Microscopic and macroscopic models for vehicular and pedestrian flow

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Abstract: In this talk we will present an overview of recent results about vehicular and pedestrian traffic flow modeling. Regarding pedestrian traffic, we will present a microscopic nondifferential model which is suitable for describing crowd dynamics at all densities, including very large ones characterized by pushing behavior. We also present a macroscopic differential (PDE-based) version of the same model. Regarding vehicular traffic, we will present two models: the first one is characterized by the fact that vehicles can automatically and anonymously share information about their position, destination, and planned path when they are close to each other within a certain distance. The pieces of information acquired during the journey are used to optimize the route itself. The second one, instead, focuses on platoon dynamics and shows how platoons can have a regularization effect on the overall traffic dynamics.

Bio: Emiliano Cristiani is a Research Director at the National Research Council of Italy, Institute for Applied Computing “Mauro Picone” (IAC-CNR). His research lies in the field of Applied Mathematics, with expertise in vehicular and pedestrian traffic modeling, self-organizing systems, optimal control, differential and mean field games, and the numerical solution of Hamilton–Jacobi equations, including Fast Marching methods.

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