

Sensitivity analysis of the MATSim transport model

Juste RAIMBAULT^{1,*}; Michael BATTY¹

¹Center for Advanced Spatial Analysis, University College London

Gower Street, London WC1E 6BT, United Kingdom

* j.raimbault@ucl.ac.uk

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Agent-based transport models are useful tools to devise policies related to diverse urban issues, such as long-term urban planning, transport system operations, or health and public transport. In such contexts, a knowledge of result uncertainties and a certain confidence at least in qualitative patterns obtained, is crucial. The MATSim framework (Multi-Agent Transport Simulation) is a widely used open-source library for such transport simulations, which has been applied to numerous dimensions of transport systems and on many case studies (Axhausen et al., 2016). Studies providing some validation and sensitivity analysis of transport models based on MATSim, such as (Zhuge et al, 2019), remain however rare. We contribute in this presentation to the effort of validating these models with a sensitivity analysis of an open data implementation for the UK. We build on the four-step multimodal transport model introduced by (Raimbault and Batty, 2021), which combines, for any urban area in the UK, the generation of synthetic population using the SPENSER model (Lomax and Smith, 2017), spatial interaction modeling integrating the QUANT model (Batty and Milton, 2021), and the MATSim framework. We study first the sensitivity of output indicators (trip distance and time distributions, modal shares, congestion) to stochasticity, and find an important variability between runs for a given urban area and the same parameters. We then test the sensitivity to some parameters (in particular the number of agents and modal discrete choice parameters) using first local sensitivity analysis, and global sensitivity analysis methods (Moris method and Sobol indices (Campolongo et al, 2011)). We also obtain significant variability of most indicators, suggesting caution for the application of these methods to real-world problems, and the need for further efforts to systematically explore and validate such large-scale integrated urban models.

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