Bachelor Thesis

Traffic Flow Optimization in Paderborn

Road traffic in cities is getting ever more complex. The increasing amount of vehicles lead to congestion, delays, and rising emissions. Traffic simulations, such as SUMO [1], can help to evaluate novel traffic management strategies aiming to mitigate these problems. This way, even drastic changes in traffic light control, road topology, or usage of future V2X technologies can be safely tested and compared. However, such simulations require traffic scenarions, that have to be built, calibrated, and maintained to accurately model the real world.

We previously built a traffic simulation scenario for the city of Paderborn [2]. Due to recent advances of SUMO and traffic in the city, this scenario is now ready for an update. With the update is in place and validated, new options for the optimization of traffic can be evaluated.

One such option would be to restructure the inner ring to become a gigant roundabout. All traffic would be routed in one direction, using all the lanes available (except for some ramps). This would allow one to remove all traffic lights—and hopefully improve traffic flow.

Goals of the thesis

This thesis is focused on the evaluation of the effect of a different road topology on the road traffic in Paderborn, which can be broken down into the following steps:

- Update and validate the Paderborn simulation scenario for new versions of SUMO and current traffic
- Simulate and measure baseline traffic for the current road topology
- Modify the road topology of the central ring to form a gigant roundabout
- Simulate and compare the traffic of the new topology against the baseline

Keywords

Traffic Simulation, SUMO, Paderborn, OpenStreetMap

[1] P. Alvarez Lopez, M. Behrisch, L. Bieker-Walz, J. Erdman, Y.-P. Flötteröd, R. Hilbrich, L. Lücken, J. Rummel, P. Wagner, and E. Wießner, "Microscopic Traffic Simulation using SUMO," in *21st International Conference on Intelligent Transportation Systems (ITSC 2018)*, Maui, HI: IEEE, Nov. 2018, pp. 2575–2582. DOI: 10.1109/ITSC.2018.8569938.

[2] D. S. Buse, "Improving Traveling Times in Paderborn using Vehicular Networking," Master's Thesis, Department of Computer Science, Paderborn, Germany, Feb. 2016.

Contact:
Dominik S. Buse <buse@ccs-labs.org>
Website:
http://www.ccs-labs.org