Possibilities of Geographic Virtual Environments within the Crisis Management

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Abstract:

Virtual geographic environments are established and still emerging in various fields of science, including geography and cartography (Çöltekin et al., 2020). The potential usage of geographic data within such an environment includes generating digital twins (Batty, 2018), which can be used for simulations of situations that are unable or hard to perform in a real environment. This advantage can be crucial for Crisis Management in performing emergency evacuation (Stachoň et al., 2023), evaluating navigation systems, etc.

As build-up areas and individual buildings are becoming increasingly complex, there is an increasing demand for assisting humans in navigation and other tasks in such environments. One of the possible navigation systems is emergency evacuation signs and indoor navigation maps/plans. It is still unclear if current map design principles are fully transferable to indoor maps (Griffin, White, et al., 2017), or what methods of map interactions might best support uses of maps in such contexts (Nossum, 2013) as well as what field methods can be used to study these map uses in ecologically valid ways (Roth et al., 2017).
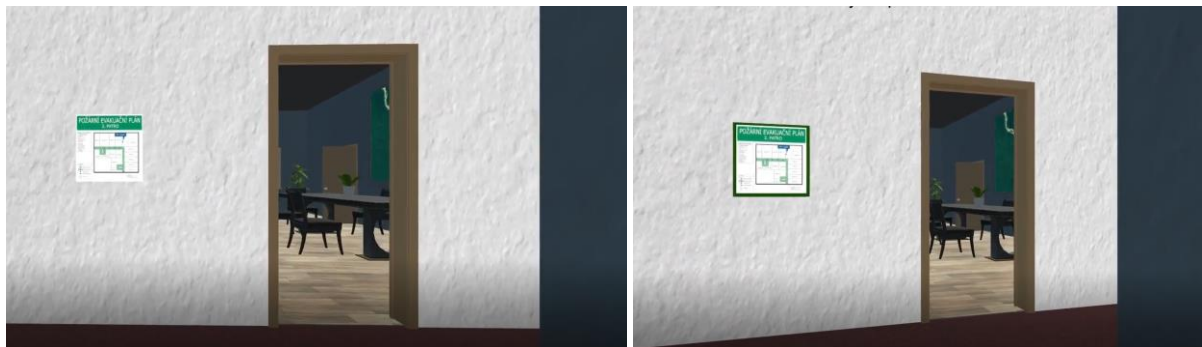

Figure 1. The difference in general visual saliency of evacuation plan using different frame colors.

This study realized using digital twins is focused on revealing the potential of virtual geographic environments for evaluation and optimization of cartographic visualizations – emergency evacuation plans. Recorded interactions provided deep insight into user behavior and strategies during the emergency evacuation. It includes not only understanding the evacuation plan/symbol set but also the external variables like a contrast to the background (see Figure 1), position, size, etc. The future research direction and unresolved issues are also discussed.

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