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Quantitative description of pedestrian dynamics: Experiments and Modeling

The first part of the lecture gives an introduction to empirical results in pedestrian dynamics. Basic quantities of pedestrian streams (density, flow and velocity) are introduced along the measurement methods. But density and flow are concepts of fluid mechanics where the size of the particles is much smaller than the size of the measurement area. Thus standard methods in pedestrian dynamics suffer from large scatter when local measurements are needed. A concept for measuring microscopic characteristics on the basis of trajectories is introduced. Assigning a personal space to every pedestrian via a Voronoi diagram reduces the scatter and allows analyzing the fine structure of the data.

The second part focuses on a model continuous in space. Basic ideas of a force model representing pedestrians as self driven particles interacting via a repulsive force are outlined. To get precise volume exclusion in two dimensions the model represents the velocity dependent shape of pedestrians by ellipses changing the size of their semiaxis with speed. In addition routing strategies are modeled to incorporate certain intelligence to the self driven particles. The particles perceive their environment and take their decision based on an observation of the current situation.