

Title	Earthquake Evacuation Behavior of Foreigners in Osaka Station Based on VR Technology
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Citation	
Issue Date	2024-03
Type	Thesis or Dissertation
Text version	author
URL	<a href="http://hdl.handle.net/10119/18927">http://hdl.handle.net/10119/18927</a>
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## Abstract

With the shifts in Japan's economy and society, Japan has attracted more foreign immigrants. With the relaxation of the Japanese government's border policy, the number of foreign tourists in October 2023 in Japan increased by 0.8% compared with that before COVID-19. Moreover, Japan is a country with frequent earthquakes, which presents a greater challenge for foreign residents or tourists with limited capabilities in disaster evacuation compared to native Japanese who have received disaster training since childhood. If we can have a more realistic understanding of the evacuation behavior of foreigners in Japan, it can be very meaningful to improve Japanese disaster response measures and enhance evacuation management capabilities.

So to have a more realistic understanding of the evacuation behavior of foreigners in Japan towards earthquakes, we developed a simulated evacuation VR system using Unreal Engine 4 and PICO 4. The system scene is Osaka Station. We collected behavior sequence datasets of the evacuation behavior of experimenters in real and virtual scenes using different recording methods. We used the Behavior Sequence Analysis method to encode the behavior of each foreign experimenter and analyzed the Levenstein distance between the evacuation behavior sequence in the VR simulation evacuation system and in real-life situations. We also calculated the cosine similarity based on behavior frequency as a vector to explore and analyze the differences in evacuation behavior habits between normal and earthquake situations. In the results section, we analyzed and discussed the differences in each behavior sequence, differences in evacuation behavior data in different environments, the impact of human flow on foreigners' evacuation behavior, route selection, and exit selection preferences.

**Keywords:** Understanding of the evacuation behavior, Simulated evacuation VR system, Behavior Sequence Analysis