The Simulation Models for Human Pedestrian Movement of a Departure Process in an Airport

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Abstract—The emergence of simulating human movement and behaviour rose in order to imitate and replace human interference with this complex demeanour. It is so diverse and uncontrollable to the extent it is almost impossible to undergo exhaustive experiments. Hence, simulating this model is crucial. Especially in designing a public area where human density is too much concentration and the need for properly planned traffic or human movement is very much needed. For that, simulations and modelling are always the best options for investigating human behaviour. In this research work, the aim is to investigate how effective and to what extent the Agent-Based Simulation (ABS), Discrete Event Simulation (DES) and hybrid of both give benefits to the society adequately. Its expected results will be an improved and better version of human pedestrian movement in the airport of the departure process simulation model.

Keywords—*simulation model, human behaviour, pedestrian movement, departure process, airport passenger, Agent-Based Simulation (ABS), Discrete Event Simulation (DES)*

I. INTRODUCTION

Airports have its own architectural design concept that differs in many aspects from any other types of building. It usually designed to accommodate a large sum of air travellers and visitors. That explains why it was built spaciously and usually systematically. As human movement or specifically pedestrian movement is so dynamic and varies, modelling it will not be an easy one. Especially when using tools that are too dependent on the pre-determined instructions which are a contrast to how humans behave.

There are a series of procedures that must be done in an airport terminal right before departure. Generally, those are; i) baggage check/ screening, ii) check-in, iii) immigration check, and iv) identity check before boarding. These are important procedures that air travellers need to go through before boarding any aeroplanes. It must be done systematically and in control to avoid any illegal air-boarding and for the cause of security.

As much as a solar system's replica would benefit in giving understanding to researchers and society, the same benefit applies to an imitation of a system. It mimics the real system in order to give understanding and helps in seeking improvements for those who involved with it. To have a clear view on how an emergent behaviour corresponds with good building layout designs in a pedestrian movement, the importance of modelling the simulation is very much crucial to be taken care of. Some previous researchers agree to the fact that simulating pedestrian movement behaviour using Discrete Event Simulation (DES) and Agent-Based Simulation (ABS) is possible. Of course, both need different approaches for its compatibility with dependent entities and independent agents [1].

Despite having different kinds of the public area and public transportation in Kuantan (Pahang, Malaysia), the airport terminal is chosen due to its systematic procedures before travellers airborne the aircraft. The security level and systematic procedure are also present in the airport departure process compared to any other transportation services here. The scope is then narrowed down to the departure process only instead of having the arrival process included. The narrowed down scopes will ease the process to investigate the key points of the of DES, ABS and hybrid of ABS/DES simulation results when modelling complex human pedestrian movement system. Later, a conceptual model of a hybrid of ABS/DES by using the individual-centric approach can be developed in order to represent each individual type of agent and its interaction.

The paper organization are as follows; Section I is the introduction to the research work. The next section is some literature review of related works. It is divided into three sub-sections which are; i) human pedestrian traffic flow, ii) human movement and the simulation model and the last one is, iii) comparative studies on the human behaviour. For section III, there are seven sub-sections named A until H. In this section, there are discussions about related works including the research methodology, simulation approaches, tools and technology, research scopes, theoretical structure, layout design and conceptual model. Then, section IV describes the research outcome based on the case study. It is related to the simulation and modelling of pedestrian movement for an airport departure process. Some conclusions and discussions are provided by the end of this research work.

II. DISCUSSION. AND CONCLUSION

A. Discussion

In this paper, a simulation model for the human pedestrian movement in the airport is developed to understand and predict the impact of various performance measurement parameters for the departure process of travellers. The models calibrated with the observed data on passengers at the airport. Input service time data at various stages of service is determined by fitting various parametric distributions around the observed data in order to prove which simulation model is the best choice of distribution is determined using various statistical measures.

B. Conclusion

The research work is focused on the human pedestrian movement in the airport based on the process of departure and specifically for the travellers. It also considers the various activities and travellers' behaviour (as in the case study). To have a realistic model for the pedestrian movement is impractical of cost and emergent behaviour of travellers. We proposed the three models to simulate the case study. Other than that, we aim to investigate the performance of the techniques and their characteristic. Most of the researchers justify that the hybrid model may result in better ways, powerful, popular choice, and flexibility as described by [6]. We will come out with the results and analysis with the case studies experimentation as the future works. In terms of to have a realistic simulation model, it needs to consider the most significant elements such as parameters those will influence the simulation results. The proposed techniques will use ABS, DES and combined ABS and DES.

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