Macroscopic traffic flow models on networks using Godunov–like numerical fluxes

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Abstract

Modelling of traffic flows will have an important role in the future. With a rising number of cars on the roads, we must optimize the traffic situation. That is the reason we started to study traffic flows. It is important to have working models which can help us to improve traffic flow. We can model real traffic situations and optimize e.g. the timing of traffic lights or local changes in the speed limit. The benefits of modelling and optimization of traffic flows are both ecological and economical.

We describe a numerical technique for the solution of macroscopic traffic flow models on networks of roads. On individual roads, we consider the standard Lighthill-Whitham-Richards model which is discretized using the discontinuous Galerkin method along with suitable limiters. In order to solve traffic flows on networks, we construct suitable numerical fluxes at junctions based on preferences of the drivers. Our semi-discrete DG solution is L^2 stable on several types of networks. We present numerical experiments, including a junction with complicated traffic light patterns with multiple phases. Differences with the approach to numerical fluxes at junctions from Čanić et al., 2015, are discussed and demonstrated numerically on a simple network.

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