ParaSUMO - parallelization of microscopic traffic simulation

Background

Traffic simulation have been powerful tools over the past decades to evaluate the effectiveness of traffic planning and management measures. However, they are usually computationally expensive and inefficient when it comes to model large-scale scenarios for example a network of the size of Munich. Due to interdependencies of vehicles being modeled in a simulation, it is relatively difficult to run a single scenario in parallel. However, there are few options to achieve that. For example, it is possible to split the network into smaller subnetworks and assign the computation power to each subnetwork according to the amount of congestion inside each subnetwork. The challenge is to ensure a seamless and smooth transfer between the boundaries of the subnetworks without losing the traffic demand and slowing down the simulation.

![Diagram](image)

*Figure 1. Overall architecture of the suggested framework*

Goal

The main goal of this project is to develop a platform for parallel simulation of urban traffic using Simulation of Urban MOBility (SUMO). The platform should include functions for partitioning a road network and the associated demand as well as a synchronization framework for a seamless transfer of vehicles among those partitions.

More specifically, the student should:

1. Perform a literature review on the existing work for parallelization of microscopic traffic simulation, in particular SUMO
2. Development of a framework for partitioning the network and demand
3. Run the simulation in each subnetwork in parallel (synchronized) while splitting the demand in inter-and intra-subnetwork
4. Guarantee seamless transfer of vehicles between neighbor subnetworks

Requirements

- Strong Python programming skills
- Hands-on experience with high performance computation
- Experience with SUMO (or any other traffic simulator) is a plus

Contact

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