UNIVERSITI TEKNOLOGI MARA

AN INDOOR EVACUATION ASSESSMENT ALGORITHM FOR CRITICAL INCIDENT

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ABSTRACT

Evacuation is defined as the retreat, dispersal, or withdrawal of people from places of risk or threat. Their reception and treatment in safe environments were coordinated, controlled, and monitored. The complicated interior design of large public buildings and the involvement of many people make evacuation management more difficult. Therefore, it is essential to have the proper emergency evacuation in every high-rise building. Currently, many developed evacuation models focus on studying different evacuation behaviour and evacuation time. Hence, the models differ in terms of features. Furthermore, comparison and validation of the evacuation model is the missing process before applying the suitable evacuation model. Both procedures were made independently without any standard assessment that encapsulates the critical incident features during the indoor evacuation and virtual spatial elements. Therefore, this research has adapted Integrated Assessment Model (IAM) in developing the conceptual research framework and the K-Mean algorithm to cluster average time taken results in developing an assessment algorithm called Indoor Evacuation Assessment Algorithm (IEAA). For the evacuation model, the microscopic model, a type of evacuation model, is chosen in developing the i-EAA since human movements and activities are more reliable and generally defined. Under the microscopic model, this research focuses on the Agent-Based Model (ABM), Cellular Automata (CA), and Social Force Model (SFM). Each model is represented by simulation software called Pathfinder, PedGo, and AnyLogic, respectively. There were seven attributes identified, which are the number of agents, agents' behaviour, room size, number of doors, number of staircases, blockage, and number of exits. The floor plan of levels 13 and 14 of Yayasan Melaka, a high-rise building located in Melaka, was used for the ten simulations study. This research then evaluates the IEAA by comparing the simulation result of the chosen evacuation models. The lowest average time taken determines which evacuation model suits the chosen high-rise building. Based on the result, 65% of the lowest average time taken is from Pathfinder, and 35% is from PedGo in producing the lowest average time taken. Further analysis of the independent samples test for Pathfinder and PedGo was conducted after the standard deviation and standard error mean were completed. As a result, there is no significant difference between Pathfinder and PedGo, which is 0.504 for level 13 and 0.455 for level 14, where the p-value is >0.05. Thus, the conclusion stated that Pathfinder represented the ABM evacuation model as the best evacuation model for Yayasan Melaka due to the lowest mean value. IEAA has contributed to developing the systematic assessment that can help determine which evacuation model is best implemented in the chosen high-rise building.

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