

User preferences for 2D markings of public buildings in immersive 3D geovisualizations

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Abstract:

The aim of designing signs on maps and other cartographic visualizations for public buildings should be to enable the user to quickly and intuitively recognize them and unambiguously interpret them. The visual attractiveness and the level of abstraction of the symbolization of public objects in cartographic representations are also significant.

In a large-scale topographic map, a sign of a building or description of such building is placed on the building surface. The shape of such a building is a figure resulting from the perpendicular projection of the building's body on the ground. More and more immersive geovisualizations use the 3D building blocks generated by a relatively simple transformation of building blueprints recorded in official national spatial databases.

In our research, we address the problem of marking public facilities in the city represented by buildings (LOD1) in immersive virtual reality. The aim of our research was to indicate user preferences for 2D markings (signs) of public buildings in immersive 3D geovisualizations. The development of tools/libraries enabling the presentation of virtual environments in web browser or head-mounted displays (HMDs) makes it increasingly important to try to answer the question: What forms of 2D markers do users of immersive geovisualizations prefer in terms of visual attractiveness and recognition of the meaning of individual signs?

In the prepared virtual city space, users wearing HMD were asked to provide their opinions on three forms of cartographic markers: the least abstract - a photograph of a building, a typical pictorial sign and the most abstract - text. For the purposes of the experiment, a set of four 3D geovisualizations of a fictitious city was developed with six public buildings exposed: a theater, a hotel, a cinema, a museum, a post office and a library, which were distinguished in the following colors: red, yellow, purple, green, blue, orange (Figure 1). Three visualizations contained one type of 2D marker (photo, symbol, text), while the fourth (mixed) contained three forms of marking, each for two buildings.

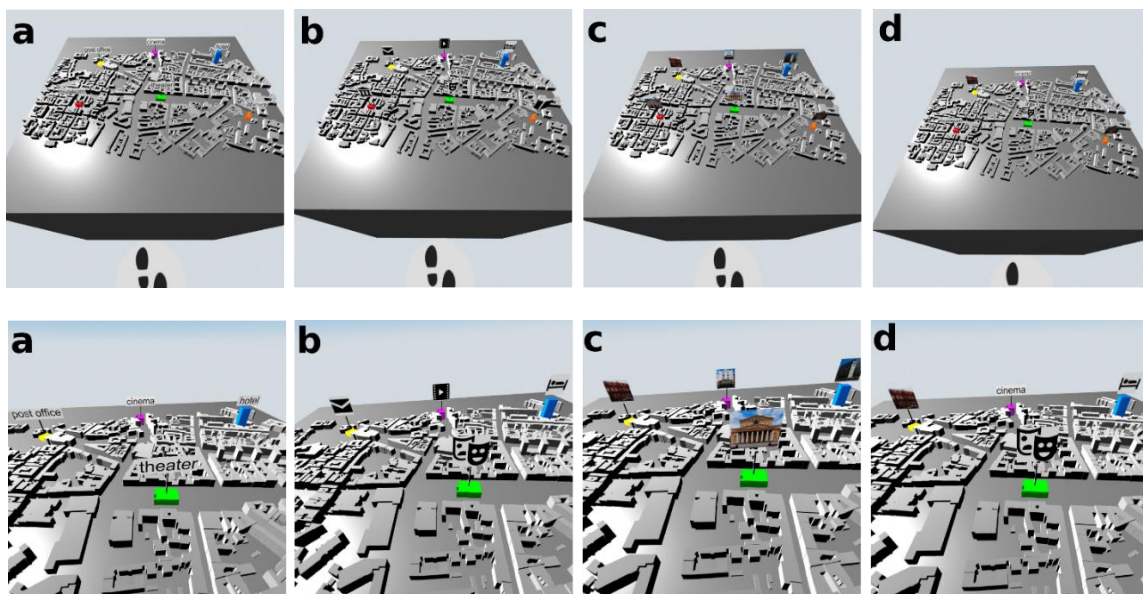


Figure 1. Set of four 3D geovisualizations viewed in an immersive virtual environment showing different types of 2D cartographic markers, a) text b) symbols c) photos d) mixed

Geovisualizations were created using the A-Frame JavaScript library supporting the webXR standard. This approach allows the experiment to be performed on different sets of HMDs. 90 geography students took part in the experiment in three groups: group 1: text + mixed, group 2: symbols + mixed, group 3: photos + mixed. Users wearing HMD had to answer several questions in terms of their subjective preferences and effectiveness of each type of presented markings.

The results of the experiment showed that there are differences in preferences for the cartographic forms of 2D markers in immersive 3D geovisualizations regarding the visual attractiveness and recognition of the meaning of the signs developed for the experiment.