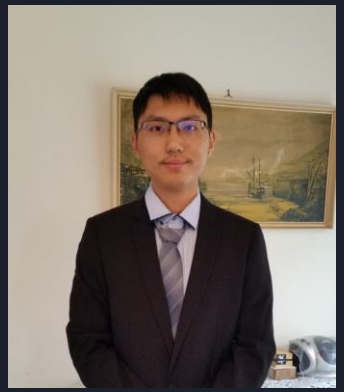
Seismic Preparedness for the General Public Using Virtual Reality: Literature Review

Presented by Chen Zhao, Edwin Roesli

Our Research Team

Student



Chen Zhao

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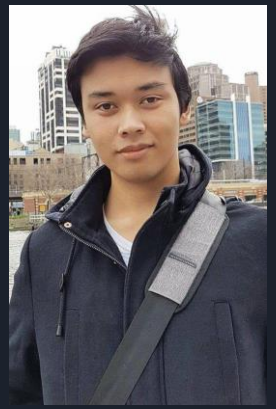

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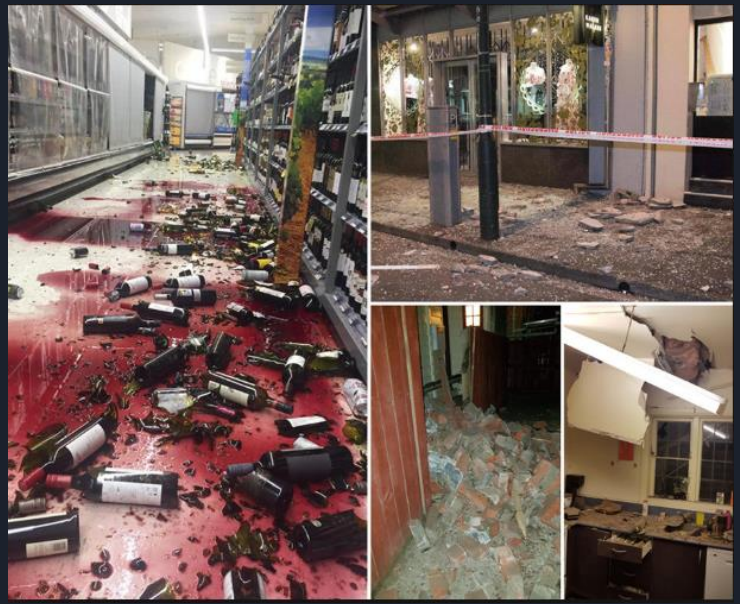
Objective of Our Research

- Hazard Identification in Earthquake Preparedness.
- Why hazard identification?
  - Hazards cause injuries to people.
  - Hazards cause damages to structures.

Background

- Earthquake
- Virtual Reality
- Serious Gaming

Earthquake



- What is an earthquake?
- Why do earthquakes cause damage?
- The importance of earthquake preparedness

Earthquake

Effects on Structural Elements

Connection Failures

Loss Support Failure

Effects on Non-structural Elements

Racks Failures

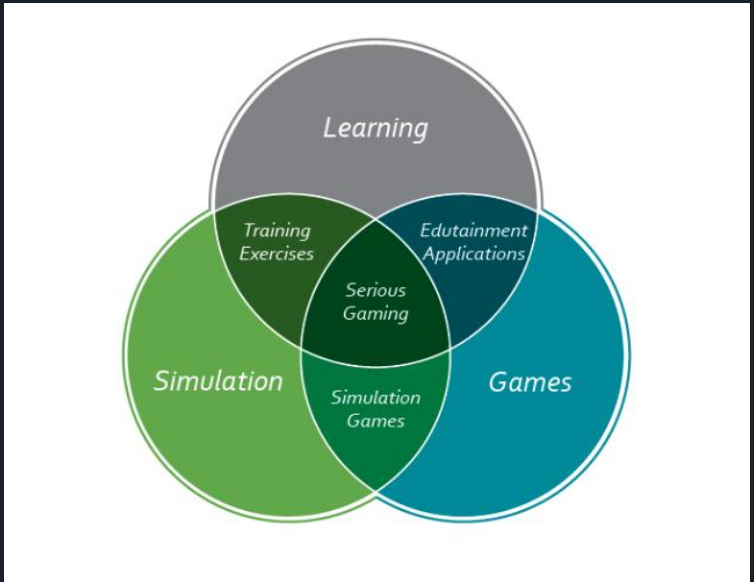
Cladding Panel Failures

[1] N. Helm, Seismic performance of non-structural systems. Poriria, New Zealand: BRANZ Ltd, 2018.

Virtual Reality

- What is virtual reality (VR)?
- What are the common types of VR ?
- What can VR bring to the user?

Serious Gaming



- What is Serious Gaming?
- Advantages of Serious Gaming

[38] D. R. Michael and S. L. Chen, Serious Games: Games That Educate, Train, and Inform. Muska and Lipman/Premier-Trade, 2005.

Related Work

- VR simulations and its advantages
- Earthquake Simulations
- Earthquake Evacuation drills

VR simulations

Previous work:

- Endoscopic simulator [1]
- Human anatomy simulator [2]

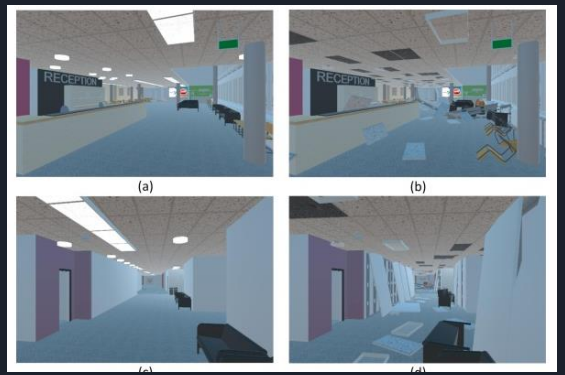
Advantages:

- Interaction
- Imagination
- Immersive

[1] I. White, B. Buchberg, V. Tsikitis, D. Herzig, J. Vetto, and K. Lu, A virtual reality endoscopic simulator augments general surgery resident cancer education as measured by performance improvement, Journal of Cancer Education, vol. 29, no. 2, pp. 333336, 2014.
[2] H.-M. Huang, U. Rauch, and S.-S. Liaw, Investigating learners' attitudes toward virtual reality learning environments: Based on a constructivist approach, Computers and Education, vol. 55, no. 3, pp. 11711182, 2010.

Earthquake simulations

- Simulation based around the Auckland hospital [1].
  - Behavioural prototype, used to see how people behave during an earthquake using non-playable-characters (NPC)
  - Training prototype to teach best practices
  - Chair shaking system also implemented to add to the immersive nature of VR



[1] R. Lovreglio, V. Gonzalez, Z. Feng, R. Amor, M. Spearpoint, J. Thomas, M. Trotter, and R. Sacks, Prototyping virtual reality serious games for building earthquake preparedness: The auckland city hospital case study, Advanced Engineering Informatics

Earthquake evacuation drills

- Preparation and planning during an earthquake
- Aims to reduce the fear of uncertainty and lack of knowledge
- Provides that randomness of never knowing when it may occur

Disadvantages:

- Participants treated the drills as a compulsory exercise with little meaning [1]
- Lack of immersion

[1] D. M. Simpson, Earthquake drills and simulations in community-based training and preparedness programmes, Disasters, vol. 26, no. 1, pp. 5569, 2002.

Discussion

- Gap between related literature and our Project
  - Some of the technologies mentioned are not readily attainable
  - Most implementations focuses on reactiveness rather than proactiveness
  - Serious gaming concepts to boost users confidence

- Research intent
  - Research the effectiveness of a virtual reality tool on a user's preparedness in an earthquake compared to traditional means such as reading hazard guides
  - Research the effect on confidence of a user’s ability to identify hazards before and after using a virtual reality tool

Summary

- Earthquake, virtual reality and serious game concepts
- Importance of hazard identification on Earthquake Preparedness
- Previous literature and implementations
- Research intent

Questions????