MULTIAGENT TRANSPORT MODEL FOR URBAN PLANNING OF THE BRNO METROPOLITAN AREA

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1 ABSTRACT

Traffic models are an important basis for the development of city master plans. Even though most of the models are not agent-based, are processed in proprietary software, and their results are usually sufficient for estimating the capacity of the planned roads, the authors decided to use the MATSim simulation framework. Unlike closed-source products, MATSim users have more control over the inputs, settings, and simulation flow, albeit at the cost of a more complex setup process. From a model created in MATSim, the position and state of each agent at any time can be determined without interpolation, allowing almost any kind of analysis.

Any model is only as accurate as the quality of the input data – and this was the biggest challenge in the case of the agent-based traffic model of the Brno metropolitan area (BMA), the second largest city in the Czech Republic. The authors used the results of the 2021 Mobility Survey, the 2011 Census, and partially the 2021 Census.

A system for processing these input data was developed at Brno City Chief Architect's Office in collaboration with Brno University of Technology, which relies on probabilities for relations between origin and destination zone based on previous and next activity. Travel diaries containing activities sequences are assigned to agents based on their home spatial unit. The choice of target zones, beeline distances to facilities, and transport modes depends mainly on the agent's current position and socio-economic category. The attractiveness of individual facilities of a particular activity is determined by their capacity, distance to the city center or other dense cluster, and sometimes by the distance to home. The resulting synthetic population includes over 600,000 agents (including those transiting through and commuting to the BMA) divided into 7 socioeconomic categories attending over 20 activities using 5 modes of transportation.

The model is still in the development stage, but is already producing results close to reality – total traffic performance within the city limits as well as the number of boundaries crossings matches the reference values; up to 60% of the monitored intersections' intensities are within ±25% of the actual measurements.