With advancement in technology, building structures are becoming bigger and more complex. As a result, incidences of horrifying building fires that result in loss of property as well as lives are being recorded worldwide. Emergency evacuation training can play a crucial role in mitigating damage not only in cases of fire, explosion or chemical spill but also in cases of natural calamities like floods and hurricanes. Conventional safety training provided in industries mostly comprises of unidirectional flow of information. Due to this passive learning style, response of employees in real life emergency situations is known to be ineffective. The proposed research focuses on the development of 3D virtual emergency evacuation safety training for residents, workers and employees which will be more engaging and effective.

In this research, a 3D virtual fire safety and emergency evacuation training was developed for occupants of a building. Participants could visualize and interact with various objects, avatars and scenarios created in 3D virtual model of a real engineering college building on a standard desktop computer by controlling an avatar through keyboard and mouse. Expert interviews and literature review were utilized to develop contents of this training. A conventional slide based fire safety and emergency evacuation training was developed and made available through a website. An effort was made to develop both trainings comparable in terms of contents. A case study with two experiments comprising of 144 participants from UCF community was conducted to understand factors such as fidelity, simulation sickness, engagement and effectiveness of 3D virtual and web based fire safety and emergency evacuation training. Results of fidelity and simulation sickness validated fitness of 3D virtual training for the purpose of training residents on fire safety and emergency evacuation. Knowledge test data analysis allowed to compare short term and long term effectiveness of 3D virtual training and slide based training. To further understand engagement, physiological measure-electroencephalogram (EEG) of 40 healthy participants was recorded in second set of experiments. Ratio of power in Beta and Alpha frequency bands was studied to understand level of attention and focus of participants in 3D virtual and slide based training.

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Approved for distribution by Luis Rabelo, Committee Chair, on October 11, 2016.

The public is welcome to attend.