

Simulation and analysis of large-scale traffic networks

Abstract

Besenyei Virág

The aim of the thesis is to compare different levels of traffic modeling on a real urban road network. The study is carried out using a validated traffic simulator (SUMO - "Simulation of Urban MObility"), with the model of the city of Luxembourg, in which vehicle traffic is modeled over a 24-hour period. The results are evaluated using various statistical indicators, visualizations, and information theory measures. The research highlights that microsimulation is more sensitive to local traffic characteristics, while the macromodel provides a more aggregated picture. The studies show that infrastructure characteristics, such as the number of lanes, capacity, lane change opportunities and road length, strongly influence the simulation results, and that microsimulation proved to be significantly more sensitive to congestion and local vehicle interactions, while macrosimulation provided a smoother aggregated picture and was less able to capture dynamic traffic changes. The analysis contributes to the exploration of spatial and temporal variations in simulation accuracy, thus supporting more informed decision-making in transport planning.