

Topographic databases in the creation of immersive geovisualizations for natural heritage sites

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Abstract:

National topographic databases are currently the primary source for creating 2D and 3D topographic visualizations. This publicly available data has become the foundation for building topographic spatial systems on national, regional, and thematic geoportals. Topographic data with a level of detail equivalent to a scale of 1:10,000, with current and uniform coverage across the entire country, are most useful. A growing number of geoportals for cities and small administrative units are using building shapes from these topographic databases for 3D visualization (Halik 2018). While creating 3D buildings and transferring them to a virtual topographic space is a relatively automated process, presenting natural objects presents more challenges. In immersive geovisualizations on topographic scales, it is possible to combine real-world representations of objects with 2D symbols for these objects, following the principles of constructing pictorial cartographic symbols (Medyńska-Gulij 2008). This allows users to directly interpret flat symbols placed on 3D buildings, e.g., hotels or libraries. Therefore, it is perceptually acceptable to mix the dimensions of cartographic symbols and structures with different levels of detail and different levels of abstraction for the city's topographic space.

This paper focuses on the possibility of appropriate symbolization of natural objects, especially in the case of creating immersive geovisualizations for natural heritage sites. Such important natural sites require a specific approach to selecting appropriate symbolization. Along the Warta River near Poznań in Poland, there is a large cluster of about 1,400 oaks, constituting the largest cluster of pedunculated oak trees in Europe. Most of these oaks, approximately 700 years old, are protected as natural features of historic importance. It is worth emphasizing that these oaks grow on the river terrace between former and current meanders, which requires appropriate representation of this specific terrain relief.

To explore the possibilities of representing these monumental oaks in immersive geovisualization, the following symbol variants were prepared, based on the level of abstraction and perspective view: typical conventional topographic signs of a deciduous tree in vertical and horizontal views, and pseudo-3D symbols in two levels of abstraction, in a first-person view and in an isometric view. Selected object layers and digital terrain model from the National Database of Topographic Objects (BDOT10k) were used as reference.

According to the student respondents, the most appropriate form for natural interpretation is a simplified pseudo-3D symbol in an isometric view. This clearly demonstrates the understandable preference for isometric symbolization for topography in computer games and the higher level of immersion in virtual reality (Slater 2018). However, for quantitative interpretation, students indicated that conventional symbols (Lambert, Zanin 2022), which allow for better quantitative interpretation, are preferable. In addition to the subjective opinions of respondents, objective research is planned, involving specific tasks for users to analyze the relationships between oak tree locations in the river meander system.

References

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