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Cartographic sources in the immersive geovisualization of a medieval stronghold

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Abstract:

This study aims to combine various sources to reconstruct and create a virtual immersive geovisualization of the typical Slavic stronghold from the 10th century to its contemporary state with the utilization of cartographic heritage sources including archive maps, old sketches and paintings. This necessitates meticulous examination, compilation, validation, transformation, and appropriate utilization of cartographical heritage sources to base the virtual reconstruction of an object on the best available data reflecting its appearance at the chosen time of analysis. The lack of well-established workflows in the field of cultural heritage reconstruction introduces a significant amount of subjectivity, negatively impacting the development of a coherent reconstruction methodology for both architectural objects and terrain. The object itself has undergone significant degradation over the years of disuse, as well as changes in terrain that hinder the recognition of its topography and function. The cartographic sources as a whole - archaeological research, historical studies, and modern cartometric data come to the rescue, enabling the representation of the object in various changing states after being compiled, transformed, and compared. Based on their characteristics and respective utility, these sources will be classified as either cartometric or non-cartometric in the ways similar to the concepts of the previous studies (Zawadzki 2023). The work also tries to address the issue of double heritage when reconstructing objects: which involves the need to use cartographic heritage such as the previously mentioned old maps and drawings to reconstruct field objects considered as objects of cultural heritage

Particular attention will be paid to the terrain changes that have occurred over the years, which are associated with environmental changes and the use of objects and are related to the concept of immersive visualization (Cecotti, 2022), i.e. a method of presenting terrain changes in a user-friendly interpretive form. the presentation of a three-dimensional environment in terms of visualization of medieval stronghold and with a virtual reality headset system has already been explored (Zagata Medyńska-Gulij, et al., 2021) but the general workflow of 3D virtual reconstruction within objects during various epochs has not been fully developed especially when it comes to recreating the terrain change and land level interference between various objects from different epochs. The conceptual workflow of this study is presented on Figure 1. The reconstruction of old topography is a challenge to the cartography itself, thus a need of the interdisciplinary approach connected not only to cartographical heritage but also to the validation of the historical cartographical sources by the historical methodologies and utilizing them in the cooperation with methodologies related to the 3D modeling and other reconstruction methods.

This research analysis will aim to validate and use the sources in the context of their reference and reconstruction value on the example of an immersive geovisualization of the state of the early Piast stronghold from the 10th century to the modern state in a virtual reality environment, focusing on terrain and topographic changes. The results of the study will be presented in a way suitable for immersive geovisualization (Carbonell-Carrera et al., 2021). The source classification will be created in such a way as to classify visualization sources as repeatable and applicable in a broader aspect of research. The study will focus on several aspects of this approach. First, it is important to understand how visualization sources can be used in the research process. They not only serve to present data, but can also be used to validate and reconstruct historical or spatial contexts. Second, it is important to create a systematic classification of sources that will enable other researchers to replicate and apply our methods in other research contexts. This approach not only contributes to improving the quality of research, but also allows you to compare the results of different studies and build on them. Finally, it is worth emphasizing that immersive geovisualization in a virtual reality environment opens new possibilities for historical and archaeological research. It allows for a more interactive and engaged exploration of the past and a better understanding of the changes that geographical areas have undergone over time. By focusing on these aspects, the study aims not only to contribute to a better understanding of this particular stronghold, but also to develop a research methodology that can be applied to other areas of historical and archaeological research.

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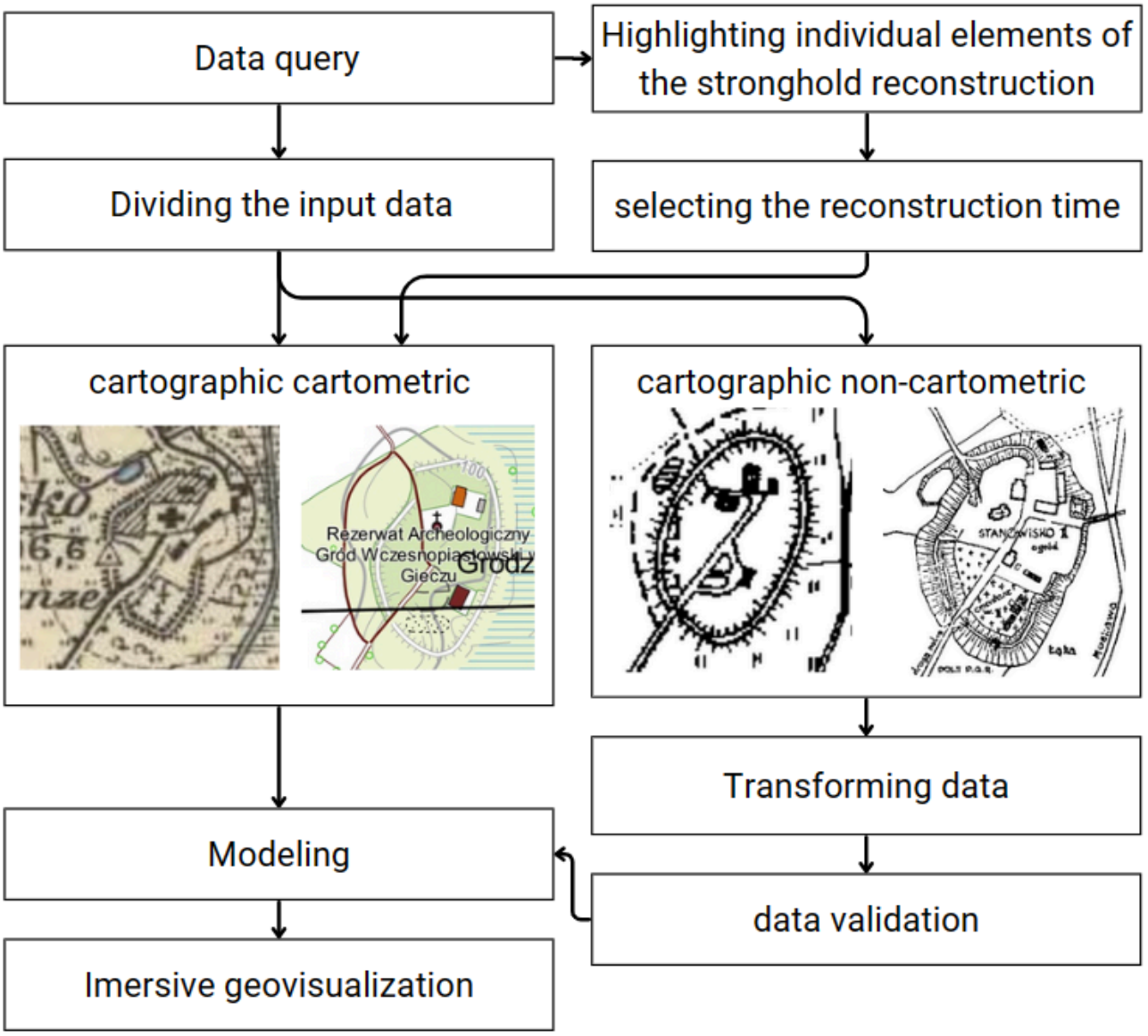

Figure 1. Concept of a workflow

References

Carbonell-Carrera, C., Saorin, J. L., & Melián Díaz, D. (2021). User VR Experience and Motivation Study in an Immersive 3D Geovisualization Environment Using a Game Engine for Landscape Design Teaching. Land, 10(5), 492. https://doi.org/10.3390/land10050492

Cecotti, H. (2022). Cultural Heritage in Fully Immersive Virtual Reality. Virtual Worlds, 1(1), 82-102. https://doi.org/10.3390/virtualworlds1010006

Zawadzki, J. (2023). Źródła referencyjne i rekonstrukcyjne do geowizualizacji porównawczej grodu w Gieczu w XII i XXI wieku. [Reference and reconstruction sources for comparative geovisualization of the stronghold in Giecz in the 12th and 21st centuries] Badania Fizjograficzne Seria A - Geografia Fizyczna, 13(A 73), 227–239. https://doi.org/10.14746/bfg.2022.13.13

Zagata, K., Gulij, J., Halik, Ł., & Medyńska-Gulij, B. (2021). Mini-Map for Gamers Who Walk and Teleport in a Virtual Stronghold. ISPRS International Journal of Geo-Information, 10, 96. https://doi.org/10.3390/ijgi10020096