

# Topographic Cues in Cultural Heritage Exploration: A User-Based Map Study in the Poznań Fortress Area

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## Abstract:

This abstract presents a planned study on the role of topographic cues in the exploration of a partially transformed cultural heritage landscape, using the Poznań Fortress area as a case study. Due to destruction, urban redevelopment, and terrain modification, many nineteenth-century elements of the former fortification system have become difficult to recognise in the contemporary terrain. The study asks to what extent historical maps and present-day topographic materials can support users in locating former heritage features, interpreting their current condition, and navigating a landscape in which original spatial structures have been partly erased or obscured.

The proposed research will involve participants working in an environment resembling a Street View session, supported by selected cartographic materials derived from historical and contemporary sources (Figure 1). Based on these materials, users will be asked to identify the probable location of selected objects and determine the type of transformation they have undergone, for example whether they have been preserved, modified, destroyed, or remain legible in the terrain. The study is intended not only to assess task performance, but also to examine how map materials influence spatial perception, orientation, and the recognition of topographic and cultural heritage cues in a morphologically changed urban environment, as the interpretation of topographic representations depends strongly on users' ability to process layered spatial information (Atit et al., 2016).

Attention will be paid to the role of terrain forms as elements that may remain more persistent than architectural structures and therefore function as important anchors of spatial orientation. In this sense, the study addresses the question of how users perceive and interpret relationships between present-day views, historical cartographic evidence, and enduring topographic features when attempting to reconstruct the former landscape. This perspective also corresponds to recent work on the interpretive potential of relief in historical topographic mapping and geomedial-based visualization of terrain (Medyńska-Gulij, 2022; Zawadzki, Medyńska-Gulij, 2024).

To better understand these processes, the experiment will also include eye tracking, allowing the analysis of visual attention and the identification of map elements that attract users' focus during spatial recognition and decision-making. This approach follows broader cartographic research on user studies and on the relationship between visual attention, map use, and spatial decision-making (Roth et al., 2017; Liao et al., 2017).

The paper connects topographic mapping, historical cartography, map-use research, and cultural heritage studies by proposing a map-based framework for analysing how users perceive, interpret, and recognise traces of former structures in a changed urban landscape. It contributes to the discussion on the use of cartographic sources in heritage exploration and highlights the interpretive importance of topography, as well as the cognitive role of maps, in the study of partially lost historical environments.

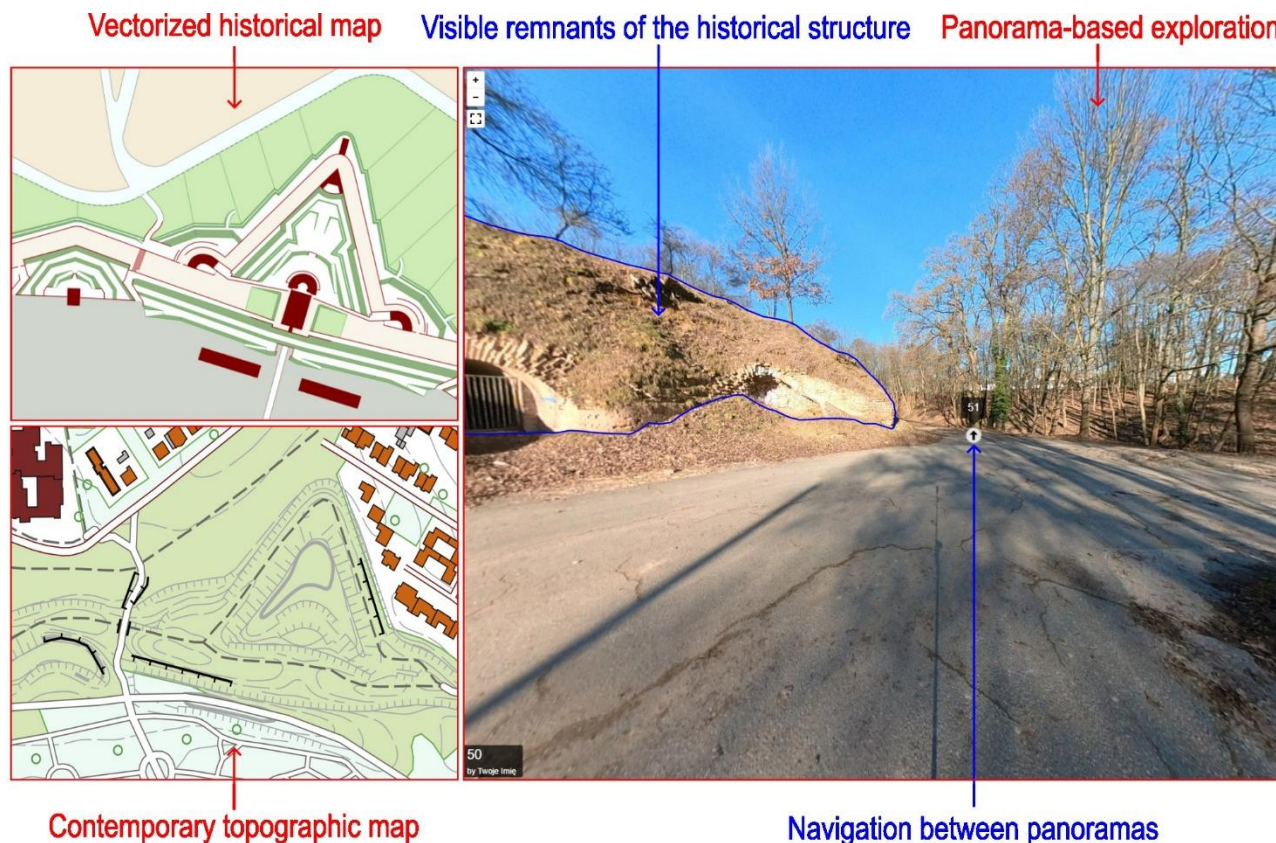


Figure 1. Prototype of the exploration window.

## References

- Atit, K., Weisberg, S.M., Newcombe, N.S., Shipley, T.F., 2016. Learning to interpret topographic maps: understanding layered spatial information. *Cognitive Research: Principles and Implications*, 1(1), Art. 2. DOI: 10.1186/s41235-016-0002-y.
- Medyńska-Gulij, B., 2022. Geomedia attributes for perspective visualization of relief for historical non-cartometric water-colored topographic maps. *ISPRS International Journal of Geo-Information*, 11(11), Art. 554. DOI: 10.3390/ijgi11110554.
- Roth, R.E., Çöltekin, A., Delazari, L., Fonseca Filho, H., Griffin, A., Hall, A., Korpi, J., Lokka, I.-E., Mendonça, A., Ooms, K., van Elzakker, C.P.J.M., 2017. User studies in cartography: opportunities for empirical research on interactive maps and visualizations. *International Journal of Cartography*, 3(Sup. 1), pp. 61–89. DOI: 10.1080/23729333.2017.1288534.
- Liao, H., Dong, W., Peng, C., Liu, H., 2017. Exploring differences of visual attention in pedestrian navigation when using 2D maps and 3D geo-browsers. *Cartography and Geographic Information Science*, 44(6), pp. 474–490. DOI: 10.1080/15230406.2016.1174886.
- Zawadzki, J., Medyńska-Gulij, B., 2024. Landscape reconstruction with earth-and-timber medieval stronghold—immersive geovisualization. *Land*, 13(8), Art. 1323. DOI: 10.3390/land13081323