

Human evacuation movement simulation model: Concepts and techniques

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ABSTRACT

An emergency scenario is an unforeseen situation that threatens human life, and it is related to the emergent movements of evacuees, which is a critical challenge to model as their movements are unpredictable. However, such practices provide less concern on how humans move, individual behaviours and individual differences, obstacles and other components. Therefore, modelling and simulation (M&S) are one of the methods that can be used to face this issue. Modelling is a method of solving problems that can be replaced by a simple object that describes the real system with its behaviour. A program with a running algorithm of a computer model is called a computer simulation. In order to develop a simulation model, a conceptual model consisting of a few components such as input, output, and techniques to be used is found to be important to be investigated for modelling the human evacuation egress (EE) movements. Therefore, two simulation techniques were found appropriate for modelling human EE, namely Social Force (SF) and Agent-based (AB). AB is autonomous with self-directed agents that pursue a series of predefined guidelines and rules to accomplish the objectives whilst the interaction among agents and the environment. Whereas SF is an approach to representing human behaviour with social-psychological and physical forces. The primary aim of this work is to review previous conceptual models and to propose a preliminary concept for modelling the human EE simulation. The findings reveal that the significant important components, such as the concept of the EE simulation model, have been identified based on the appropriateness and importance of each, such as the simulation techniques, EE movement procedure, and EE movement state. The conceptual model will be designed to assist in the development process of the EE simulation model for future work.

KEYWORDS

Agent-based; Data analytics; Evacuation egress; Human movements; Simulation model; Social force

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