs

polygons

metadata

metadata



INDIGO

core division

real graffiti
physical resource

approximations
digital resources

digital photos

textured 3D models

orthophotographs

polygons

metadata



metadata



INDIGO

core division

real graffito

digital resources

digital photos

textured 3D models

orthophotographs

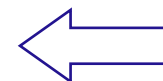
polygons

metadata

GRAFFITI (meta)data

<i>INDIGO metadata (physical graffito)</i>	
Category Level	Category Name
1	Descriptive metadata
1.1	Core metadata
1.2	Locational metadata
1.3	Temporal metadata
1.4	Contentual / aboutness metadata
1.5	Formal / appearance metadata
2	Administrative metadata
2.1	Rights metadata
2.2	Access metadata
2.3	Technical metadata
3	Structural metadata
3.1	Origin relationships
3.2	Graffiti ensemble relationships
3.2	Spatio-temporal relationships

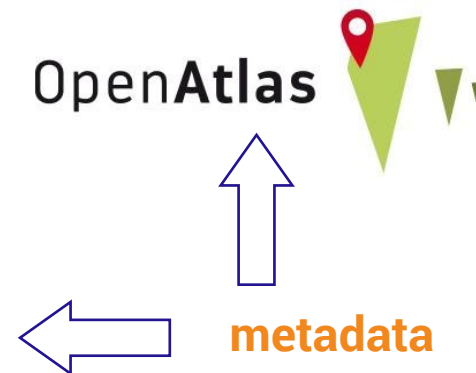
digital photos
textured 3D models
orthophotographs
polygons



metadata

GRAFFITI (meta)data

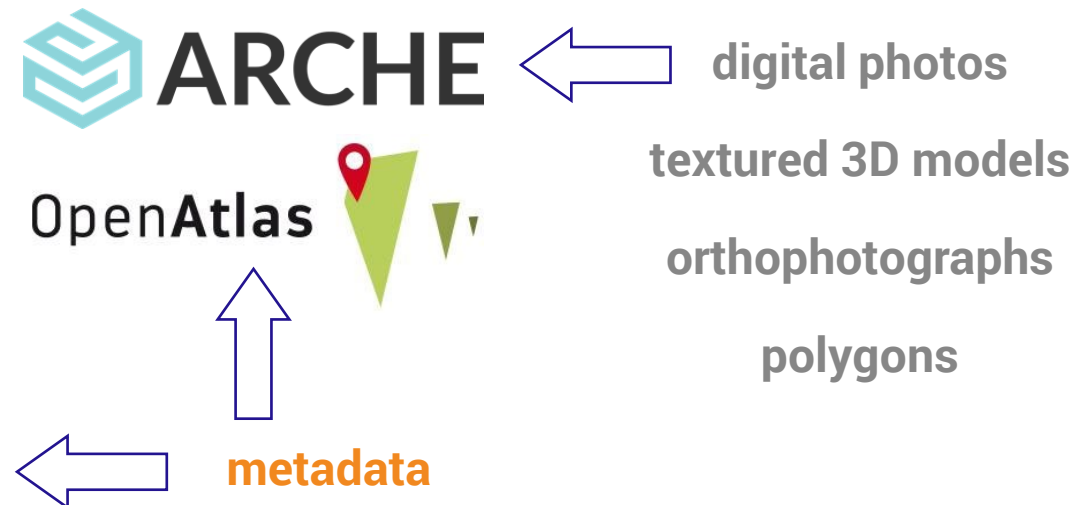
<i>INDIGO metadata (physical graffito)</i>	
Category Level	Category Name
1	Descriptive metadata
1.1	Core metadata
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2.3	Technical metadata
3	Structural metadata
3.1	Origin relationships
3.2	Graffiti ensemble relationships
3.2	Spatio-temporal relationships



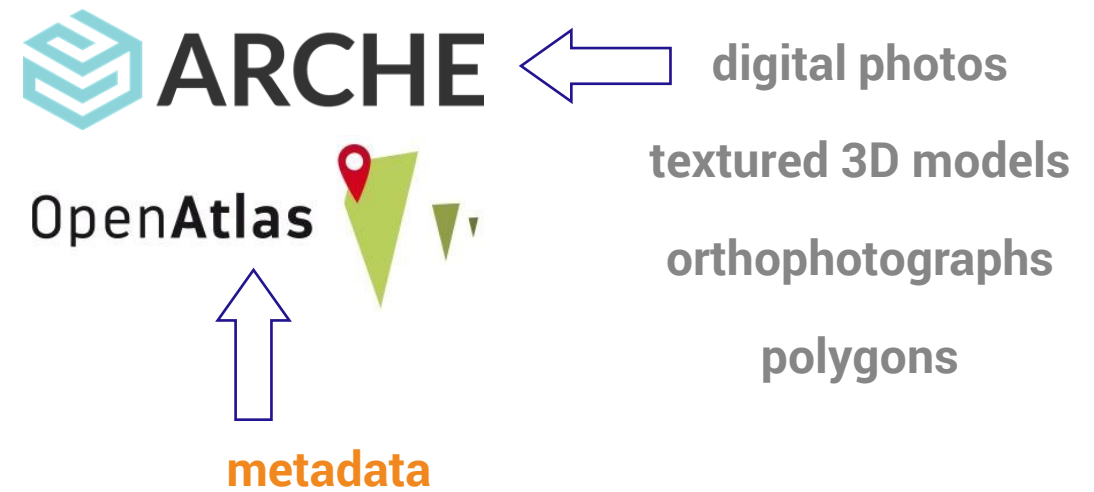
digital photos
textured 3D models
orthophotographs
polygons

GRAFFITI (meta)data

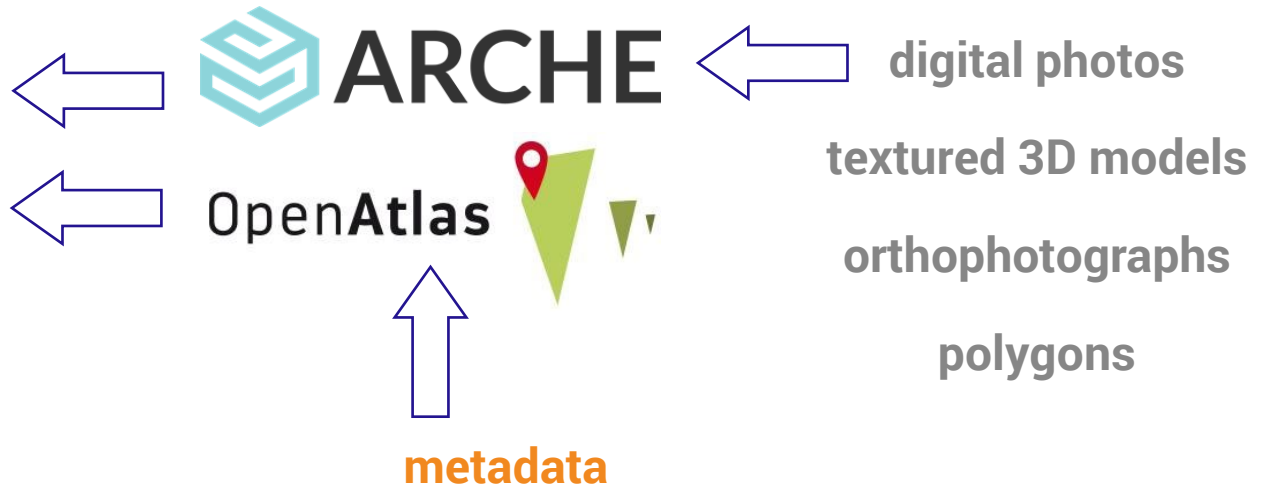
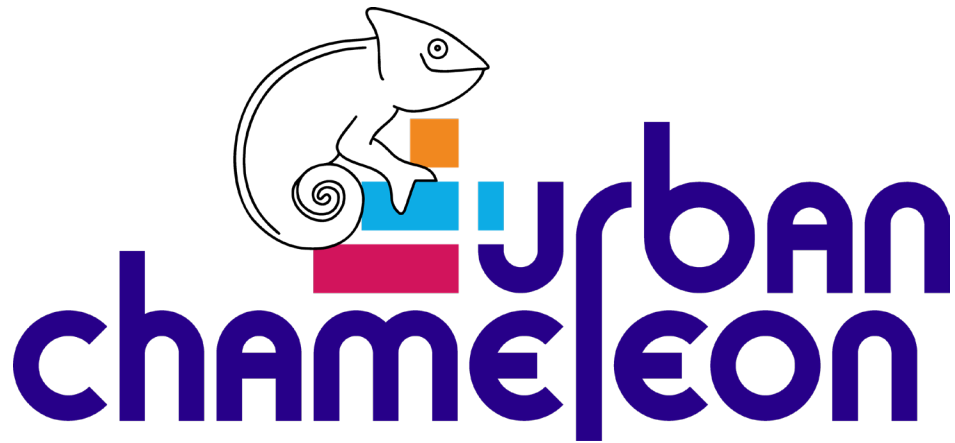
<i>INDIGO metadata (physical graffito)</i>	
Category Level	Category Name
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1.1	Core metadata
1.2	Locational metadata
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2.3	Technical metadata
3	Structural metadata
3.1	Origin relationships
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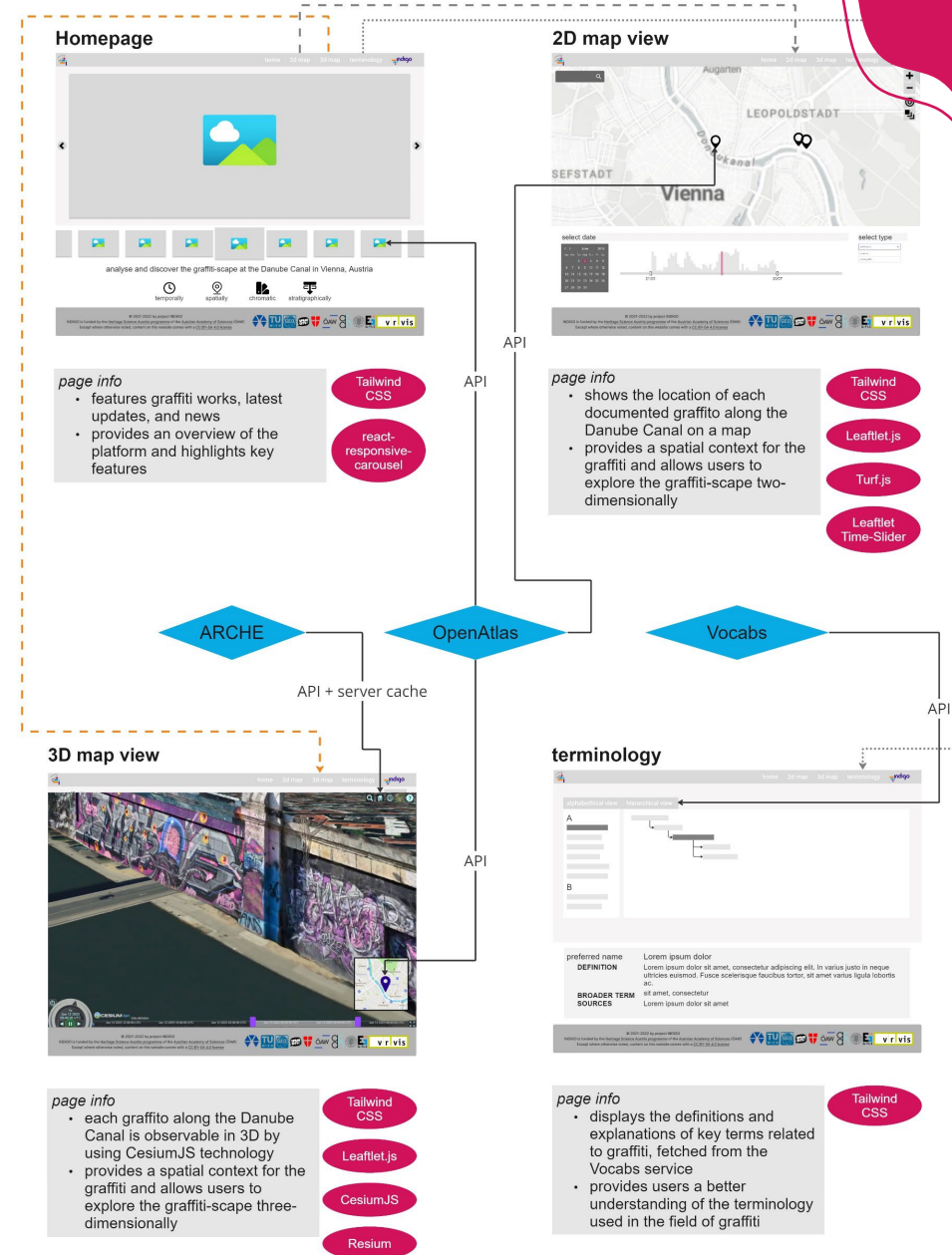
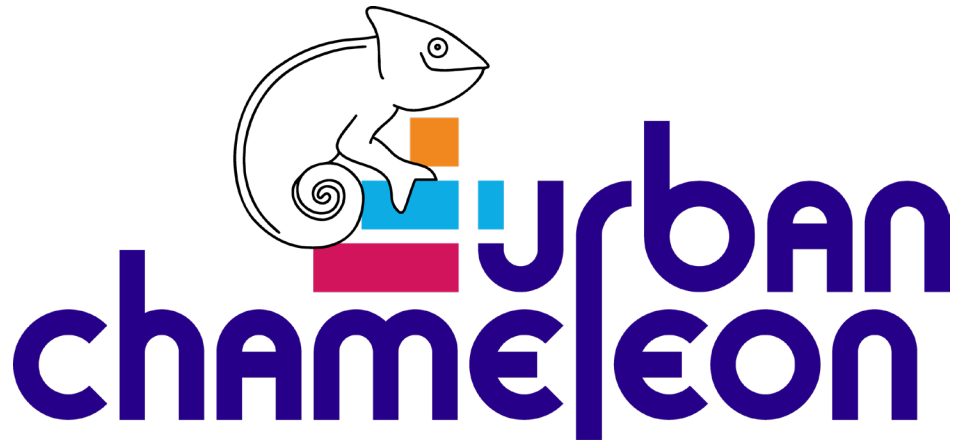
FINAL goal



FINAL goal



FINAL goal





INTERACTIVE 3D dissemination

archaeologists / art historians

sociologists / linguists

ethnographers / anthropologists

architects / geographers



INTERACTIVE 3D **dissemination**

archaeologists / art historians

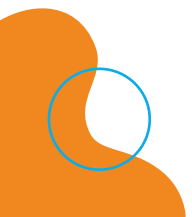
sociologists / linguists

ethnographers / anthropologists

architects / geographers

ETHICAL + COPYRIGHT aspects

RIGHT now



RIGHT now

DATA, LOTS OF DATA

RIGHT now

DATA, LOTS OF DATA

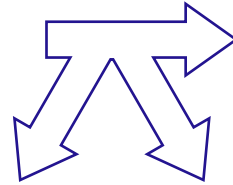


ARCHE

CoreTrustSeal certified data repository

RIGHT now

DATA, LOTS OF DATA

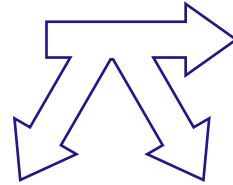


ARCHE

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DATA, LOTS OF DATA



~~PHOTO METADATA CONFLICTS~~

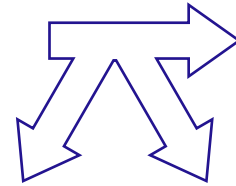


ARCHE

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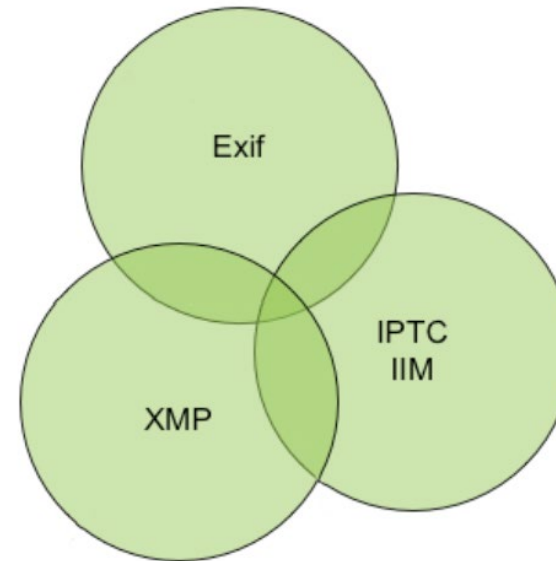
DATA, LOTS OF DATA



ARCHE

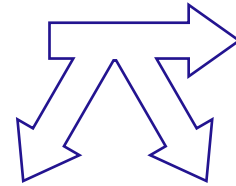
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~~PHOTO METADATA CONFLICTS~~



RIGHT now

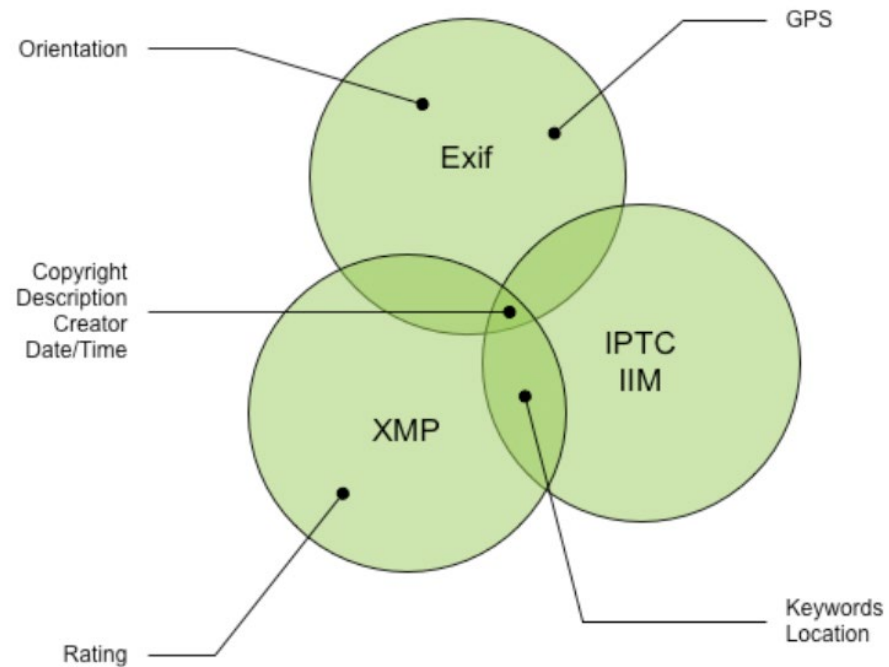
DATA, LOTS OF DATA



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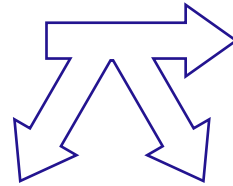
CoreTrustSeal certified data repository

PHOTO METADATA CONFLICTS



RIGHT now

DATA, LOTS OF DATA



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PHOTO METADATA CONFLICTS

JPG

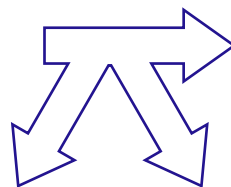
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NEF

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[XMP:XMP-crd] Shadows 2012 : 10  
[XMP:XMP-crd] Luminance Smoothing : 32  
[XMP:XMP-crd] Luminance Noise Reduction Detail : 75  
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[XMP:XMP-crd] Color Noise Reduction : 10  
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RIGHT now

DATA, LOTS OF DATA



ARCHE

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PHOTO METADATA CONFLICTS

JPG

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NEF

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[XMP:XMP-crd] Shadows 2012 : 10

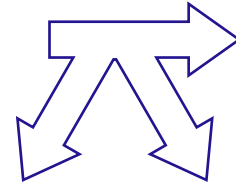
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- ⚠ [IFD0]:Artist not mapped to [XMP-dc]:Creator (embedded).
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- ⚠ [IFD0]:Orientation not mapped to [XMP-tiff]:Orientation (embedded).
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: 32
: 75
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: Camera Standard

RIGHT now

DATA, LOTS OF DATA



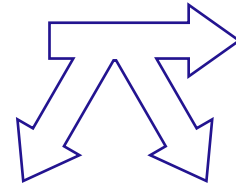
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~~PHOTO METADATA CONFLICTS~~

ANONYMISATION

RIGHT now

DATA, LOTS OF DATA



ARCHE

CoreTrustSeal certified data repository

~~PHOTO METADATA CONFLICTS~~

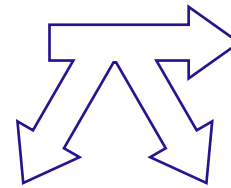
ANONYMISATION



Celantur

RIGHT now

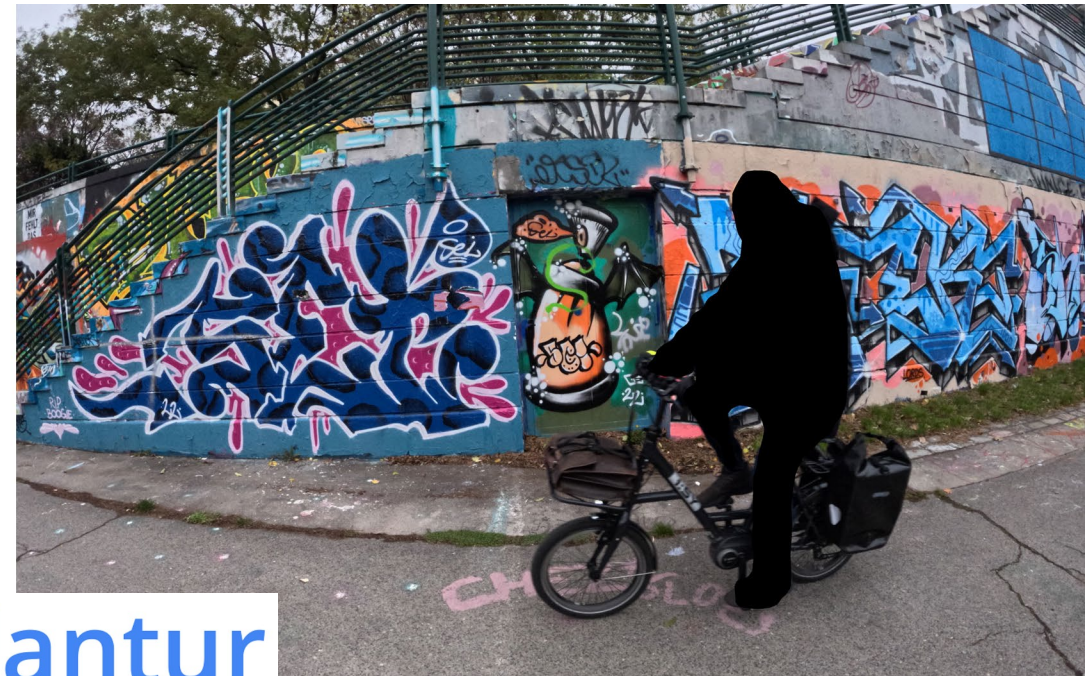
DATA, LOTS OF DATA



CoreTrustSeal certified data repository

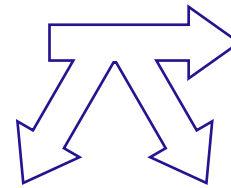
PHOTO METADATA CONFLICTS

ANONYMISATION



RIGHT now

DATA, LOTS OF DATA



ARCHE

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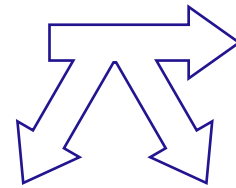
PHOTO METADATA CONFLICTS

ANONYMISATION



RIGHT now

DATA, LOTS OF DATA



ARCHE

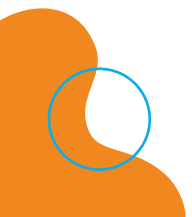
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PHOTO METADATA CONFLICTS

ANONYMISATION



DISSEMINATION general audience



DISSEMINATION **general audience**

NewsLetter 

vol.24 - Week 40 - 03-07 October 2022

VRVis meeting

01 Thursday 06-10-2022
10:00 @ VRVis
discuss collaboration



bot character by DEADBEAT HERO south of the Friedensbrücke on the right Donaukanal bank [21-09-2022]
Nikon Z 7II + Nikon NIKKOR Z 20mm f/1.8 S @ f/5.6 - 1/400 s - ISO 360

 <p>CVL Computer Vision Lab</p>	 <p>UC</p>	
<p>1. CVL meeting Tuesday 27-09-2022 meeting between Sebastian Zambanini of the TU Wien's Computer Vision Lab and Geert to discuss potential thesis subjects</p>	<p>2. Proceedings meeting Wednesday 28-09-2022 the editors of the goINDIGO 2022 proceedings meet to sync info about article submissions and outstanding papers</p>	<p>3. Monthly team meeting Friday 30-09-2022 during monthly team meeting 11, the INDIGO project staff discussed the status quo and talked about upcoming matters</p>

last two weeks

NEWSLETTER

26

DISSEMINATION **general audience**

Gallery Wednesday



NEWSLETTER

26

INSTAGRAM

±500

DISSEMINATION general audience

Die Presse SAMSTAG, 16. JULI 2022

WISSEN & INNOVATION W3

Digital. Ein Forschungsteam entwickelt ein 3-D-Modell der unzähligen Graffiti am Donaukanal: um die kurzlebigen Werke zu bewahren und eine Basis für andere Forschungen schaffen. Zu Besuch bei einer der längsten Graffitiflächen der Welt.

Buntes Erbe zum Lachen, Ärgern und Grübeln

VON ALICE SENARLENS DE GRANCY

Wir haben seit fast vier Jahren einen Hund und gehen mit ihm oft im Prater spazieren, aber auch entlang des Donaukanals“, erzählt Geert Verhoeven von der Idee zu seinem aktuellen Forschungsprojekt. Dabei betrachtete er die Graffiti an den Wänden – „manche waren weniger schön, manche wirkten wie Kunst“ – und bemerkte auch deren Vergänglichkeit: „Sie werden teilweise nach ein paar Stunden oder Tagen übersprüht.“ Der Archäologe begann, die oft kurzlebigen Werke als Kulturerbe zu sehen, das es zu bewahren gilt, und startete gemeinsam mit dem Kunsthistoriker Stefan Wogrin und anderen wissenschaftlichen Partnern das Projekt Indigo (Inventory and Disseminate Graffiti along the Donaukanal).

Der Donaukanal ist heute berühmt für die vielen Graffiti, dabei wissen die meisten nicht, dass Sprays eigentlich nur auf 300 Metern erlaubt ist“, erzählen die beiden Männer an diesem windigen und untypisch kalten Sommertag vor der Kaiserbadschleuse. Hier entstand 1984 neben dem Nachtclub Flex die erste legale Graffiti-Fläche Wiens. Anfang und Ende sind mit einer – bunt besprühten – Reliefplatte markiert, auf der eine Taube zu sehen ist: Die sogenannte Wienerwand sei ein Unikum mit klarer Botschaft, berichtet Wogrin, der sich seit rund 20 Jahren mit Graffiti befasst – und selbst anfertigt: „Man wollte die Sprayer genauso wenig wie die Tauben.“ Dennoch ermöglicht es die Stadt Wien Künstlerinnen und Künstlern aus der Graffiti-Szene so, auf diesen Flächen zu arbeiten, ohne kriminell zu sein.

Thema lässt niemanden kalt
Denn Graffiti polarisieren bis heute. „Die einen lieben sie, die anderen hassen sie“, sagt Verhoeven, der diese Reaktionen auch von wissenschaftlichen Tagungen kennt. „Es gibt jedes Mal 100.000 Fragen.“ Das Interesse gefällt ihm – und auch, dass ein Beitrag aus seiner Forschungsgruppe im März einen Best Paper Award bei einer Konferenz



Außergewöhnlicher Kulturschatz: Geert Verhoeven (l.) und Stefan Wogrin vor einem ihrer Forschungsobjekte.

(Jana Mollgasser)

im italienischen Mantua gewonnen hat. Üblicherweise befasst er sich als stellvertretender Leiter des Ludwig-Boltzmann-Instituts (LBI) für Archäologische Prospektion und Virtuelle Archäologie mit ganz anderen Kulturschätzen: Er begleitete die Forschungen rund um das jungsteinzeitliche Stonehenge, war bei den Arbeiten zum römischen Carnuntum oder der Wikinger-

IN ZAHLEN

13 Kilometer lang sind die Flächen am Donaukanal, an denen Wiener Forscher Graffiti fotografisch festhalten und daraus ein 3-D-Modell bauen.

27.000 Fotos verknüpfte das erste Modell. Wöchentlich kommen zwischen 1000 und 3000 neue Bilder dazu.

300 Meter misst der Bereich, in dem Sprays am Wiener Donaukanal legal ist.

Fundstätte Birka dabei. „Und im Stephansdom habe ich Fresken dokumentiert und publiziert“, schildert Geert Verhoeven, der 2010 innerhalb von vier Tagen sein Haus in Belgien verkauft hat und für die Forschungsstelle nach Wien gezogen ist. Die am LBI genutzten und weiterentwickelten Messsysteme und Simulationsmethoden bilden die Klammer über die verschiedenen Themen. Ziel ist stets, Kulturerbe digital festzuhalten.

Digitaler Spaziergang am Kanal
Diese virtuellen Werkzeuge sollen nun auch helfen, die Graffiti am Donaukanal darzustellen – auch Anwendungen für den Tourismus sind denkbar: Den Forschern schwebt ein digitaler Spaziergang am Donaukanal vor, bei dem man auch ältere, an einer Stelle vorhandene Graffiti anschauen und mehr über sie erfahren kann.

Doch noch sind große technische Hürden zu nehmen: Die Far-

ben bei ständig wechselnden Lichtverhältnissen richtig abzubilden, sei sehr schwierig, führt das Duo aus. Auch die Orte ändern sich: „Die Container da drüben waren vor fünf Monaten noch nicht da“, sagt Wogrin und zeigt auf die bunt besprühten Quader am anderen Ufer. Zumindest einmal pro Woche geht er daher den Kanal ab dem Hundertwasserhaus bis zur Friedensbrücke auf beiden Seiten ab, sichtet Neuheiten und macht unzählige Fotos, die später zum großen Ganzen kommen.

Rund 27.000 Fotos bildeten das Basismodell. Seither werden – wie bei einem Puzzle – ständig neue hinzugefügt und beschrieben. Welche Figuren sind dargestellt, was steht geschrieben? Gewaltige Datenmengen müssen richtig verknüpft werden. Dabei unterstützen auch Forschungssteams der TU Wien und der Universität Politècnica de València in Spanien. Auch das VRVis, das Zentrum für Virtual-

Reality und Visualisierung in Wien, soll künftig helfen, das Neuland zu ergründen. „Es gibt noch keine Projekte, die können, was wir brauchen“, erläutert Verhoeven.

Schließlich soll, unterstützt vom Förderprogramm Heritage Science Austria der Österreichischen Akademie der Wissenschaften, ein öffentliches zugängliches Archiv entstehen, das weltweit kein Pendant findet. Der Donaukanal sei, zusammen mit der Berliner Mauer, wohl die längste ununterbrochene Graffitifläche der Welt, so Verhoeven – und in Bezug auf die Graffiti-Forschung „definitiv die längste“. Die Daten sollen dann Disziplinen wie Soziologie, Linguistik, Kriminologie oder Kunstgeschichte für ihre Forschung offenstehen.

Putin, dargestellt als Hitler

Inhaltliche Analysen folgen also später, doch aus seinen Beobachtungen weiß Wogrin schon heute: „Die Motive haben oft einen Bezug zum Kanal. Man sieht viele Fische oder Fischeknochen oder auch Oktopusse.“ Für politische Botschaften werde meist mit Schablonen gearbeitet, so ließen sich Parolen schnell aufsprühen. „Darin habe man zuletzt auch den Beginn des Ukraine-Kriegs gespürt, fand Putin als Hitler dargestellt und einzelne Säulen mit den Farben der Ukraine gelb-blau bemalt. Aber es gibt Graffiti, die für noch mehr Diskussionen sorgen: „Was tun mit homophoben oder nationalsozialistischen Botschaften“, fragt Verhoeven. „Als Forscher wollen wir alle Daten anbieten, aber freilich keine Bühne für Neonazis sein.“

Überdies soll ein Thesaurus entstehen, der die Terminologie erklärt und vereinheitlicht. „Ist es Street-Art oder Graffiti? Sind es Writers, Creators oder Künstler, die hier wirken?“, verdeutlicht Wogrin offene Fragen. Bis zum Projektende im Juli 2023 wird die Datenbank jedenfalls noch ordentlich wachsen. Er hoffe, dass das Projekt dann immer noch gefördert werde, sagt Verhoeven. Denn er will das Neuland hier am Kanal, auf das ihn einst sein Hund geführt hat, weiter für die Nachwelt dokumentieren.

NEWSLETTER

26

PRESS

2

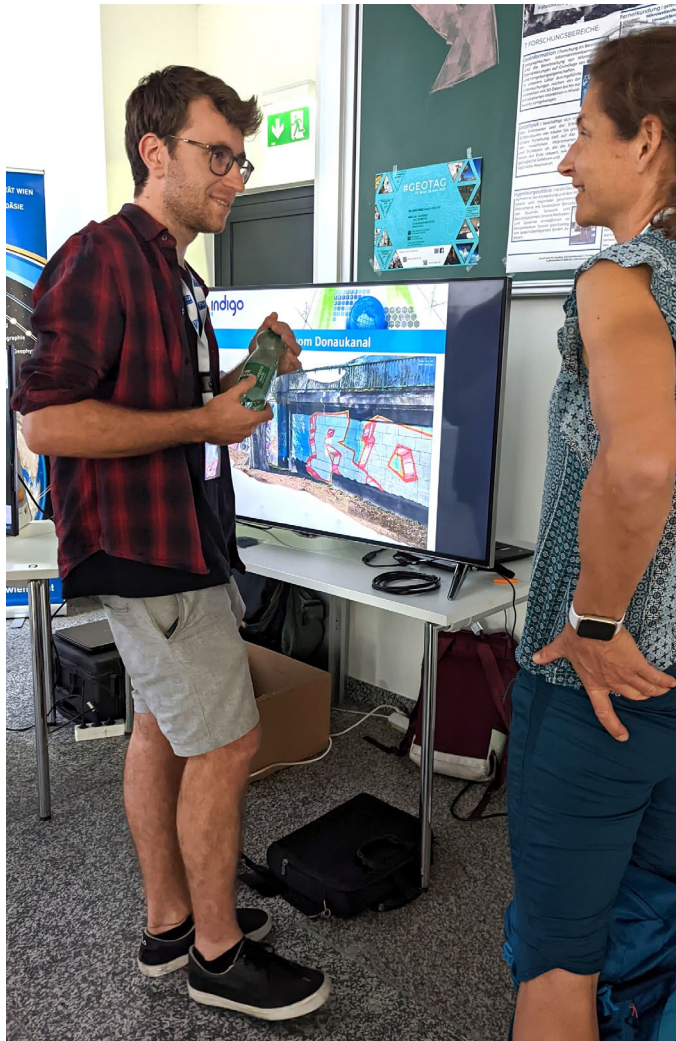
INSTAGRAM

±500

Die Presse 16/07/2022

DISSEMINATION **general audience**

Lange Nacht Der Forschung 2022



NEWSLETTER

26

PRESS

2

INSTAGRAM

±500

EVENTS

5

DISSEMINATION **general audience**

ILOVEGRAFFITI.DE Podcast 69

The image is a composite. On the left, a person is seen from behind, holding a camera up to take a photo of a wall covered in graffiti. A white box with the text 'I Love Graffiti.de' is overlaid on the top left of this image. In the center, a screenshot of the 'indigo' website is shown, featuring a purple header and a main section titled 'further heritage research' with the 'indigo' logo. Below this, there's a section for '3D-ARCH 2022' with a photo of a building at night and the text 'MANTOVA, ITALY 2-4 MARCH 2022'. At the bottom of the screenshot, there are logos for 'isprts' and 'CIPA'. Below the website screenshot, a video player interface is visible, showing a microphone icon and the text 'PODCAST#069: SPRAYCITY.AT'. The video player has a progress bar at 42:30 / 1:05:05 and various control icons.

PODCASTS
3

PODCAST #069 – Graffiti in WIEN und ÖSTERREICH - SPRAYCITY.AT

5,502 views May 31, 2022

ILOVEGRAFFITI.DE
45.3K subscribers

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128 Dislike Share Download Clip Save ...

Bevor wir euch in einigen Tagen eine frische 5MINUTES Episode aus Wien servieren, wollen wir uns im Podcast mit jemandem unterhalten, der auf dem Gebiet Graffiti in Österreich wirklich ein Experte ist: Stefan von SPRAYCITY.AT (<https://spraycity.at>) Als wir im März 2008 angefangen haben ...more

Comments


19

vsnpk

Add a comment...

DISSEMINATION **general audience**


GEObranchen.de

GEObranchen.de
Geobusiness & Geowissenschaft 

FIRMEN VERBÄNDE GEOJOBS GEO-IT DATENBANK GEOEVENTS **MEDIATHEK**

22 AUGUST 2023 → **Graffiti erforschen – mit Geoinformation**

Der Wiener Donaukanal ist ein Graffiti-Hotspot: Ein buntes Bild reiht sich dort an das andere, die Vielfalt ist groß: Vom grimmigen Totenkopf bis zur fröhlichen Comic-Figur, vom Namenschriftzug bis zum politischen Statement. Aus wissenschaftlicher Sicht sind diese Bilder höchst interessant – kunstgeschichtlich, soziologisch, historisch.



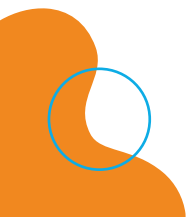
PODCASTS

3

BLOGS

4

DISSEMINATION scientific audience



DISSEMINATION **scientific audience**

AUTOGRAF

COOLP 

GRAPHIS 

SOFTWARE

3

DISSEMINATION **scientific audience**



SOFTWARE



3

HARDWARE

1

DISSEMINATION scientific audience

Heritage [open-access]

Article
AUTOGRAF—AUTomated Orthorectification of GRAffiti Photos

Benjamin Wild ^{1,*}, Geert J. Verhoeven ², Martin Wieser ³, Camillo Ressel ¹, Jona Schlegel ², Stefan Wogrin ⁴, Johannes Otepka-Schremmer ¹ and Norbert Pfeifer ¹

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² Ludwig Boltzmann Gesellschaft—LBI ArchPro, 1190 Vienna, Austria
³ Independent Researcher, Vienna, Austria
⁴ SprayCity, Austria; Vienna, Austria
* Correspondence: benjamin.wild@tuwien.ac.at

Abstract: Admired and despised, created and destroyed, legal and illegal: Contemporary graffiti are polarising, and not everybody agrees to label them as cultural heritage. However, if one is among the steadily increasing number of heritage professionals and academics that value these short-lived creations, their digital documentation can be considered a part of our legacy to future generations. To document the geometric and spectral properties of a graffiti, digital photographs seem to be appropriate. This also holds true when documenting an entire graffiti-scape consisting of 1000s of individual creations. However, proper photo-based digital documentation of such an entire scene comes with logistical and technical challenges, certainly if the documentation is considered the basis for further analysis of the heritage assets. One main technical challenge relates to the photographs themselves. Conventional photographs suffer from multiple image distortions and usually lack a uniform scale, which hinders the derivation of dimensions and proportions. In addition, a single graffiti photograph often does not reflect the meaning and setting intended by the graffitiist, as the creation is frequently shown as an isolated entity without its surrounding environment. In other words, single photographs lack the spatio-temporal context, which is often of major importance in cultural heritage studies. Here, we present AUTOGRAF, an automated and freely-available orthorectification tool which converts conventional graffiti photos into high-resolution, distortion-free, and georeferenced graffiti orthophotomaps, a metric yet visual product. AUTOGRAF was developed in the framework of INDIGO, a graffiti-centred research project. Not only do these georeferenced photos support proper analysis, but they also set the basis for placing the graffiti in their native, albeit virtual, 3D environment. An experiment showed that 95 out of 100 tested graffiti photo sets were successfully orthorectified, highlighting the proposed methodology's potential to improve and automate one part of contemporary graffiti's digital preservation.

Keywords: graffiti; cultural heritage; orthophoto; photogrammetry; street-art; structure from motion; georeferencing

1. Introduction

Grffiti are an ephemeral yet ubiquitous phenomenon. Although sometimes only existing for several hours or days, one cannot avoid seeing graffiti in urban environments. Graffiti are polarising. They upset, please, provoke, and sometimes even insult individuals or societies. Often graffiti creators do not even intend to infuriate, but the mere existence of their works triggers human emotions.


Despite or maybe even because of their omnipresence and polarising nature, documentation of 'contemporary' graffiti, in contrast to 'ancient graffiti' such as inscriptions on the urban walls of Roman Pompeii, has never received much scientific attention [1,2]. Even in their overview and position paper on the academic legitimacy of

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Heritage 2022, 5, 2987–3009. <https://doi.org/10.3390/heritage5040155> www.mdpi.com/journal/heritage

SOFTWARE

3

ARTICLES

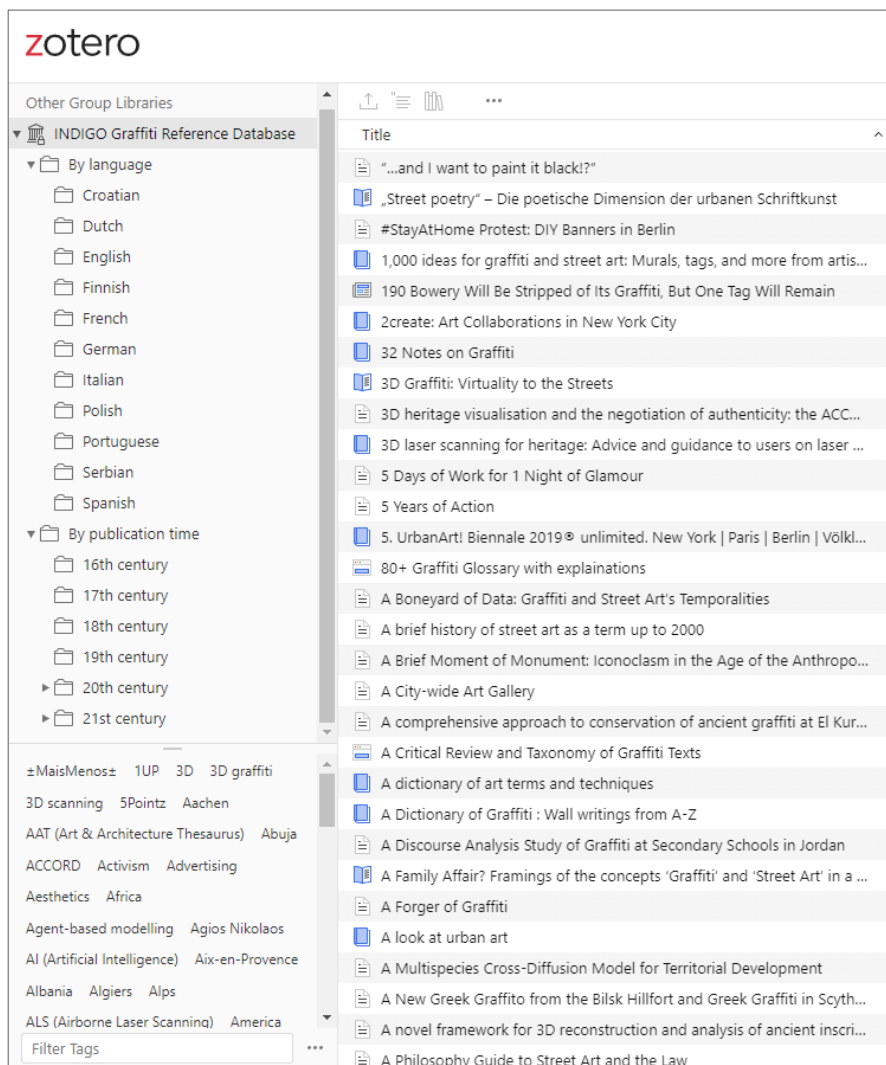
5+9 (+6)

HARDWARE

1

DISSEMINATION scientific audience

Graffiti literature database



SOFTWARE

3

ARTICLES

5+9 (+6)

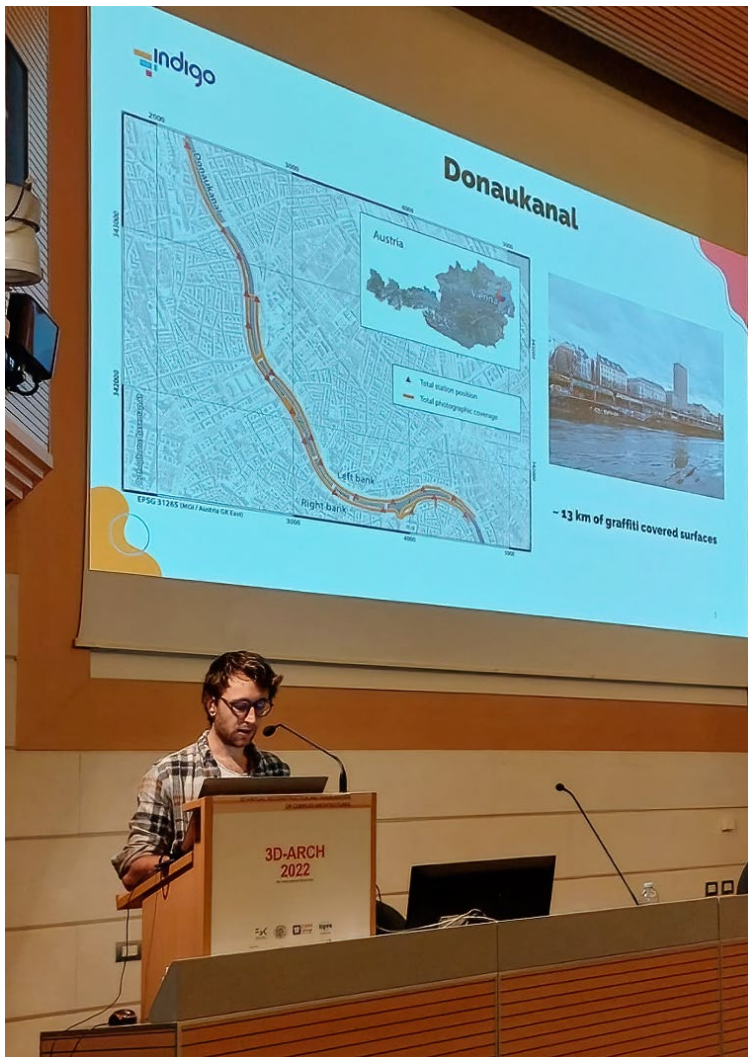
HARDWARE

1

DATA SETS

5 (+1)

DISSEMINATION **scientific audience**



TALKS


24

DISSEMINATION **scientific audience**

Acquiring centimetre-accurate camera coordinates in project INDIGO

Martin Wieser | Independent researcher | scenemap@gmail.com
 Geert Verhoeven | LBI ArchPro | geert.verhoeven@archpro.lbg.ac.at
 Benjamin Wild | Technische Universität Wien | benjamin.wild@geo.tuwien.ac.at


3rd Heritage Science Austria meeting: 23 September 2022



INDIGO is funded by the Heritage Science Austria programme of the Austrian Academy of Sciences (OAW)

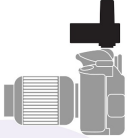
(7) Create products

From the georeferenced photo network a 3D mesh, point cloud or orthophotos can be produced in the desired CRS




(1) Mount device

The camera's hot shoe is used for mounting and camera synchronisation



(2) Configure RTK

Input RTK provider (e.g. EPOSA)
Provide settings for correction data




(3) Prepare camera

Set and fix focusing
Deactivate electronic and optical image stabilisation

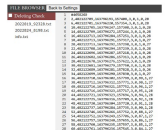
(4) Acquire photos

Follow a specific set of rules:
 - oblique & perpendicular photos
 - no change in focus or zoom
 - different subject distances
 - cover entire image sensor




(5) Download device data

Download camera positions & rotations over WiFi from the device's webservice via a browser



(6) Process device data & photos

Use the logged camera positions to georeference and scale the photo network
With many photos, centimetre accuracy is achievable



RTK GNSS receiver
GPS & Galileo satellites
L1/L2/L5 multi-band
RTK

IMU
3-axis gyroscope
3-axis accelerometer
3-axis magnetometer

Position **Rotation**

Feedback
LEDs & status display

GNSS: Global Navigation Satellite System
 EPOSA: Echtzeit-Positionierung-Austria
 CRS: Coordinate Reference System
 IMU: Inertial Measurement Unit
 GPS: Global Positioning System
 RTK: Real-Time Kinematic

TALKS
24

POSTERS
3

DISSEMINATION **scientific audience**



TALKS

24

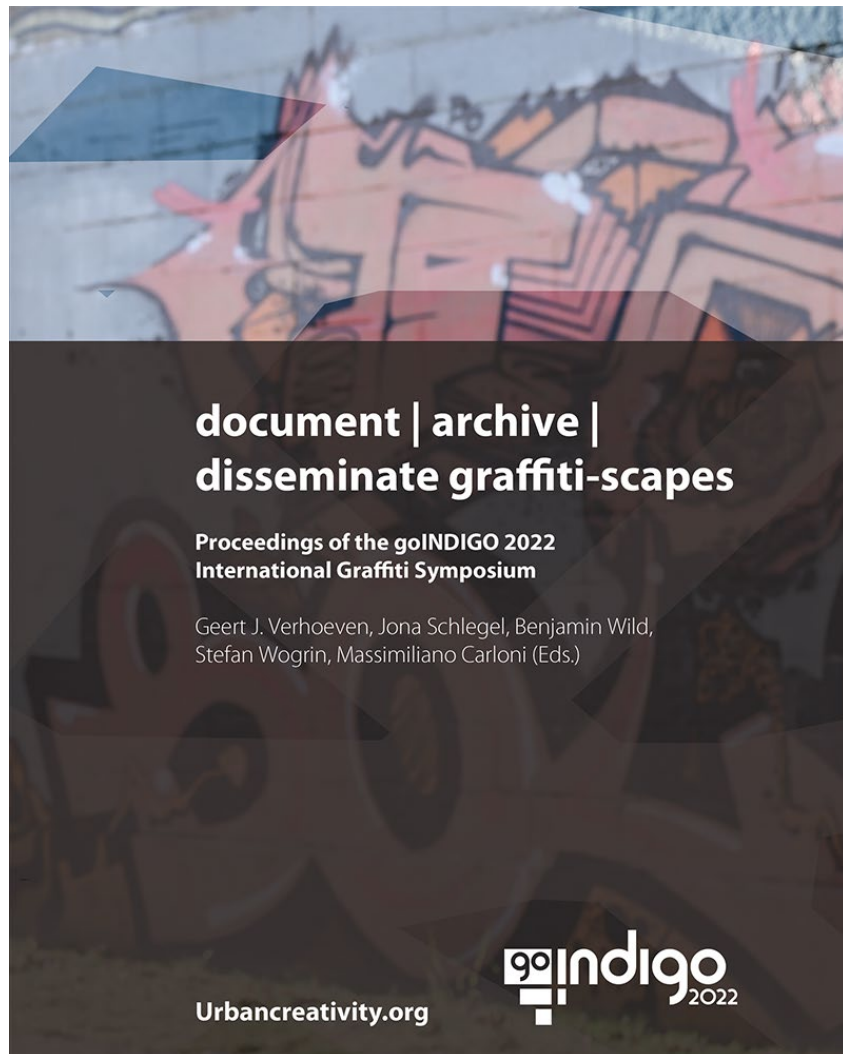
SYMPOSIA

2

POSTERS

3

DISSEMINATION **scientific audience**



TALKS

24

SYMPOSIA

2

POSTERS

3

EDITED VOLUME

1 (+1)

INDIGO website



<https://projectindigo.eu>

#indigodonaukanal to notify us

Home Project details Contribute News Contact

indigo

IN-ventory and

DI-sseminate

G-raffiti along the

d-O-naukanal

graffiti makes people laugh, wonder, angry, think
graffiti is a **unique** | **complex** | **short-lived** | **socially relevant** form of cultural heritage

the two-year INDIGO project aims to build the basis to systematically *document* | *disseminate* | *analyse* almost 13 km of uninterrupted graffiti along Vienna's *Donaukanal* (Eng. Danube Canal) in the next decade

graffiti community engagement and *regular photo visits* allow INDIGO to build a spatially, spectrally, and temporally accurate record of most (il)legal sprayings, engravings and other personal expressions on the Canal's public urban surfaces

a *spatial database* manages all images and *relevant metadata* like style, artist pseudonym and creation data, while the involvement of graffiti creators and scholars safeguard (meta)data correctness and completeness

this database feeds a *free online platform* that empowers everyone to explore (through virtual walks or displaying the change of graffiti

INDIGO team



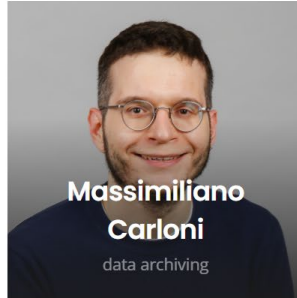
Geert Verhoeven



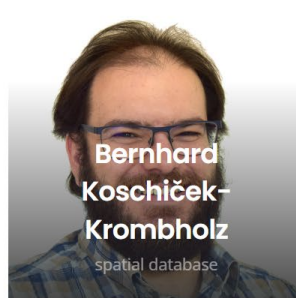
Norbert Pfeifer



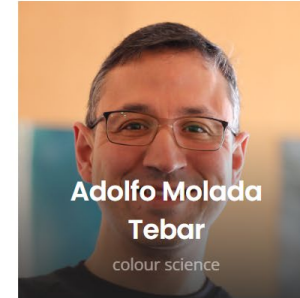
Stefan Wogrin



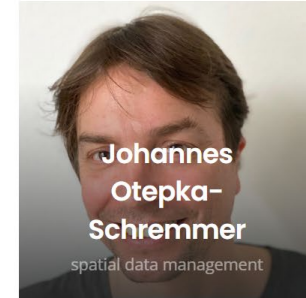
Massimiliano
Carloni
data archiving



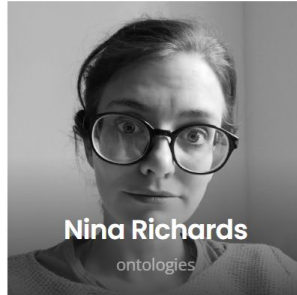
Bernhard
Koschiček-
Krombholz
spatial database



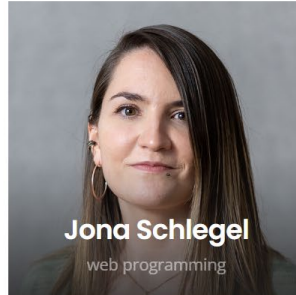
Adolfo Molada
Tebar
colour science



Johannes
Otepka-
Schremmer
spatial data management



Nina Richards
ontologies



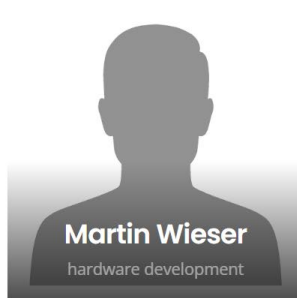
Jona Schlegel
web programming



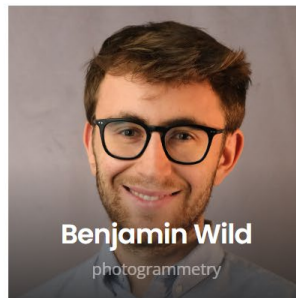
Martina Trognitz
data archiving



Alexander
Watzinger
spatial database



Martin Wieser
hardware development



Benjamin Wild
photogrammetry



Digital Graffiti-scape Archaeology

