ORAL PAPER

Spatial Cognition and Wayfinding Strategy During Building Fire

Leila Hajibabai • M. R. Delavar •
M. R. Malek • A. U. Frank

Keywords spatial cognition · fire emergency · wayfinding · crisis management · indoor environment

Abstract Simulation of human behavior in space is a powerful research method to advance our understanding of the interaction between people and their environment. It allows for both the examination and testing of models and their underlying theory of cognitive and perceptual phenomena as well as the observation of the system's behavior. This paper outlines the use of specific spatial objects to facilitate escaping from an indoor environment in a crisis situation.

There have been a number of events in which extensive life loss have been happened because the time needed for safe evacuation from a threatened building was not adequate. There is a need to understand how the people, the building, and the environment react during a fire. The occupant characteristics, human response to cues, decision-making and wayfinding will be outlined in this paper.

The goal-driven spatial reasoning that leads to action begins with incomplete and imprecise knowledge derived from imperfect observations of the space. In most cases people are unfamiliar with the environment or the situation is critical and they should find their destination with external information and with no available maps. Such information can be achieved through the signs, etc. To represent and simulate people's processes of wayfinding it is necessary to understand how people immediately make sense of spatial situations while performing a wayfinding task which will occur in a building during fire emergencies.

A scientific wayfinding strategy in a fire emergency is developed in this research, which would allow the assessment of the achieved information for people in a critical situation. In this process, one would decide upon paths with the use of signs and topological specifications in decision points in order to find his/her way to escape from the building. The theoretical outset of the research is the observation that humans show distinct behavioral and cognitive preferences when dealing with wayfinding tasks in dangerous situations.

The goal of the research is to organize environmental cues and to use them in decision-making and navigation in an indoor environment in a fire emergency. Construction and inspection of mental representations of spatial environments and exploring these models have been discussed and the proposed computational model tested in an indoor complex building. Initial results verify the reliability of the model.

L. Hajibabai (✉) • M. R. Delavar • M. R. Malek • A. U. Frank
Center of Excellence in Geomatics Engineering and
Disaster Management,
Dept. of Surveying and Geomatics Engineering,
Engineering Faculty, University of Tehran, Iran
lhaji@ut.ac.ir

A. U. Frank
Institute of Geoinformation and Cartography, Wien, Austria