

Suggested Master of Science project at the division of Mathematics LTH and Numerical Analysis:

Modelling, simulation and flux identification of traffic flow

Supervisor: Stefan Diehl, room MH:551A, tel 046-2220920, stefan.diehl@math.lth.se

Traffic flow can be modelled with a nonlinear partial differential equation (PDE), whose solution gives the vehicle density along the road. With special numerical methods one can simulate traffic flow along a road and situations when traffic lights turn red and green. This modelling perspective is called macroscopic, where the vehicles are seen as small particles in the similar way as small particles in a liquid can be modelled with a continuum fluid approach. The model equations for traffic flow and sedimentation of particles in a liquid are similar. For the latter problem, the supervisor has developed a special method for the identification of the nonlinear flux function of the PDE for the process of sedimentation. This should be tested on traffic flow. The project includes

- studies on the scalar hyperbolic conservation law PDE and the modelling of traffic flow,
- implementation of a numerical method for approximate solutions of scalar nonlinear hyperbolic PDEs,
- identification of the flux function of the PDE, called the fundamental diagram in traffic flow, partly with a special method, partly with a traditional method where parameters of a given flux function are calibrated by optimizing an object function that measures the difference between the numeric solution and real data from traffic-flow movies,
- simulations of different traffic situations.