# User aspects of navigation in virtual environments

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Due to the technological revolution, new opportunities have emerged for cartographers in recent years. New kinds of cartographic visualizations have developed, among others 3D imagery and virtual environments (VEs), that can be created in varying degrees of abstraction. Virtual environments represent opportunity for both cartographic and psychological research, as they both strive to utilize the advantages of controlled environments and stimuli. Knowledge and experience obtained in virtual reality can be under certain circumstances transferred into the real environment, however still, participants tend to perform differently in these two conditions. Due to safety, financial or capacity reasons, in same cases it is hard to perform certain tasks in reality, and virtual environments may represent convenient substitution.

We conducted series of experiments concerning task solving in different types of virtual environments and focused mainly on different levels of immersion and interactivity on one hand, and user behavior on the other. We also addressed the impact of two stimuli with different level of realism on user indoor navigation. Participants were instructed to navigate through a designated evacuation route, which they previously learned with the use of virtual tour, respectively a 2D floor-plan. The successful completion of the task was measured by the number of wrong turns during navigation. We also asked the responders to describe the evacuation route verbally and draw a map to be used for potential evacuation. The resulting data was obtained using several qualitative and quantitative research methods (mobile Eye Tracking, structured interviews, cognitive maps, formulation of navigation instructions, additional questions evaluating spatial orientation). The results suggested that participants from both groups were able to finish designated navigation route, but more detailed mental spatial representations were provided by the “virtual tour” group. Participants formulated richer navigation instructions, plotted more landmarks in cognitive maps, but their layouts were topologically less accurate compared to the "floor plan" group.

Findings obtained from presented studies should serve as a basis for further research concerning user behaviour and between user interaction in situation of indoor fire outbreaks and evacuation scenarios. As these aspects cannot be easily studied in real conditions, for simulation we plan to use collaborative virtual environments where more agents are included. Results of the research will provide valuable information for designing effective and user friendly evacuation instructions and routes in complex environments.