A Framework of AR-Enabled GIS Affordances for Disaster Response

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Moataz Soliman
Rowe School of Business
Dalhousie University
moataz.soliman@dal.ca

Michael Bliemel
Faculty of Business and IT
University of Ontario Institute of Technology
Michael.bliemel@uoit.ca

Binod Sundararajan
Rowe School of Business
Dalhousie University
binod@dal.ca

Abstract

Disasters exact a huge human and economic cost worldwide and it is thus crucial to strive for improving the effectiveness of disaster response and training. Among the critical success factors identified for effective disaster response are obtaining and sharing situational awareness across distributed organizational networks, coordination, multiorganization response, and the ability to collect, analyze, and distribute relevant information (Harrald, 2006). Augmented reality/Mixed reality (AR/MR) tools -in conjunction with geographical information- can offer valuable contributions in facilitating emergency response and preparedness (e.g., Tsai et al., 2012). In this research, we endeavor to develop a framework of the affordances offered by AR-enabled geographic information systems (GIS) tools, and to examine the impact of those affordances on the effectiveness of disaster response. Guided by Technology Affordances and Constraints Theory (Majchrzak and Markus, 2013), we examined several studies and extracted some affordances, along with constraints, that AR-GIS tools can present. The next phase of our research will involve further developing the framework, in addition to conducting experiments using Microsoft HoloLens; a fully untethered, holographic computer that enables users to interact with high-definition holograms -and other objects- in the real world using gaze, gesture, and voice. The experiments will involve evaluating the performance of individuals and teams using HoloLens as compared to more traditional collaboration methods such as text messaging and voice communication. Our research will seek evidence of measurable improvement in disaster response key performance indicators but would also showcase possible limitations of current HMD tools, such as physical strain and/or headaches on prolonged use. The results of this research are expected to contribute to our knowledge about online collaboration, and to inform designers about what works and what needs to be revisited.

Keywords

Augmented reality, mixed reality, geographic information systems, disaster response, online collaboration.

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