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## Hybrid Social Force-Fuzzy Logic Evacuation Simulation Model For Multiple Exits

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### Abstract

One of the most important aspect of evacuation management system, when it comes to organizing a safer large-scale gathering is crowd dynamics. Utilizing evacuation simulation of crowd dynamics during egress, for planning efficient crowd control can minimize crowd disaster to a great extent. Most of the previous studies on evacuation models have been done over a discrete space which have neglected the uncertainty aspect of an agent's decision making, especially when it comes to panic situations. This study proposes a model for evacuation simulation under uncertainty conditions in a continuous space via computer simulations. It will focus on developing an intelligent simulation model utilizing one of the artificial intelligence techniques which is fuzzy logic. Social Force Model will be taken as the base for basic agent motion. Membership functions such as distance from the exit, familiarity and visibility of the exit, density of crowd around the exit are incorporated in the fuzzy logic system to model the system. From our findings, it can be deduced that factors such as density, distance, and familiarity all considerably affect the time of evacuation of agents from the threat place. Indeed, uncertainty aspect influences agents' decision making, thus affecting the result of evacuation time.

### Keywords

Author Keywords: Multiple Exits Evacuation Simulation; Fuzzy Logic; Social Force Model and Crowd Dynamics

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