Modelling the Movement of Crowd Evacuation Using Computational Simulation Technique

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Abstract
The Artificial Intelligence is related to Computer Science and the computational modelling techniques are part of Artificial Intelligence likewise the computational and simulation model. The technique consist the theories and concept which can be operated by the machine and important to realize that the computational method allows for creating, analyzing and experimentation. The most popular and well-known technique is Agent-based Simulation (ABS). ABS is able working in emergent phenomenon with the characteristic of individual agent behavior and movement. Whereas Social Force Model (SFM) has been used in last few decades and attracted the researchers in the crowd evacuation investigation. Hence artificial intelligence (AI) is advancing to produce more concise and interesting crowd behaviors but not guarantee to produce the realistic model. So, this research work investigates the three simulation techniques which are SFM, ABS and the hybrid of SFM/ABS in order to simulating the crowd evacuation of human pedestrian in the building using computational simulation tool. The research work has been started with the case study description and data collection. Secondly, the development of conceptual model and the implementation of the simulation models using the computational simulation tool. This research work aimed to have these three different computation simulation techniques and intended for the most appropriate and better simulation model as the expected results. Findings from this research work show that the proposed simulations model using the computational simulation techniques can assist developer and the researcher to implement the human movement of crowd simulation model (a case study of in the building on fire)

Keywords: computational modelling technique; social force model; agent-based simulation; simulation model; crowd simulation; artificial intelligence.

1. Introduction

Simulation model is used as a support tool for decision-making and prediction for the effects for any changes or optimize the technique in terms of time, cost, effort, and identity safety. In order to produce a model and the results, the simulation models are being tested as the simulation modelling implements an experimental test [1][2]. Therefore computational simulation models able to obtain more understanding in a current system through the testing scenario (what-if scenario) using specific software tools. Hence, the simulations model processes have become a useful tool to overcome the issues especially in the modelling the human movement in the crowd evacuation such as building on fire [3].

Important to realize that the fire disasters are the hazardous for pedestrian and evacuation planning is prima facie as a critical component in emergency management [4]. The solution is through the doing simulations for the fire crowd evacuation in the building with the modelling approaches [5]. With attention to simulate a building evacuation for the human pedestrian movement in a real life situation, the modelling of this scenario is needed. In addition, the simulation with a computer program is an interesting element can be done in order to understand and predict the building on fire (as a case study) as realistic as real life situation.

For this reason, the development of computational simulation model is capable of replicating the realistic condition [6]. As the case study of the crowd evacuation for fire emergency scenario in the office building, this research work proposed these three simulation techniques; ABS, SFM and hybrid SFM/ABS. This research work expected to have the appropriate and better simulation model based on the expected result. The expected result obtains from the preliminary results and validates it using the statistical analysis. The next section describes the aim and objective for this research work and the paper organization as well.

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