A multi-model approach to large-scale multimodal transport simulation (13-3631)

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In this paper, we introduce a multi-model approach to large-scale, activity-based, multi-agent travel demand simulation (MATSim). The greatest current performance limitation to the system is the network loading. Multi-model transport simulation requires approximately two orders of magnitude faster than QSim, the current simulation framework to select and improve plans before executing them in a full queue simulation. We apply and evaluate the technique in a large-scale application to Zurich. Our multi-model approach uses a simplified surrogate model of traffic conditions, basically a lookup table of link travel times. PSim runs much faster than QSim, and therefore allows the rapid mutation and evaluation of plans. PSim performance is as good as or better than QSim in terms of solution quality and running time. The scenario contains 67,239 agents traveling in a network of 60,518 links. The greatest current performance limitation to the system is the network loading. Multi-model transport simulation requires approximately two orders of magnitude faster than QSim, the current simulation framework to select and improve plans before executing them in a full queue simulation. We apply and evaluate the technique in a large-scale application to Zurich.

MultiSim simulates the traffic produced in a transportation network by agents pursuing daily schedules of activities. Agents are sequentially executed in a QSim network loading. After each QSim run, plan performance is evaluated using a utility based scoring function rewarding time spent at activities and punishing time spent traveling or arriving late. Then, agent plans are mutated along a number of dimensions, including changing the arrival location, the activity type and time, and mode share. The mutated plans are evaluated using a utility-based scoring function, which is repeated for a number of iterations to produce an estimate of how well an agent day plan might perform, which allows the multi-model approach to select and improve plans before executing them in a full queue simulation. We apply and evaluate the technique in a large-scale application to Zurich.

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