

Optimization of pedestrian dynamics

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In this talk we investigate a PDE system modeling the dynamics of pedestrians in an emergency scenario. The model consists of a nonlinear transport equation and an Eikonal equation providing a potential which determines the movement direction of the individuals. Although people tend to optimize their own situation in a greedy way, this will not lead to an optimal evacuation of the whole crowd. As a remedy, we introduce agents which locally attract the people and aim at finding their optimal trajectories minimizing the evacuation time. The agent dynamics are modeled by an additional ODE.

We study existence and regularity of solutions of the coupled PDE-ODE system and derive necessary optimality conditions for the optimal control problem. For a numerical solution we investigate a discretization based on a finite volume method in space and a Runge-Kutta scheme in time such as gradient-based optimization methods.