OpenOPorto: A Review of MatSim Model Creation Methodologies Applied to Porto, Portugal

Advanced Methods of Modeling and Simulation- ProDEI

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

Professor
Rosaldo Rossetti
rossetti@fe.up.pt

Author
Iohan Sardinha
up201801011

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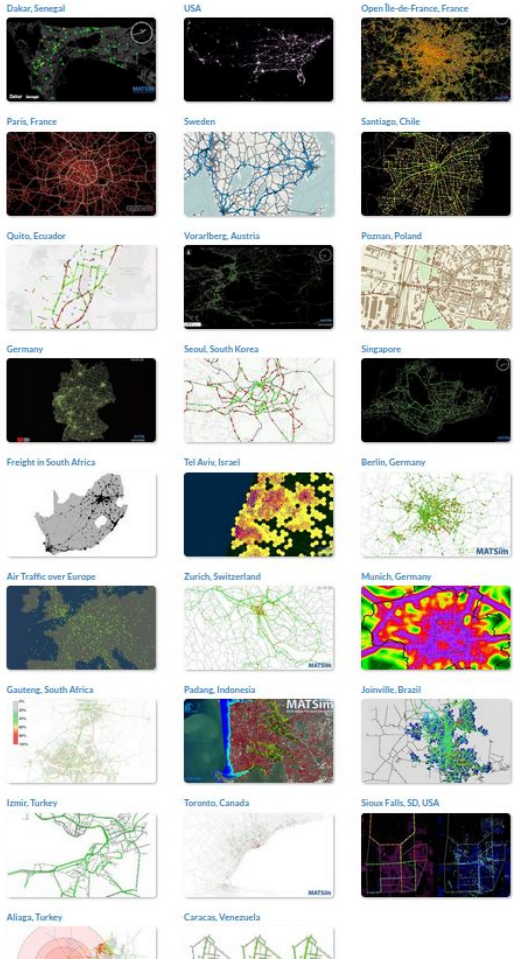
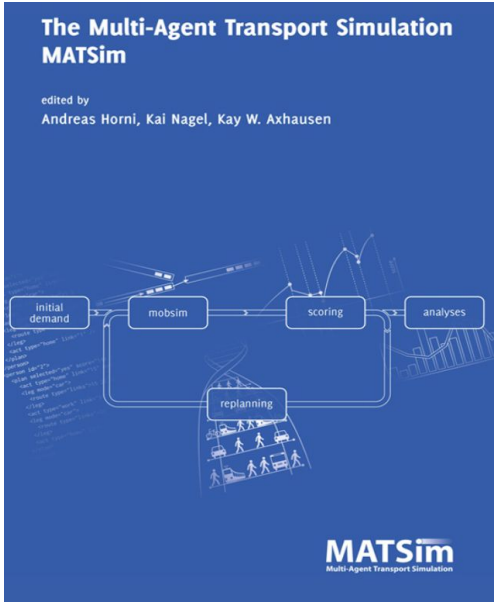
Context

- Multimodal Transportation
- MatSim - The Multi-Agent Transport Simulation
  - Consolidated
  - Capable of scaling
  - Tested in many different scenarios
  - Somewhat active community
- City Digital Twins
- Artificial Societies
- Reproducibility



Goals

- Create a Transportation Model of the City of Porto
- Use Open Data
- Model Creation Methodology found in the literature
  - Test
  - Analyse
  - Update



Resources Available

- MatSim Book and Handbook - 2016
- T.U.Berlin Annual Course - 2022
- Papers
  - OpenBerlin - 2019
  - Zurich Scenario - YEAR
  - Santiago de Chile - YEAR
  - Ilê-de-France - YEAR

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A MATSim
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The 8th International Workshop on Agent-based Mobility, Traffic and Transportation Models, April 29 - May 2, 2019, Leuven, Belgium

The MATSim Open Berlin Scenario: A multimodal agent-based transport simulation scenario based on synthetic demand modeling and open data

Dominik Ziemke[a,*], Ihab Kaddoura[a], Kai Nagel[a]

[a]Technische Universität Berlin, Transport Systems Planning and Transport Telematics, Salzufer 17-19, 10587 Berlin, Germany

Abstract

With more diverse transport policies being proposed and the advent of novel transport services and technologies, the transport system is becoming more individualized in many aspects. Transport models, the most important tool to assess policies and schemes, need to be sufficiently expressive to address these developments. Agent-based transport models, where travelers with individual properties and the ability to act and decide autonomously are resolved individually, allow to appropriately model and analyze such policies. This paper describes the *MATSim Open Berlin Scenario*, a transport simulation scenario for the Berlin metropolitan area implemented in the agent-based transport simulation framework MATSim. The scenario is solely based on open data and the demand for transport is created based on a fully synthetic procedure. Contrary to most transport simulation scenarios, no information from a travel diary survey is required as input. As such, the scenario generation procedure described in this study is spatially transferable and facilitates the creation of agent-based transport simulation scenarios for arbitrary regions.

Keywords: transport modeling; agent-based simulation; synthetic demand generation; open data

1. Introduction

Transport models are the most important tool to assess transport policies and schemes, to forecast their outcomes and to assess their effectiveness. In contrast to earlier decades where transport policies mainly consisted in infrastructure investment schemes, today more diverse solutions, largely based on transport demand management, are sought to balance the needs imposed on urban systems like high levels of mobility, improved sustainability, and livability. Policies intended to meet these ends include, for instance, improvements of the public transport system, vehicle shar-

* Corresponding author. Tel.: +49-30-314-21383 ; fax: +49-30-314-26269.
E-mail address: ziemke@vsp.tu-berlin.de

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Data Origins

- Open Street Map
  - Network
  - Shapes
- INE
  - Inner city movement
- Open Data Porto Digital
  - Bus and Metro GTFS

OpenStreetMap

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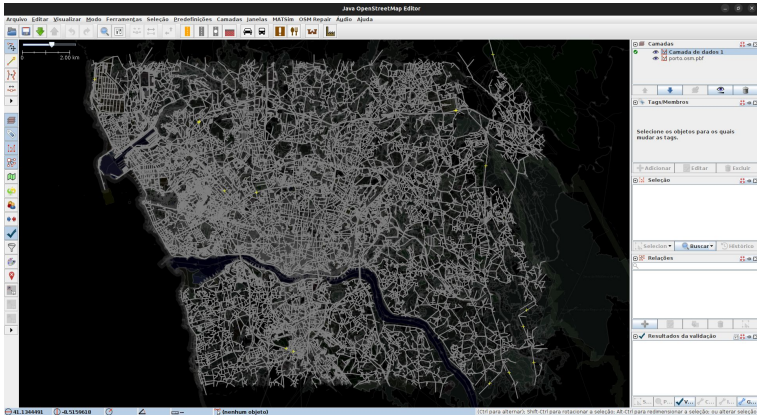
Model Creation

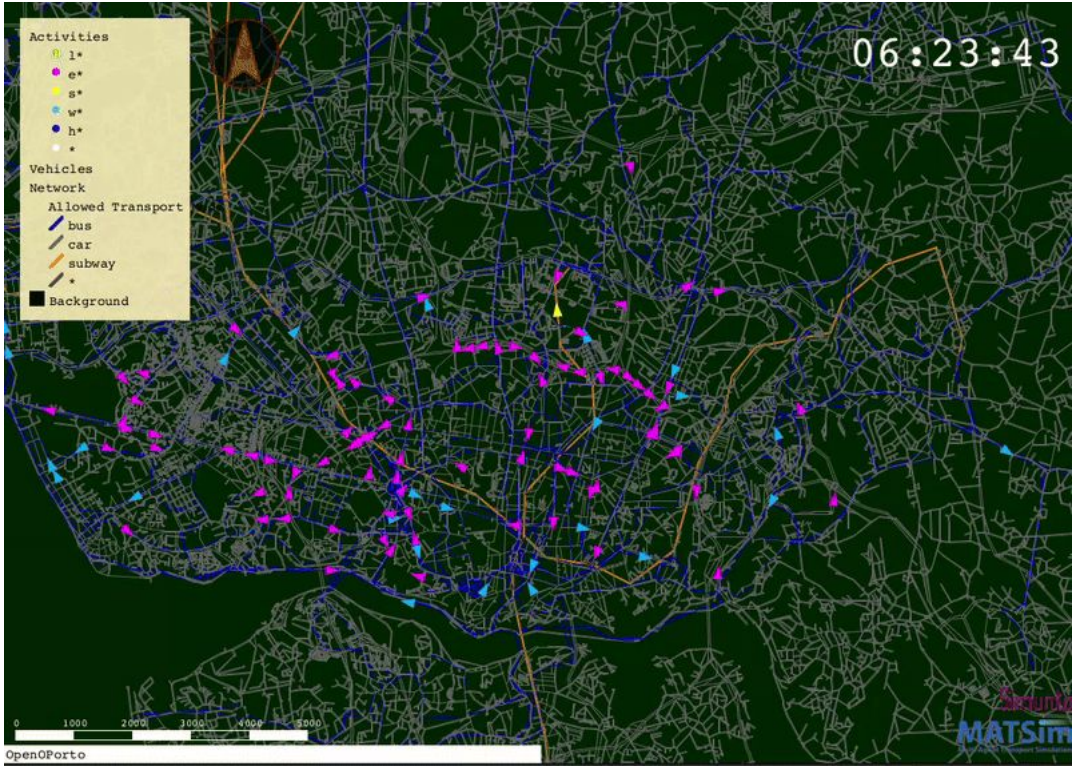
- Config
  - Adjusts the simulation parameters
  - Modules used
  - Population Percentage
- Network
  - Portugal (Osmium)→ Porto map (JOSM) → MatSim Network
  - OSM + GTFS
- Plans
  - Movement between neighborhoods census
  - Python Shapely
- Transit Vehicles & Schedule
  - GTFS2MATSim



Challenges

- Combining different sources
  - Car + Bus + Metro
  - Map Projections
  - Road Network Vs. Stop Network
- Deprecated Information
  - Data manipulation tools
  - Input formats versions
- Activity Generation
  - Lack of census information
  - Differs a lot by scenario
  - No generalizable examples in literature

Result



* Simunto Via Visualizer limits the total number of agents to 500 for free license

Future Work

- Current Limitations to be overcome
  - Separate networks for cars and buses
  - Simple demand generation
- Improvements
  - Other vehicles/methods
  - Expand to whole Porto Metropolitan Area
  - More realistic population generation
    - Wealth, Gender, Activities, Usage of each kind of transport...
  - Households and Facilities
  - Visualization with complete capabilities
  - Output Analysis
  - File processing pipeline

Conclusions

- Information in the literature and online is outdated
- Debugging is very complex, especially due to the lack of material
- Once the process is defined, building the inputs becomes simple
- It is possible to build something complex out of open data
- The population generation is the most complex
- Information about movement varies a lot from place to place in format and availability

Thank you!
Questions?