Model predictions vs. experimental data: the influence of social groups on evacuation scenarios

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The significance of social groups in pedestrian crowds is known for many years now. Therefore, their behaviour and impact on the crowd dynamics have become an important part of pedestrian research recently. However, since reliable empirical data are scarce, especially for evacuation scenarios, most studies focus on modelling and simulation aspects, see [1,2] and references therein. Nevertheless, comparison of modelling results to experimental data may help to understand the dynamics and impact of groups.

With this in mind, an extended Floor Field Cellular Automaton (FFCA) model is proposed and analysed for evacuation scenarios of inhomogeneous crowds including social groups of different sizes. It is shown that the existence of social groups have a significant impact on the evacuation times, depending on the strength of the group coupling.

In order to test the model predictions, an experimental study was carried out with pupils of two schools in Germany [3,4,5]. The students had to perform several evacuation runs that included different types of social groups. In particular, the groups' sizes, their compositions and the inter-group interactions were varied. The analysis of the experimental data implies that the presence of social groups can affect the evacuation times of the crowd advantageously.

Comparing these results to the predictions made by the FFCA model you can learn more about an appropriate choice of the modelling parameters as well as the pedestrian behaviour in the presence of social groups [5].

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[3] C. von Krüchten, F. Müller, A. Svachiy et al., in Traffic and Granular Flow '15 (2016) 65 - 72
[4] C. von Krüchten, F. Müller and A. Schadschneider, in Proceedings of Pedestrian and Evacuation Dynamics 2016 (2016), 113 - 118
[5] C. von Krüchten and A. Schadschneider, Physica A 475, (2017) 129 - 141