

Problems in Human Motion Planning

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Moving through a densely-populated environment can be surprisingly hard, owing to the problem of congestion. Learning to deal with congestion in crowds and in networks is a long-standing and urgently-studied problem, one that can be equally well described at the level of dense, correlated matter or at the level of game-theoretical decision making. In this talk I describe two related problems associated with motion planning in congested environments. In the first part I consider a description of pedestrian crowds as densely-packed repulsive particles, and I address the question: what is the form of the pedestrian-pedestrian interaction law? In the second part of the talk I examine a simple model of a traffic network and study how inefficiency in the traffic flow arises from “selfish” decision-making. Analysis of the model reveals a surprising connection between Nash equilibria from game theory and percolative phase transitions from statistical physics.