

Title of the master thesis: **Simulation-based Evaluation of the Potential of Local Adaptive Traffic Signal Control for Controlling Urban Networks**

Abstract

Traffic signal control has the task of traffic management in terms of quality, safety, environmental sustainability and efficiency. The aim of this master thesis is to evaluate the potential of an adaptive network control system VITAL.Net by a simulation-based comparison with the fixed-time control program TRANSYT via SUMO. Especially with the different control methods, the medium and high traffic demand conditions is required to be specifically discussed. The evaluation is performed on different aspects, for example, delay time, main speed and pollutant emission.

As the main objective of the comparison work, VITAL.Net developed by German Aerospace Center (DLR) is an adaptive network control method, which is based on the concept of delay time minimization. In this self-organized control system, the delay time of all approaching vehicles is one of the most essential and primarily optimized characteristics and it is considered to use at the local intersection and network level. As TRANSYT from the Transport and Road Research Laboratory in England is an offline computer program applied for optimized fixed-time programs and coordinated signal networks, the simulation test of TRANSYT signal plans is chosen as a reference case in the comparison. The different algorithms of network control lead to different traffic performances in a small network scope (3*2 intersections).

In this thesis, another fixed-time calculation method based on HBS (2001) calculation method has also been discussed. This fixed-time signal programs based on HBS add the diversity of the fixed-time control method in the comparison work and make the conclusion more persuasive to proof if the adaptive control method has the advantage of improving the traffic network control overall than fixed-time control with dedicated indicators and a better coordination performance in the main traffic flow direction.

The results of simulation-based comparison could be analyzed based on the data of trip information. The output data of SUMO makes it possible to observe each individual vehicle trip to describe the performance of the whole network control. The comparison results reveal that the extension of delay-based control algorithm VITAL.Net method has significant potential to achieve better traffic flow qualities in terms of delay-time reduction.