

Recent Progress on Fokker-Planck Multilane Traffic Flow Models

Reinhard Illner
University of Victoria

Abstract

I will begin with a brief review of traffic models. The bulk of the lecture will focus on recent mathematical results obtained in collaboration with R. Pinnau and C. Kirchner from the University of Kaiserslautern:

1. It will be shown how the second-order conservation law model due to Aw and Rascle can be derived from a kinetic model of Fokker-Planck type.

2. We present a criterion on braking/acceleration force terms, and on the diffusivity such that the fundamental diagram is computable and one-valued. (i.e., for each density $\rho > 0$ there is a unique average speed u and an equilibrium solution $f(v)$ of the model such that $\int f(v) dv = \rho$ and $\int v f(v) dv = \rho u$.)

3. We will revisit the original Fokker-Planck model for multilane traffic with lane-changes and explain why a multivalued fundamental diagram emerges in this case. A linear stability analysis for the corresponding equilibria will also be presented.

4. We will conclude with a general discussion on open problems and possible generalizations.