Qualitative Methods of Validating Evacuation Behaviors

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Abstract

Multiagent simulations (MAS) have been used to study the whole systems that the interactions among components and the system are difficult to express. However, components of the system can be described. Disaster-related simulation is an example of such systems They include evacuation systems that simulate occupant egress behaviors or assess plans related to rescue responses. Verifying the results of simulations that involve human behavior and validating the utility of these simulations are difficult. In this paper, we discuss the validity of MAS-based evacuation systems by examining qualitative differences perceived in simulations.

Keyword: Agent System, Evacuation simulation, Validation

1 Introduction

Disaster-related application systems involving damage assessment, response measurement, and evacuation guidance. Emergency planning reports have highlighted several concerns that future simulation systems should address [2]. These concerns include modeling individual emotions and interactions between humans, and characterizing the behavior of groups of people in crowds. These concerns cause difficulty in verifying simulation results from empirical data.

2 Related Works

Durupinar et al. defined personality as the regular pattern of a person's behavior and mental traits, and demonstrated the effects of personality on crowd simulations [3]. Okaya et al. proposed an information-transfer and sharing model during evacuation and demonstrated how guidance methods can improve evacuation time. They employed MAS to simulate the features[4].

The simulations with the new features enable effective evacuation planning for unseen emergencies. However, validating the results of these simulations is critical to ensure they apply to real-world cases. Validation requires data from real-world situations [1]. However, data related to emergencies that cannot be foreseen differ from data obtained from prior cases experiments.

3 Validating Simulations

Evacuation drills are conducted periodically to practice smooth and effective evacuations from buildings and rescue operations at emergency sites. The purpose of these drills is to determine flaws in prevention plans for foreseen emergencies or to develop plans to evacuate people effectively. During real disasters, people respond to directives and helpful information from authorities, fellow citizens, family, and friends, and behave differently in response to such information.

We believe that MAS-based evacuation systems can replace evacuation drills that mobilize people in real environments. Evacuation simulations using various scenarios provide us with data for analyzing the qualitative differences of these scenarios.

In this paper, we provide examples of simulations under various conditions and show that qualitative analysis improves disaster prevention plans. The improvement validates the effectiveness of MAS evacuation systems.

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