Using 360o Panoramic Augmented Reality for Fall Hazard Identification

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Falls are the leading cause of fatalities in the construction industry and account for approximately a third of the injuries in the US. Additionally, falls usually lead to severe injuries and require long, costly periods of recovery. Therefore, falls have become a key target area for intervention and prevention in construction. Currently, virtual modeling methods such as Building Information Modeling (BIM) provide a media to visualize components and manage and coordinate associated construction management activities. These virtual models mediate to simulate and address the replacement of the full real-world conditions – time, physical space, and material properties. However, these models hinder and diminish the full perception of the real-world environment, providing users with an unreal computer-generated simulation of a construction environment. These limitations stem from the fact that simulating as-built work environments in virtual platforms is time-consuming and computationally expensive. To address these limitations, this study utilizes a novel 360o panoramic augmented reality technique to develop mixed reality safety training environments for fall hazard identification. The objective of this research is to investigate the ability of panoramic augmented reality as a vehicle to facilitate fall hazard identification learning. The very nature of panoramic augmented reality demands users' observation and interaction with hazards on the jobsite to better identify safety challenges in different construction instances.

A platform will be created using panoramic augmented reality to develop hazard identification skills within complex context of real construction projects. The platform development will involve a set of interconnected 360o panoramic augmented reality scenarios that represent several distinct (fall hazard) safety related challenges on real projects. The platform will be assessed using a small-scale, class training where construction management students will be the target audience. Two methods will be used to facilitate the learning assessment: pre-training and post-training questionnaires, and measuring hazard identification index. To assess the learning of the trainees, questionnaires will be distributed before and after the intervention. The hazard-identification index (number of hazards identified by the trainee divided by the total number of identifiable) will be used to assess the trainees' hazard identification skills during the training. Statistical analyses will be performed based on the data collected.

On this ongoing research, the results from assessment of the platform are not available yet as they are being currently collected. It is anticipated that trainees will develop hazard recognition and awareness for construction jobsites topics. This would ultimately lead to a safer jobsite, and will provide an efficient place to investigate innovative ways of hazard identification training by bringing real physical hazardous situations closer to users in a completely safe controllable way. The immersive true-to-life learning experience will be provided for free through a website to students, workers, and professionals around the world to be easily used in any platform (e.g. Smartphones, tablets, PC, laptops, head-mounted-displays).

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