

Modeling, simulation and control of traffic flows on a highway network

With the increasing traffic demand on the Belgian road network, the need for a better usage of the existing road infrastructure arises in order to counter the forthcoming congestion. Within this context, our research is aimed at improving the current and future traffic conditions.

Several steps will be taken in order to accomplish this. First of all, a detailed modeling study needs to be done. Traffic flows can be largely classified as either being macroscopic (a stream of vehicles is considered as a whole) or microscopic (each vehicle is considered separately) in nature. We will initially use a microscopic classification scheme, more specifically, traffic cellular automata. This approach implements the car following and lane changing microscopic submodels as rule based behaviour.

The second step is the proces of (online) traffic simulation. Its scope is the Flanders' highway network and its secondary road network (which will be considered as a fall back option). Calibration and validation of the model parameters becomes very important when tuning them to the (real world) traffic situation.

The third and final step is controlling the traffic flows in this network using several adaptive control strategies. These controls can be ramp metering, variable speed limits, rerouting directives et cetera. An important aspect in this process is the use of historical and actual traffic data (which are gathered by various traffic sensors). This will lead to predictions (within certain confidence intervals), based on datamining techniques using autocorrelations, attractor reconstruction (using embedded delay coordinates), spectral analyses, ... as well as correlations with climatological data.