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The impact of potential crowd behaviours on emergency evacuation: An evolutionary game-theoretic approach (Article) (Open Access)

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Abstract

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Crowd dynamics have important applications in evacuation management systems relevant to organizing safer large scale gatherings. For crowd safety, it is very important to study the evolution of potential crowd behaviours by simulating the crowd evacuation process. Planning crowd control tasks by studying the impact of crowd behaviour evolution towards evacuation could mitigate the possibility of crowd disasters. During a typical emergency evacuation scenario, conflict among agents occurs when agents intend to move to the same location as a result of the interaction with their nearest neighbours. The effect of the agent response towards their neighbourhood is vital in order to understand the effect of variation of crowd behaviour on the whole environment. In this work, we model crowd motion subject to exit congestion under uncertainty conditions in a continuous space via computer simulations. We model best-response, risk-seeking, risk-averse and risk-neutral behaviours of agents via certain game-theoretic notions. We perform computer simulations with heterogeneous populations in order to study the effect of the evolution of agent behaviours towards egress flow under threat conditions. Our simulation results show the relation between the local crowd pressure and the number of injured agents. We observe that when the proportion of agents in a population of risk-seeking agents is increased, the average crowd pressure, average local density and the number of injured agents increases. Besides that, based on our simulation results, we can infer that crowd disasters could be prevented if the agent population consists entirely of risk-averse and risk-neutral agents despite circumstances that lead to threats.

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References (53)

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1 Bouzat, S., Kuperman, M.N.

Game theory in models of pedestrian room evacuation

(2014) *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics*, 89 (3), art. no. 032806. Cited 41 times.
http://harvest.aps.org/bagit/articles/10.1103/PhysRevE.89.032806/apsxml
doi: 10.1103/PhysRevE.89.032806

View at Publisher

2 Chen, X.
(2006) *Microsimulation of Evacuation Strategies*. Cited 3 times.
Ph.D. thesis, Texas State University-San Marcos

3 Chizari, H., Malekinezhad, F., Embi, M.R., Yatim, Y.M., Razak, S.A., bin Haji Ahmad, M.H., Bakhtiari, M.

Agent-based approach for modeling evacuee uncertainty behavior using game theory model

(2013) *Life Science Journal*, 10 (3), pp. 1350-1355. Cited 6 times.
http://www.lifesciencesite.com/lsj/life1003/202_19634life1003_1350_1355.pdf

4 Christensen, K., Sasaki, Y.

Agent-Based emergency evacuation simulation with individuals with disabilities in the population

(2008) *JASSS*, 11 (3). Cited 43 times.
http://jasss.soc.surrey.ac.uk/11/3/9/9.pdf

View at Publisher