Simulator of traffic infrastructures and situations

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What is the purpose?

Traffic lights at intersections affects daily lives of many people around the world. Regardless if they are driving themselves or happened to be in a public transport vehicle. For example, in the city of Los Angeles, there are more than 4 100 intersections controlled by traffic lights. In an environment like that, it is getting more and more difficult to coordinate the traffic. This thesis aims to explore a way to simulate traffic on multiple intersections using real-world traffic controller configurations and advanced ways of traffic controls like traffic actuation.

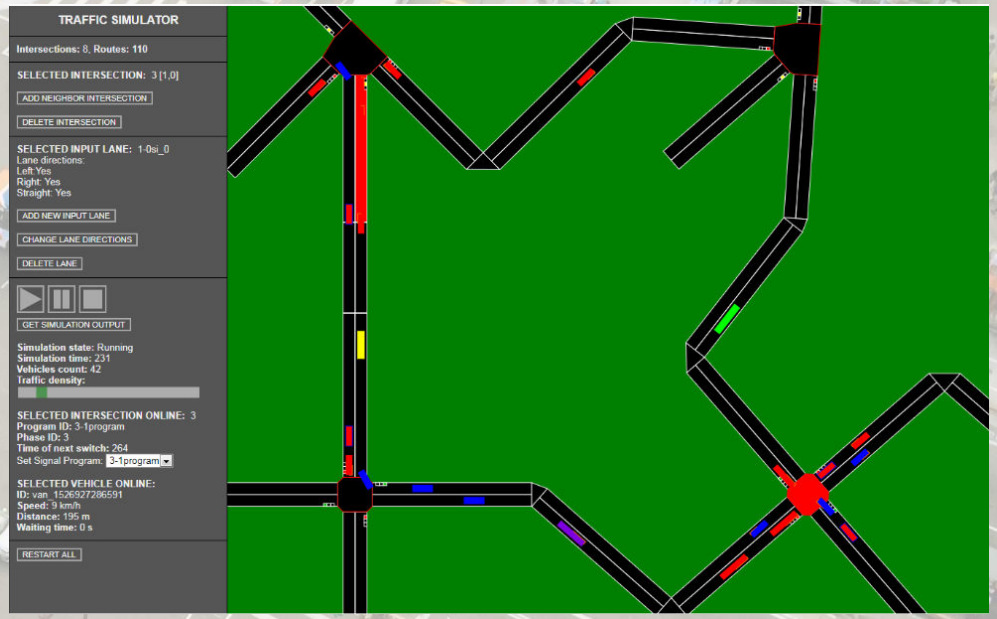
Practical outcome of it should be an application for simulation and visualization of traffic on those intersections. A tool for traffic engineers, which can help them design and test various signal plans of an intersection with relation to other intersections with different kinds of traffic and different density.

How it works?

The resulting program is in fact a combination of a backend and a frontend application. Backend is a SpringBoot based Java application, which works in cooperation with open-source simulation package SUMO. Its tasks are mainly to prepare configuration files for SUMO and then to control the simulation via TraCI interface. Simulation control consists of a basic traffic actuation, vehicle generation and gathering mostly environmental statistical data about the simulation (e.g. NOx pollution in specific time or average waiting time of vehicles).

Input to the backend is realized via the frontend part, which is a JavaScript application. User can upload various configurations for specific type of controller (Siemens sX series). Intersections are automatically connected. They can be also extended manually with more traffic lanes for specific signal group, if the data from the configuration are not exactly accurate (e.g. to the modeled real-world intersection). User is able to switch signal plan of an intersection and also to adjust traffic density. Those operations can be performed in a real time. For the visualization part, SVG technology was used. Data for the visualization are transported periodically via HTTP requests via JSON messages.

What's next?



Developed application is focused mainly on technical principles, which can such application use in a real world. It is a base for next development, which will continue in the next academic year. Testing of the application revealed some weak spots in performance under specific conditions, which needs to be improved first. Also, for some real-life usage, there needs to be more practical functionality implemented as well. Next master's thesis's aim will be to use real controller for the simulation of an intersection.