Cartography M.Sc.

The Nuances of Mapping Street Art – Developing a Web Map for Interactive Graffiti Exploration

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Outline

- Introduction
- Methodology
- Results
- Conclusion

The Nuances of Mapping Street Art – Developing a Web Map for Interactive Graffiti Exploration

Introduction

Motivation

- Graffiti and street art are seen as cultural heritage by many (Bonadio, 2022) and are gaining more research attention.

- Graffiti are rather ephemeral and rely on other media to be disseminated and preserved (de la Iglesia, 2015).

- Graffiti are highly contextual (Ferrell and Weide, 2010).

- The map medium can contextualize by showing how graffiti and their environment relate to each other spatially.

- There exist numerous graffiti archives and maps. Yet, the subject has not been formally approached from a cartographic perspective.

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Introduction

Research Objectives

- **RO1**: Conduct a literature review on the spatial aspects of graffiti and assess current graffiti-dedicated web maps.

- **RO2**: Develop a web map prototype for exploring graffiti along Vienna's Donaukanal (Danube Canal), including adaptive graffiti symbols and a 3D map view.

- **RO3**: Evaluate the web map prototype through qualitative user testing.

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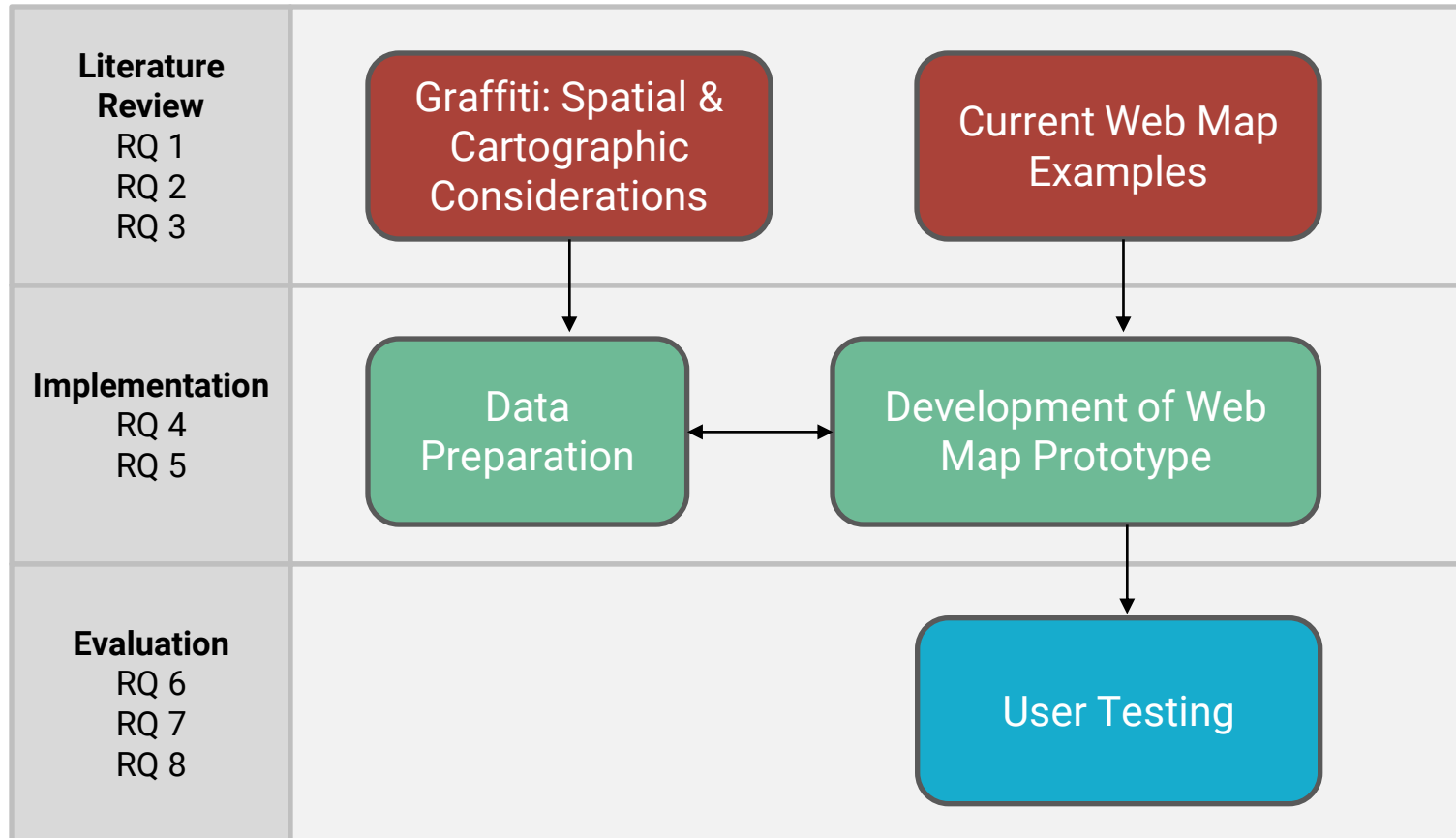# Introduction

Literature-based Research Questions

- **RQ1**: What are the (unique) challenges of mapping graffiti and street art?

- **RQ2**: What approaches exist for presenting graffiti (and graffiti-like structures) in web maps?

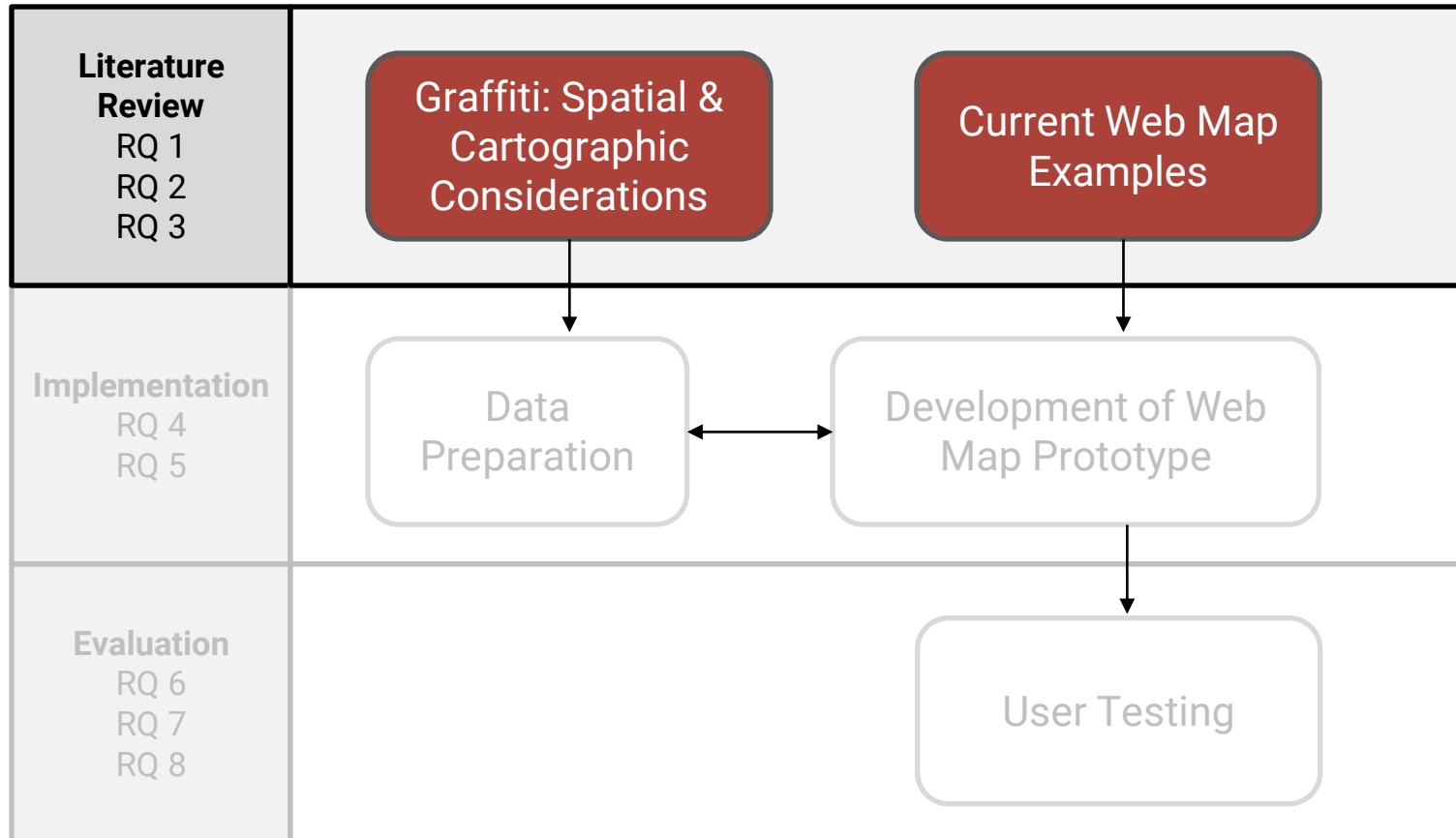- **RQ3**: What symbolization types can be used to represent graffiti across varying scales or zoom-levels?

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Implementation-based Research Questions

- **RQ4**: How can these symbolization types be derived from polygon geometry data?

- **RQ5**: How can the insights gained from previous research questions (RQ1-3) be applied in the development of a web map prototype for exploring graffiti?

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Evaluation-based Research Questions

- **RQ6**: How useful is the web map prototype - its design and interactive features - for exploring graffiti in a spatial context?

- **RQ7**: How does the user-experience differ when exploring graffiti in the prototype's 2D or 3D map mode?

- **RQ8**: How could the web map prototype be improved in terms of usability?

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Methodology

Literature Review RQ 1 RQ 2 RQ 3	Graffiti: Spatial & Cartographic Considerations	Current Web Map Examples
Implementation RQ 4 RQ 5	Data Preparation	Development of Web Map Prototype
Evaluation RQ 6 RQ 7 RQ 8		User Testing

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Methodology

Graffiti: Spatial Perspectives

- All graffiti are site-specific (Bengtsen, 2013).

- Graffiti content often plays with or references the environment including other graffiti.

- Spatial context is crucial for graffiti's analysis (Pugh, 2015).

- Many graffitists are embracing digital media as an extension of its (spatial) context.

Photo by Alexgchale. Link to the license

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Graffiti: Cartographic Considerations

- Graffiti vary in size, shape & orientation.

- Mostly on near vertical, flat surfaces.

- Boundaries can be ambiguous.

- Often very dense occurrences → clusters.
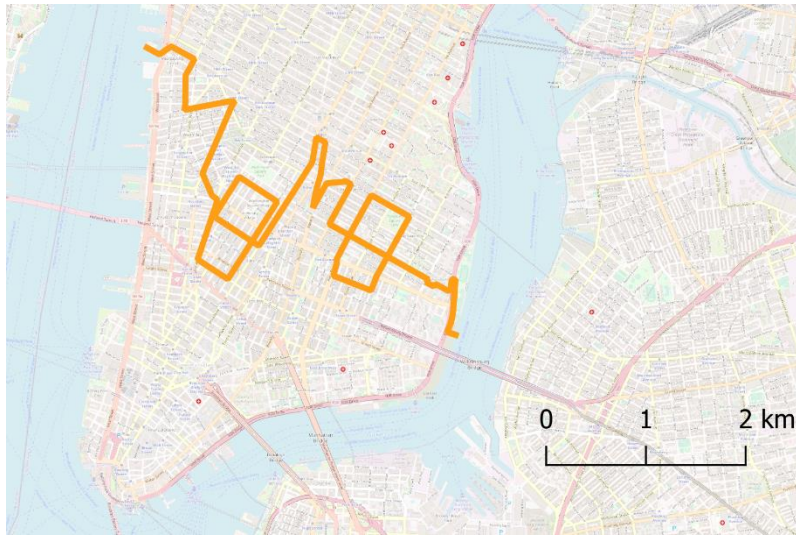
MOMO's graffiti tag across Manhattan (see Schacter, 2013)
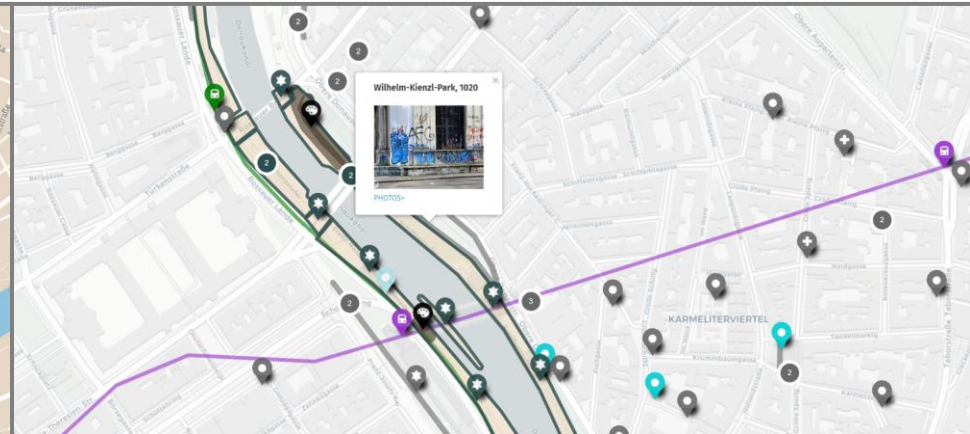

A cluster of (overlapping) graffiti

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Methodology

Current Web Map Examples (Selection)

The Vagabundler Project
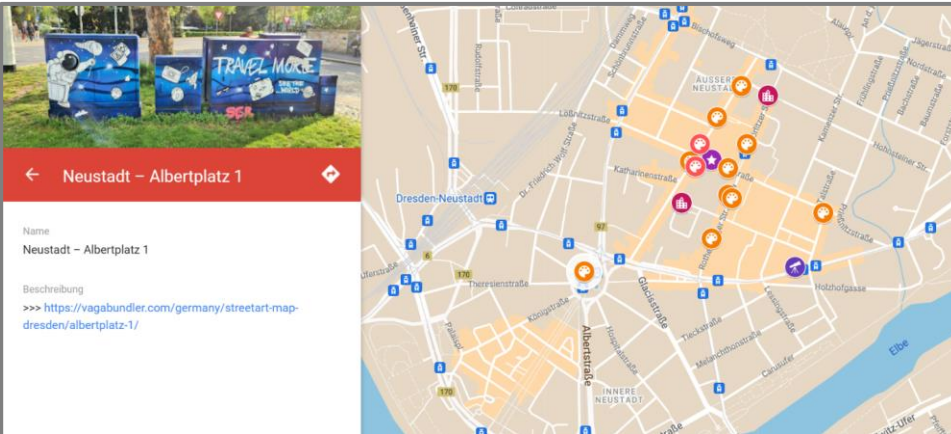
SPRAYCITY.AT

Street Art Cities

Arte per strada Torino

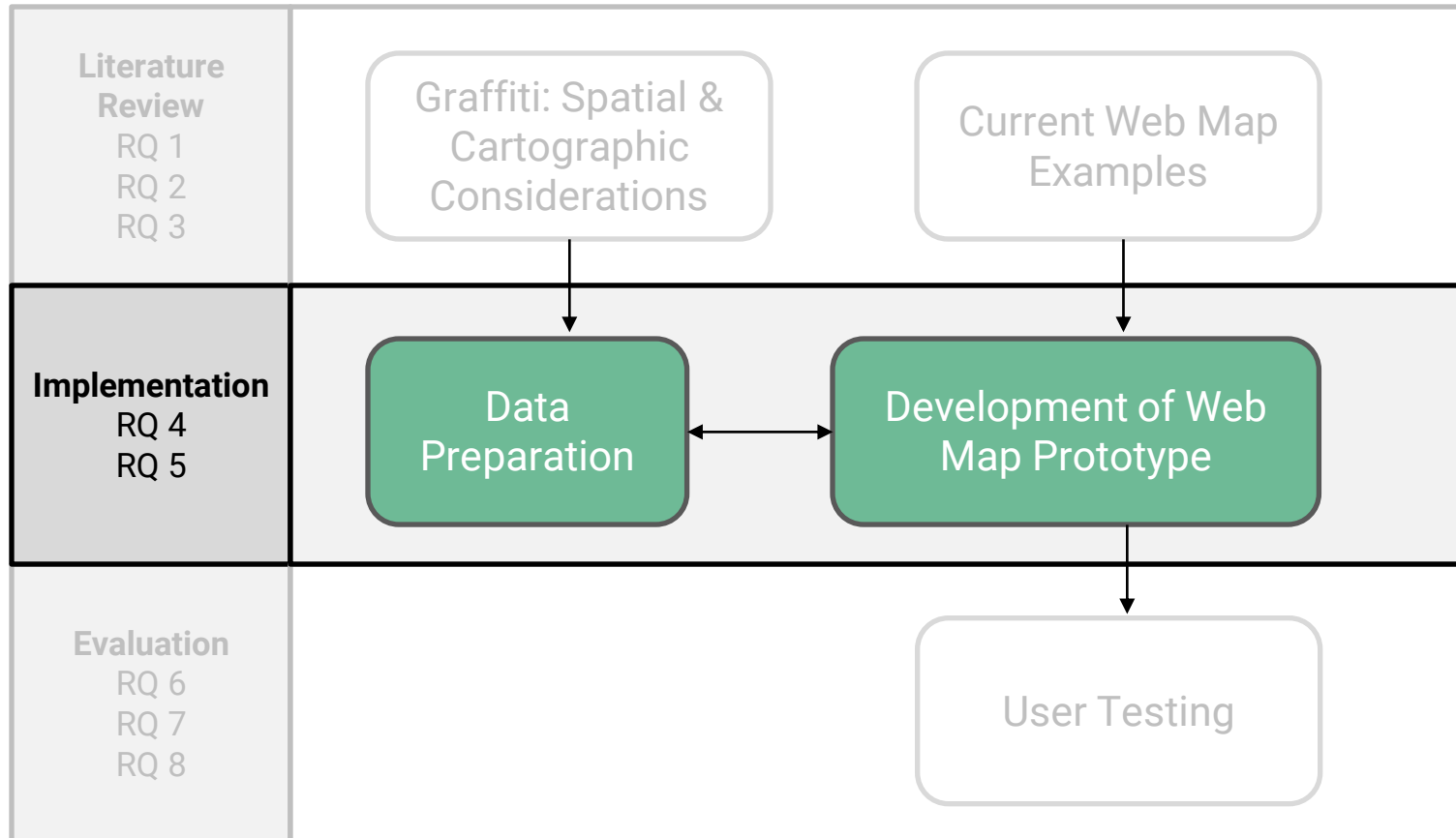The Nuances of Mapping Street Art – Developing a Web Map for Interactive Graffiti Exploration
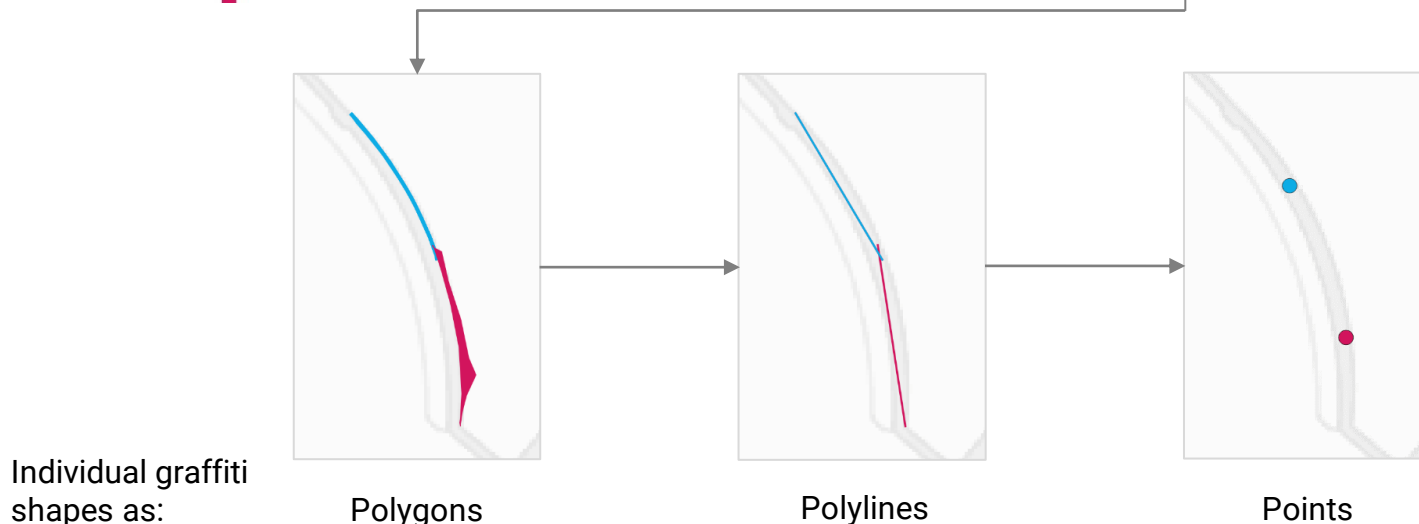
Methodology
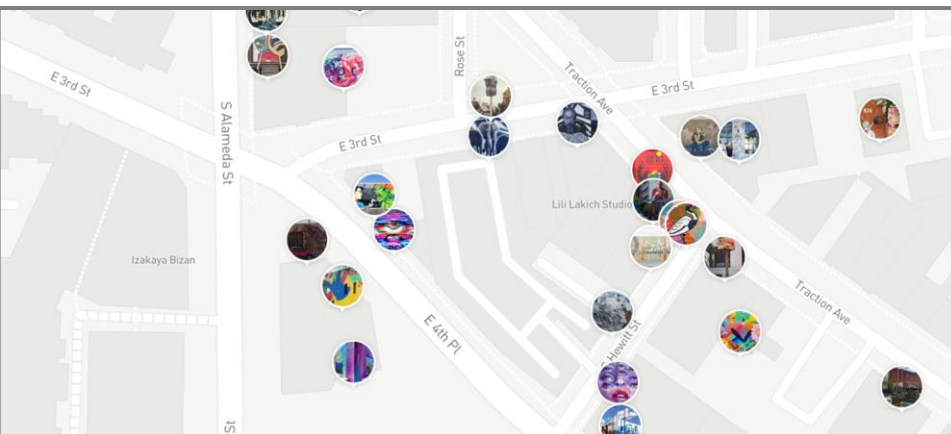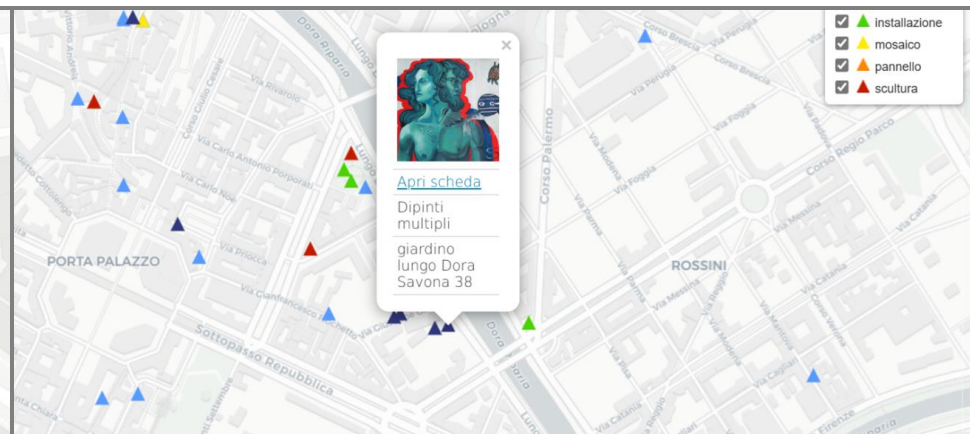
Evaluation of 11 Current Web Map Examples

- Similar sets of basic interactive operations (Roth, 2013): zooming, panning & information retrieval.

- None allow map reprojection (e.g., 3D mode)

- Level of Detail:
  - At most: 1 coordinate pair per graffito.
  - Often: 1 collective feature represents multiple graffiti.

- Basemaps:
  - Responsive web tiles.
  - Mostly in greyish muted colors.

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Methodology

Data Sources & Preparation

- Basemap (grey): basemap.at

- Buildings (floor plans): MA 41 - open government data

- Buildings (attributes): OpenStreetMap

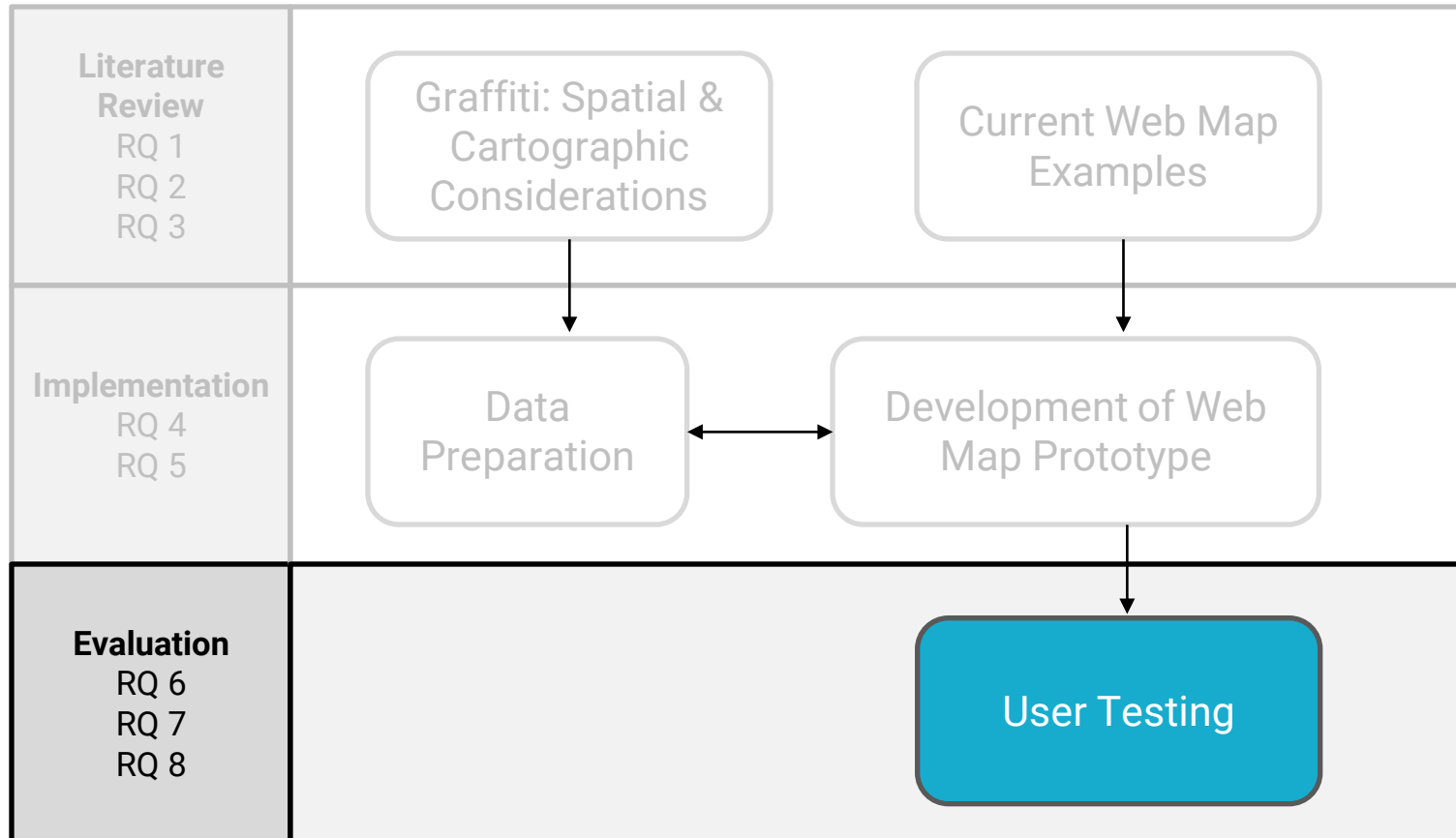- Graffiti (97 orthorectified images & geo-referenced 3D polygons): Project indigo

Individual graffiti shapes as:

Polygons   Polylines   Points

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Methodology

Development of Web Map Prototype

Library: MapLibre GL JS (https://maplibre.org/)

- Started 2020

- Open-source fork of MapBox

- Supports 3D mapping

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Methodology

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Methodology

Qualitative User Study - Design

1. **Free exploration**
   Cold start scenario

2. **Solving tasks**
   Locating certain graffiti by using filters

3. **Interview questions**
   Semi-structured

Thinking-Aloud
& Observation

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Methodology

Solving Four Tasks

1. Describe where graffiti with political content was located in the year 2021!

2. Find the (spatially, not temporally) longest animal-related graffiti to be seen on June 15th , 2020!

3. Search for the section of the Danube Canal between the Salztorbrücke (Salztor Bridge) and the Marienbrücke (Marien Bridge)! On which shore side of that section can you find more graffiti if you consider the entire time period?

4. Directly on the corner where the Vienna River (Wienfluss) flows into the Danube Canal is a building called the Urania. Which graffito of the visual-centric type, viewed over the entire time period, is located closest to Urania?

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Results

Web Map Prototype

- Purpose: exploration – spatial, temporal & semantic filtering of graffiti along the Donaukanal

- Interaction operations (Roth, 2013): pan, zoom, retrieve, filter, reproject, resymbolize & search
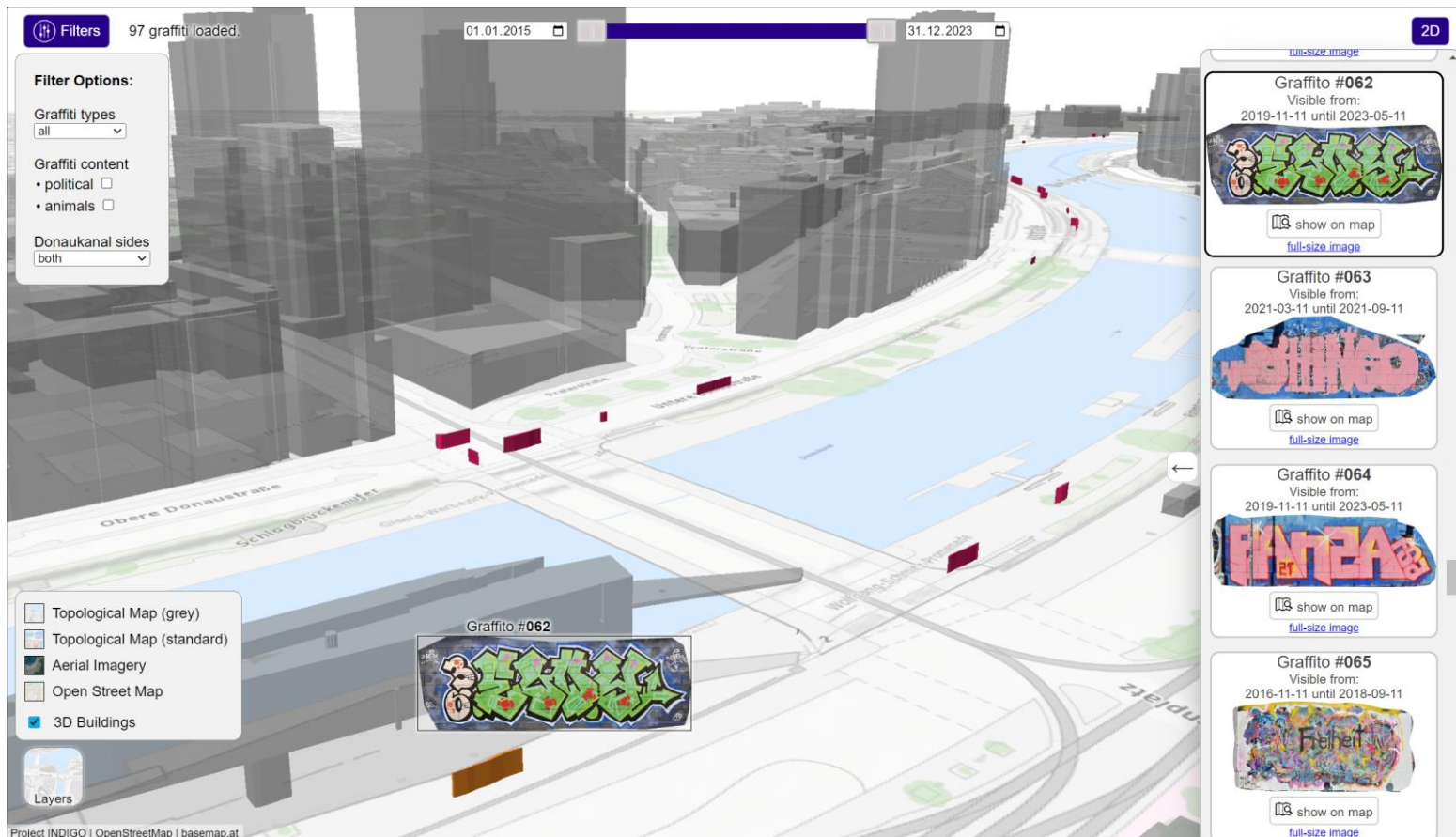
2D mode:

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Results

Web Map Prototype

3D mode:

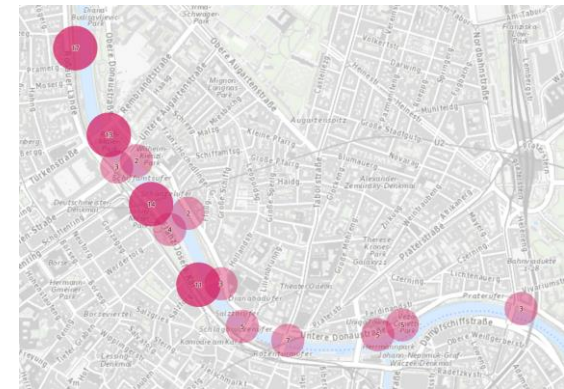The Nuances of Mapping Street Art – Developing a Web Map for Interactive Graffiti Exploration
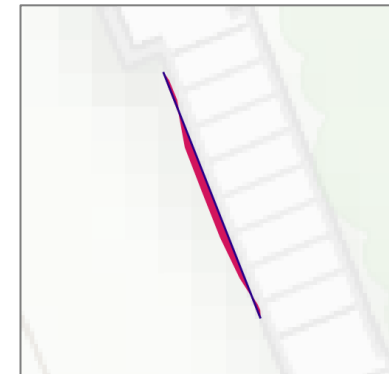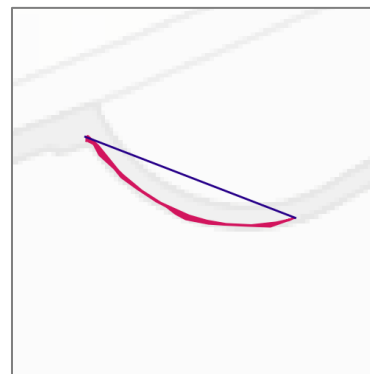
Results

Graffiti Feature Generalization (2D)

- Broad scale: dynamic clustering →
- Medium scale: polyline features
- Close scale: polygon features

Comparison of graffiti polygons and polylines:

- 87 graffiti were well represented by polylines.
- 10 graffiti were not. →

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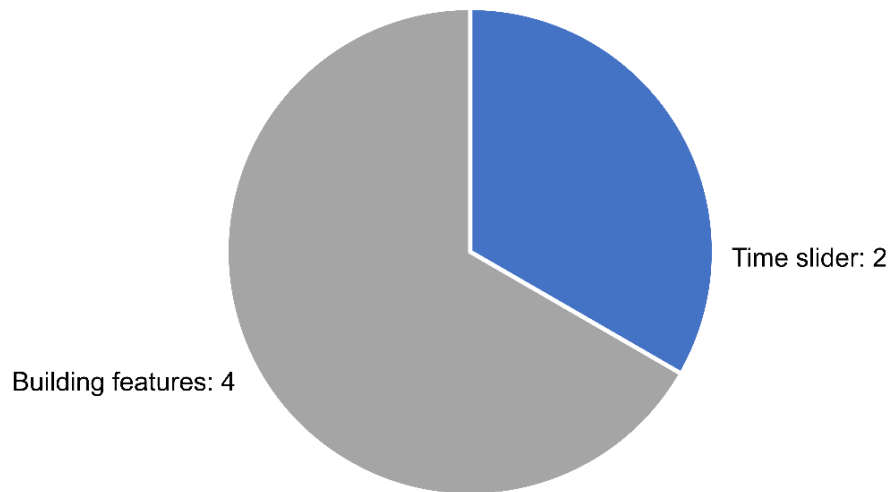
Results

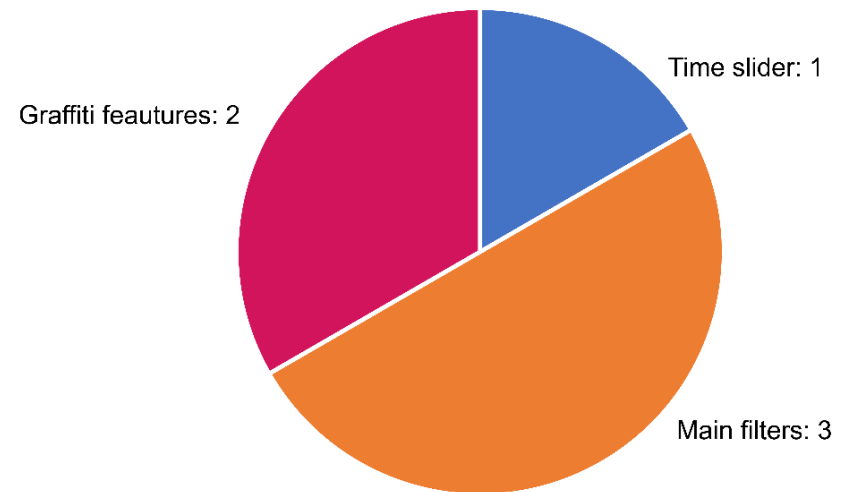## User Study − Free Exploration (cold start scenario)

No meaningful forming of connections between graffiti and their environment (basemap & 3D building features) were observed.

First interactions:

First web map element interected with
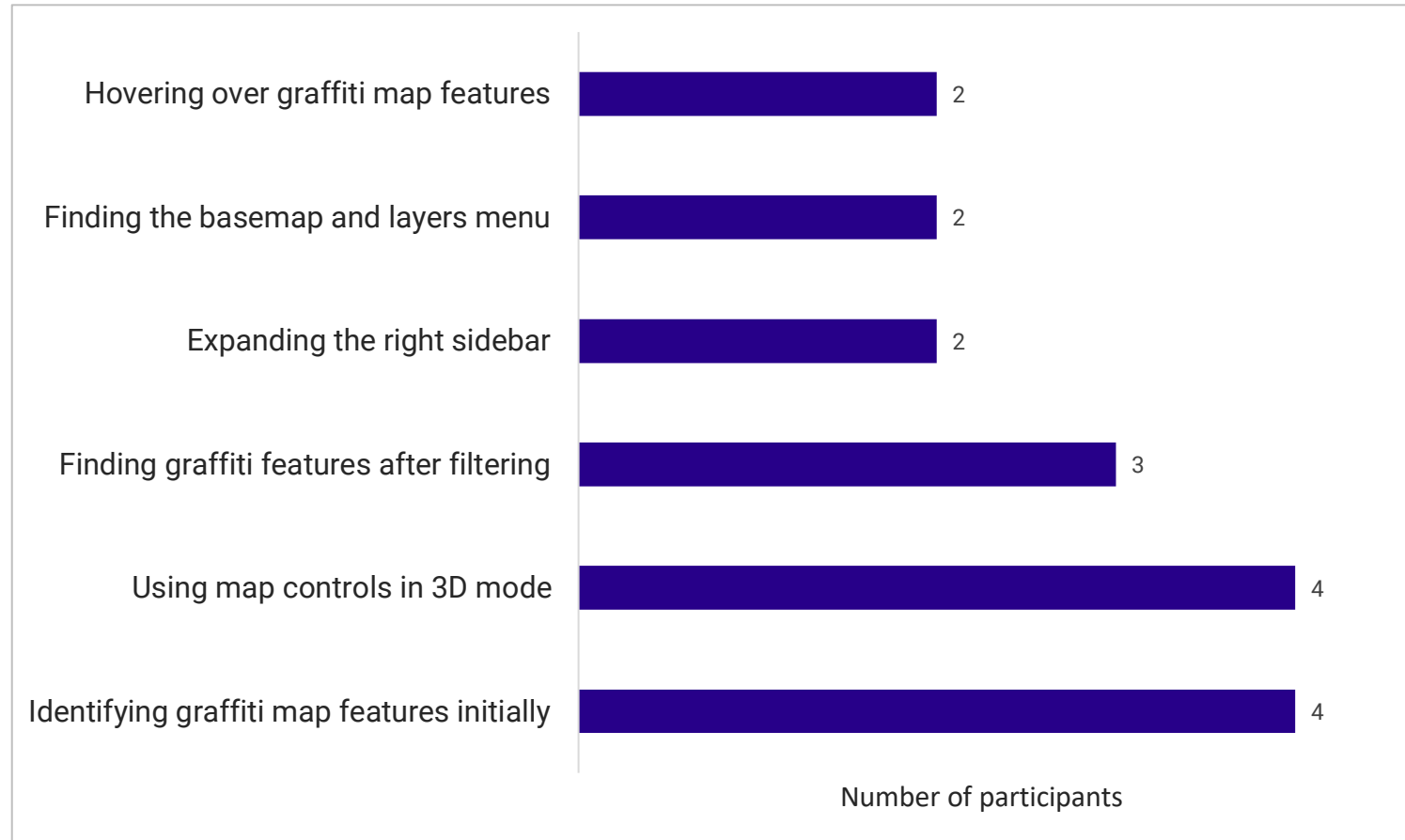
Time slider: 2

Building features: 4

Second web map element interected with

Graffiti feautures: 2

Time slider: 1

Main filters: 3

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Results

User Study – Solving Tasks

- All participants completed all tasks successfully except for one instance due to nonfunctional web browser (Safari).

- Average times of completion (mm:ss):
  - Task 1: 02:21
  - Task 2: 02:49
  - Task 3: 02:48
  - Task 4: 03:13

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Results

User Study – Shared Usability Issues

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Results

User Study – Selection of 2D/3D Map Modes

ID	Selected map mode (2D or 3D)			
	Free Exploration	Task 1	Task 2	Task 3
TP1	2D	3D	2D	2D
TP2	2D	3D	2D	2D
TP3	3D	3D	3D	2D
TP4	3D	3D	3D	3D
TP5	3D	3D	3D	3D
TP6	2D	2D	2D	2D

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Conclusion

- Graffiti are suitable for mapping and make for rather complex main map features, mainly due to their inherent variability.

- Adjusting graffiti symbology based on map scale (or zoom-level) is beneficial.

- Line features offer an effective compromise between simplicity and accurate representation of shape.

- The web map prototype proved successful in answering basic spatial, temporal & semantic questions on graffiti.

- User testing indicates a preference of map-based graffiti exploration in a 3D-environment.

- The prototype has usability issues. An important improvement would be to make graffiti features more noticeable.

References

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your attention!