Emergency Evacuation Models Based on Cellular Automata with Route Changes and Group Fields

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Abstract

In this paper, we propose an extension of cellular automata models applied to emergency evacuation pedestrian dynamics. The new extensions are the route change probabilities and group fields. The first extension allows for pedestrians to change direction when necessary to access an alternate exit route. The second extension adds a field that makes groups of pedestrians always walk close to each other and exit together. Several experiments were conducted to study the effects of these new extensions, first to verify the associated collective phenomena and to verify the effect with the security performance measures, more precisely, in the evacuation time, as well as to perform comparisons with other previous models. The main conclusions are that the effects of these new extensions effectively modify the security performance measures and can therefore be important for improving the models and providing better estimates.

Keywords: Traffic flow, cellular automata, emergency evacuation, pedestrian dynamics.