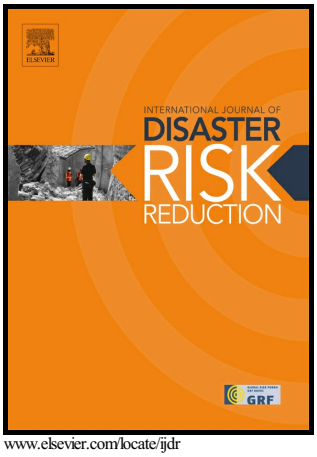

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Video-Based Analysis of School Students' Emergency Evacuation Behavior in Earthquakes

Ziyuan Gu[1,2], Zhiyuan Liu[1]*, Nirajan Shiwakoti[3], Min Yang[1]

[1]Jiangsu Key Laboratory of Urban ITS, Jiangsu Province Collaborative Innovation Center of Modern Urban Traffic Technologies, Southeast University, China

[2]Institute of Transport Studies, Department of Civil Engineering, Monash University, Melbourne, VIC 3800, Australia

[3]School of Aerospace, Mechanical and Manufacturing Engineering, RMIT University Melbourne, VIC 3053, Australia

*Corresponding author. Email: zhiyuanl@seu.edu.cn

Abstract

One of the critical challenges in the development of evacuation models for pedestrian crowds is the lack of complementary data under emergency conditions. Specifically, the study of evacuation behavior of students in schools has been limited in the literature. This paper analyzes school students' emergency evacuation behavior in earthquakes using data extracted from videos of real emergency evacuation. A comparison between students' behavior under normal conditions and under emergency circumstances is made to identify the differences. These differences are quantitatively analyzed through regression modeling.

Overall, students' behavior under normal conditions is stable as expected. The cumulative curve of the number of departures can be modeled as a linear function. Differently, students' emergency evacuation behavior is much more chaotic. Four stages – reaction, acceleration, linearity and saturation – are identified, which form a convex cumulative curve rather than a linear one. It is also found that, under emergency circumstances, students' reaction time increases substantially, and the mean value as well as the variance of the number of departures per second becomes much larger. However, the reaction time is comparatively lower than those observed from previous studies on adults. Moreover, we could not observe the highly competitive behavior or 'faster is slower effect' as predicted from previous mathematical models. These results provide useful practical knowledge towards the development of mathematical models intended to simulate the emergency evacuation behavior of students in schools.

Keywords: emergency evacuation; students' behavior; video analytics; disaster management; crowd dynamics