

A Virtual Reality Simulation Tool for Reducing the Risk of Building Content during Earthquakes

Authors : Ali Asgary, Haopeng Zhou, Ghassem Tofighi

Abstract : Use of virtual (VR), augmented reality (AR), and extended reality technologies for training and education has increased in recent years as more hardware and software tools have become available and accessible to larger groups of users. Similarly, the applications of these technologies in earthquake related training and education are on the rise. Several studies have reported promising results for the use of VR and AR for evacuation behaviour and training under earthquake situations. They simulate the impacts that earthquake has on buildings, buildings' contents, and how building occupants and users can find safe spots or open paths to outside. Considering that considerable number of earthquake injuries and fatalities are linked to the behaviour, our goal is to use these technologies to reduce the impacts of building contents on people. Building on our artificial intelligence (AI) based indoor earthquake risk assessment application that enables users to use their mobile device to assess the risks associated with building contents during earthquakes, we develop a virtual reality application to demonstrate the behavior of different building contents during earthquakes, their associate moving, spreading, falling, and collapsing risks, and their risk mitigation methods. We integrate realistic seismic models, building contents behavior with and without risk mitigation measures in virtual reality environment. The application can be used for training of architects, interior design experts, and building users to enhance indoor safety of the buildings that can sustain earthquakes. This paper describes and demonstrates the application development background, structure, components, and usage.

Keywords : virtual reality, earthquake damage, building content, indoor risks, earthquake risk mitigation, interior design, unity game engine, oculus

Conference Title : ICERDCES 2023 : International Conference on Earthquake Resistant Design for Civil Engineering Structures

Conference Location : Istanbul, Türkiye

Conference Dates : June 22-23, 2023