MATSIM BRUSSELS SCENARIO GENERATED FROM OPEN-SOURCE PIPELINE & UBIQUITOUS RAW DATA

MATSim User Meeting 2022

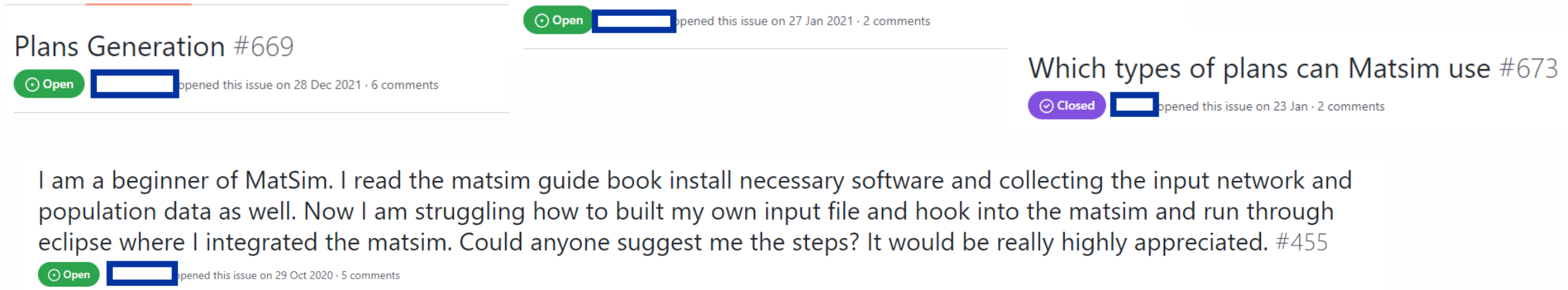
VRIJE UNIVERSITEIT BRUSSEL

Jingjun Li, Evy Rombaut, Lieselot Vanhaverbeke

Contact: jingjun.li@vub.be

MOTIVATION

For MATSim beginners, synthetic travel demand generation (or so-called plan file in MATSim) is usually the most challenging barrier.



MOTIVATION

CURRENT RESEARCH LIMITATIONS AND MOTIVATION

1 Based on highly simplified assumptions;

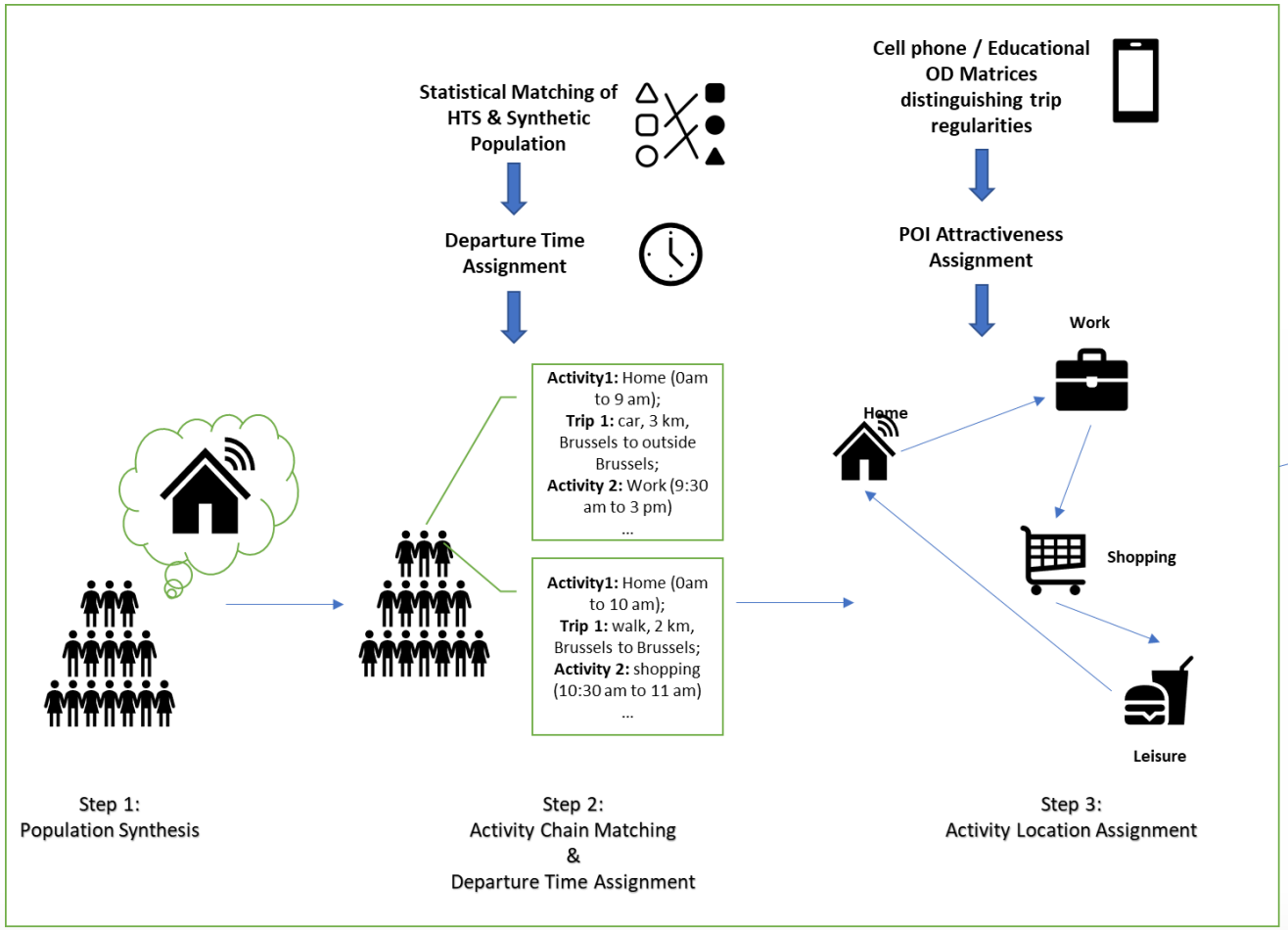
2 Translating HTS directly;

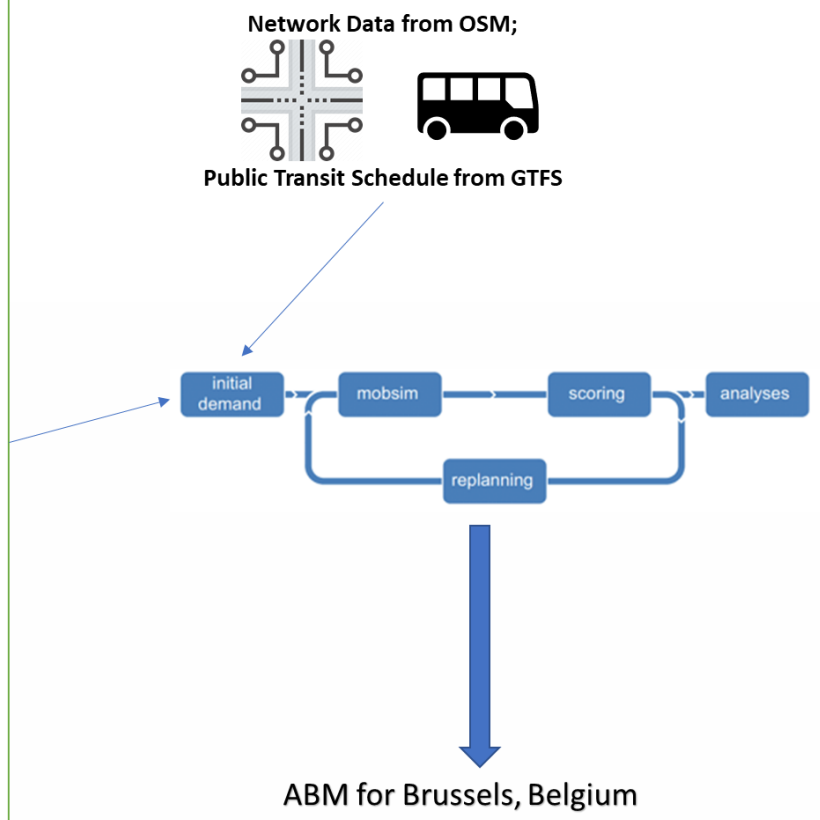
3 Deploying proprietary data/toolkits.

Research motivation: An open-source and modular synthetic ABM generation pipeline that adopts highly standardised, anonymised and ubiquitous raw data. The resulting model should be more accurate and policy-sensitive.

One case study adopting our pipeline is carried out for the Brussels Capital Region, Belgium.

PIPELINE OVERVIEW

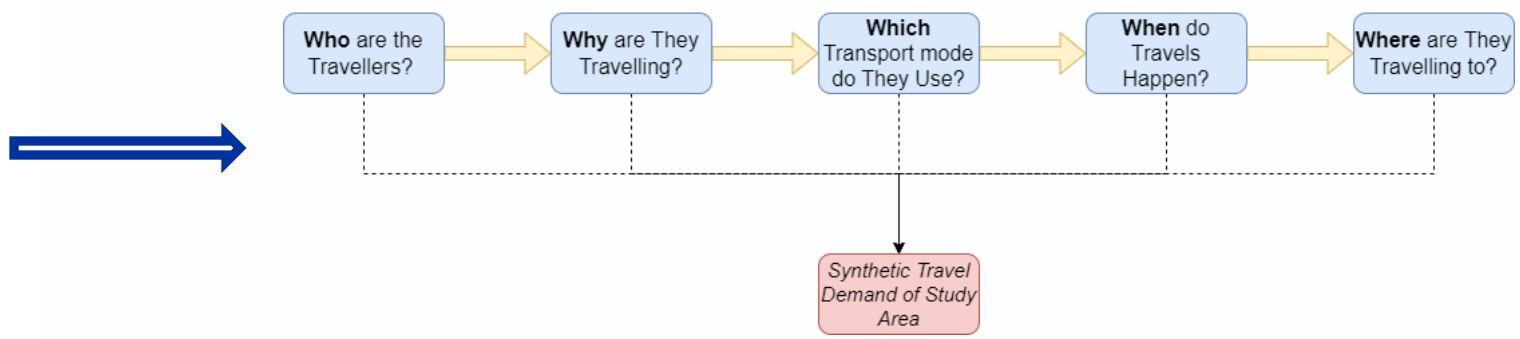




Synthetic Travel Demand Generation

A TYPICAL MATSIM AGENT

```
<person id="1">
        <plan>
                <act type="h" x="-25000" y="0" link="1" end_time="06:00" />
                <leg mode="car">
                        <route>2 7 12</route>
                </leg>
                <act type="w" x="10000" y="0" link="20" dur="00:10" />
                <leg mode="car">
                        <route> </route>
                </leg>
                <act type="w" x="10000" y="0" link="20" dur="03:30" />
                <leg mode="car">
                        <route>13 14 15 1</route>
                </leg>
                <act type="h" x="-25000" y="0" link="1" />
        </plan>
</person>
```



5W Aspects

DATA ADOPTED

1 National HTS Data (MONITOR);

2 Census (DemoBel);

3 POI Data (Geographical Datastore for Brussels);

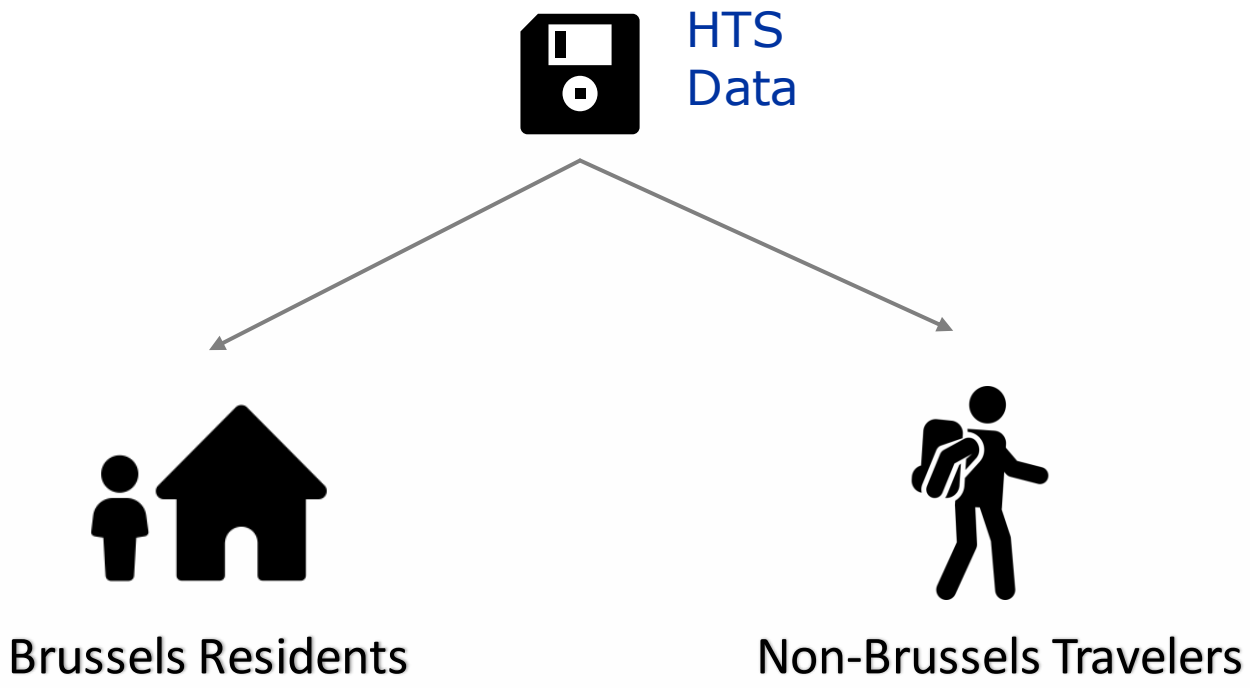
4 Cellphone OD Matrices Distinguishing Travel Regularity (Proximus);

5 OSM + GTFS Data;

6 Traffic Count Data.

STEP 1

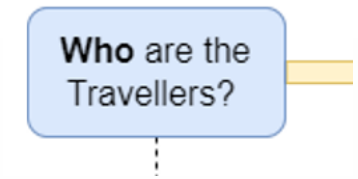
POPULATION CLASSIFICATION & SYNTHESIS



Most non-Brussels residents have trips in Brussels

STEP 1

POPULATION CLASSIFICATION & SYNTHESIS



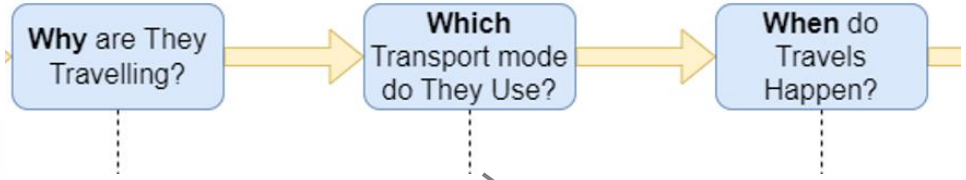
Population synthesis

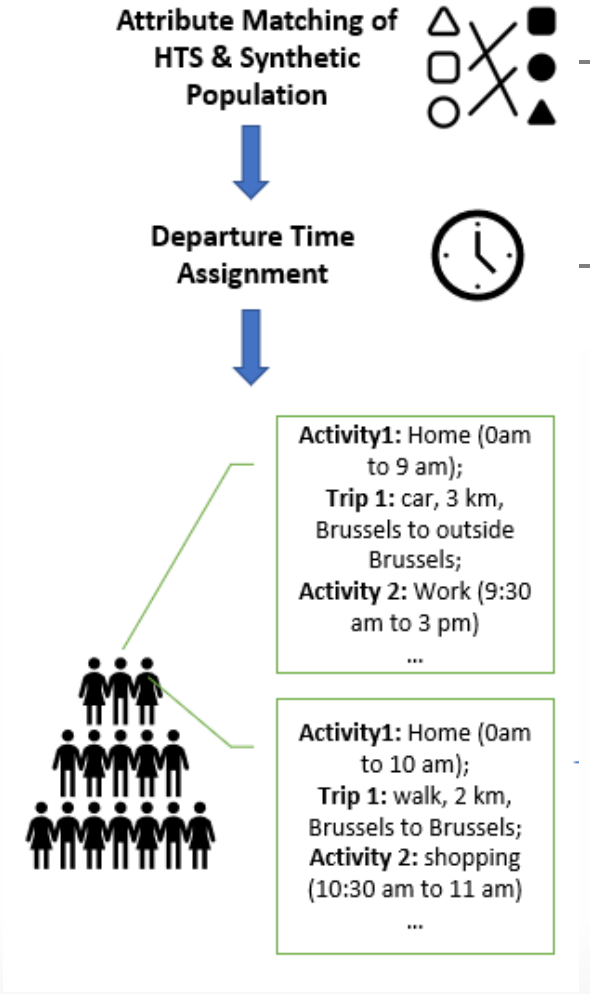
ID	Age	Gender	Degree	…
1	18	M	1-2	…
2	26	F	7-8	…
3	66	M	5-6	…

Home Assigned

STEP 2

ATTRIBUTE MATCHING





A new approach avoiding overfitting inspired by *eqasim**

Avoid excessive traffic congestion

* *https://github.com/eqasim-org*

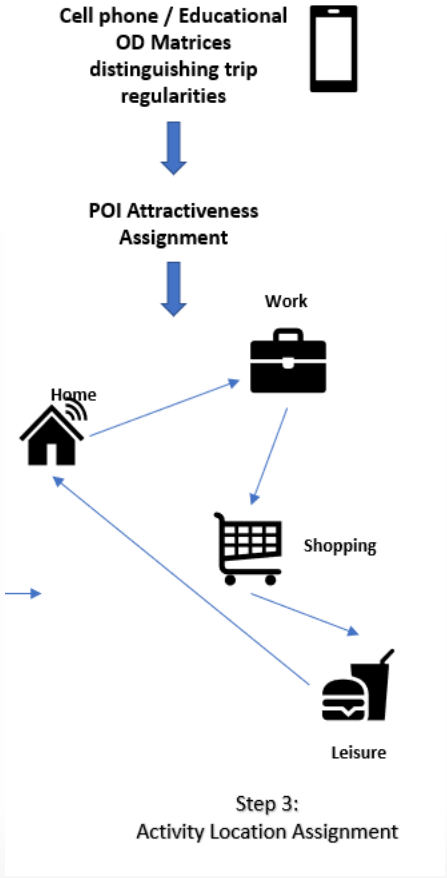
STEP 2

ATTRIBUTE MATCHING

Personal ID	Activity Sequence	Departure Time (Reference)	Origin Municipality	Origin Trip Characteristics	Arrival Time	Destination Municipality	Destination Trip Characteristics	Trip Distance	Trip Purpose	Travel Mode
t_i	1	9:05	l_D	within Brussels	9:20	?	within Brussels	1 km	work	car
t_i	2	17:20	?	within Brussels	17:35	?	outside Brussels	0.5 km	shopping	car
t_i	3	18:05	?	outside Brussels	18:35	?	within Brussels	1.5 km	home	car

STEP 3

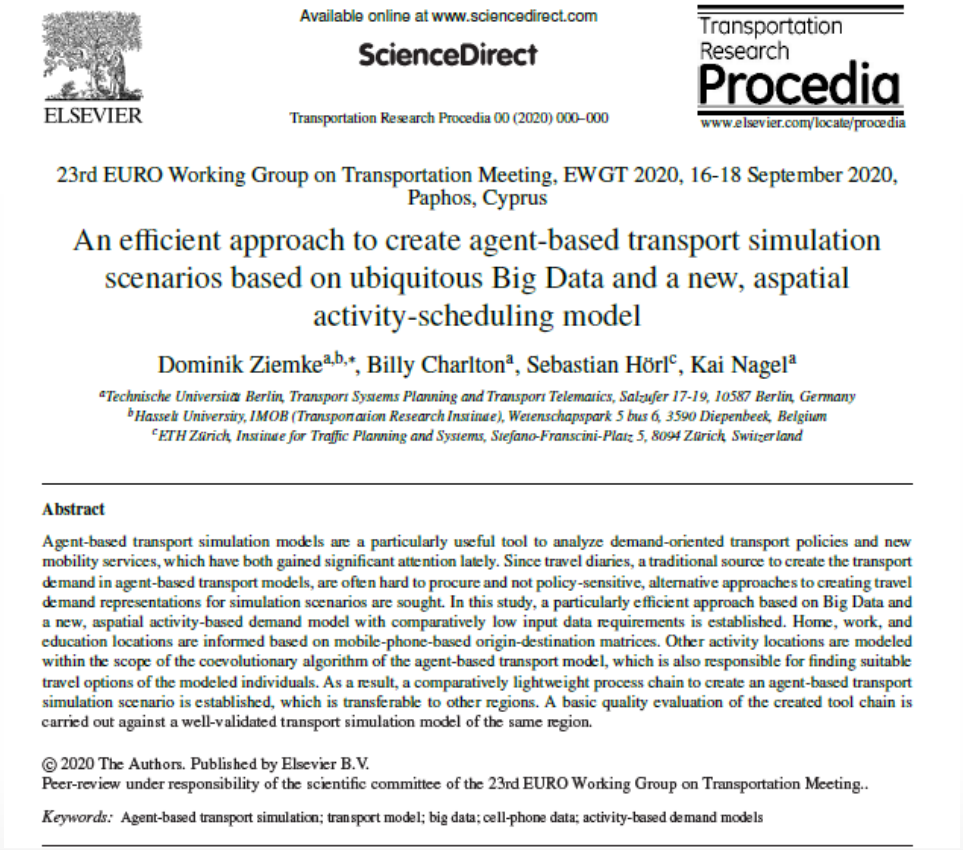
CURRENT ACTIVITY LOCATION ASSIGNMENT



1. 8% holds multiple primary locations;
2. 22% of Brussels residents‘ weighted population have at least one activity outside of Brussels;
3. MATSim has Discretionary activities choice extension not applicable to us;
4. A new location assignment algorithm suitable for all scenarios is yet to be developed.

STEP 3

ACTIVITY LOCATION ASSIGNMENT



Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 00 (2020) 000–000

Transportation Research Procedia

www.elsevier.com/locate/procedia

23rd EURO Working Group on Transportation Meeting, EWGT 2020, 16-18 September 2020, Paphos, Cyprus

An efficient approach to create agent-based transport simulation scenarios based on ubiquitous Big Data and a new, aspatial activity-scheduling model

Dominik Ziemke[a,b,*], Billy Charlton[a], Sebastian Hörl[c], Kai Nagel[a]

[a]Technische Universität Berlin, Transport Systems Planning and Transport Telematics, Salzufer 17-19, 10587 Berlin, Germany
[b]Hasselt University, IMOB (Transportation Research Institute), Wetenschapspark 5 bus 6, 3590 Diepenbeek, Belgium
[c]ETH Zürich, Institute for Traffic Planning and Systems, Stefano-Franscini-Platz 5, 8094 Zürich, Switzerland

Abstract

Agent-based transport simulation models are a particularly useful tool to analyze demand-oriented transport policies and new mobility services, which have both gained significant attention lately. Since travel diaries, a traditional source to create the transport demand in agent-based transport models, are often hard to procure and not policy-sensitive, alternative approaches to creating travel demand representations for simulation scenarios are sought. In this study, a particularly efficient approach based on Big Data and a new, aspatial activity-based demand model with comparatively low input data requirements is established. Home, work, and education locations are informed based on mobile-phone-based origin-destination matrices. Other activity locations are modeled within the scope of the coevolutionary algorithm of the agent-based transport model, which is also responsible for finding suitable travel options of the modeled individuals. As a result, a comparatively lightweight process chain to create an agent-based transport simulation scenario is established, which is transferable to other regions. A basic quality evaluation of the created tool chain is carried out against a well-validated transport simulation model of the same region.

Peer-review under responsibility of the scientific committee of the 23rd EURO Working Group on Transportation Meeting..

Keywords: Agent-based transport simulation; transport model; big data; cell-phone data; activity-based demand models

Movements between 6-10 am is viewed as regular trips, can be improved

STEP 3

ACTIVITY LOCATION ASSIGNMENT

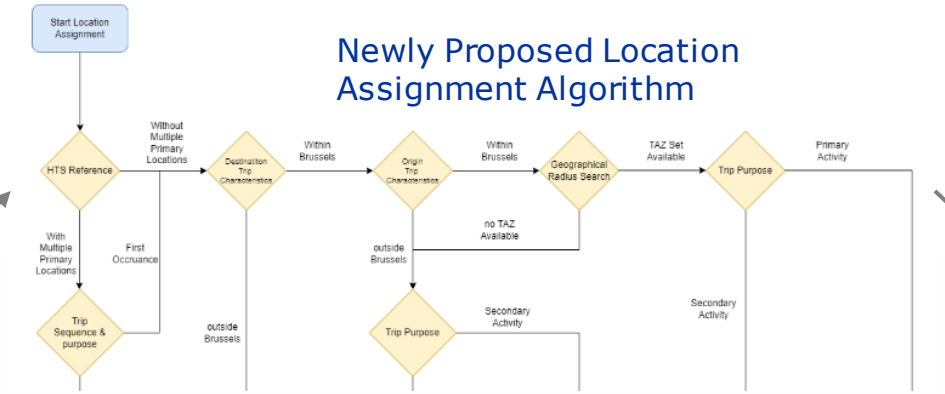
Origin	Destination	Regular Flow	Irregular flow
A	B	…	…
A	C	…	…
A	D	…	…

A new form of cellphone data distinguishing travels' regularities

STEP 3

ACTIVITY LOCATION ASSIGNMENT

Newly Proposed Location Assignment Algorithm



Loop Activity one by one

origin

destination

Where are They Travelling to?

SYNTHETIC TRAVEL DEMAND OUTCOMES

Attribute from the synthetic population

Person ID	Activity Sequence	Start Time	End Time	Type	Duration (minute)	Location
s_i	1	0:00	9:05	Home	545	l_1
s_i	2	9:20	17:20	Work	480	l_2
s_i	3	17:35	18:05	Shopping	30	l_3
s_i	4	18:35	24:00	Home	325	l_4

Person ID	Trip Sequence	Departure Time	Arrival Time	Mode	Travel Time (minute)	Travel Distance (km)
s_i	1	9:05	9:20	car	15	1
s_i	2	17:20	17:35	car	15	0.5
s_i	3	18:05	18:35	car	30	1.5

PRELIMINARY RESULTS

The final MATSim Brussels Scenario consists of 6 activity types (home, work, school, shopping, leisure and others) with seven available transport modes (car, ride, pt, bike, walk, motorcycle and train) and roughly 150,000 agents for 10% scenario.

The current model shows plausible agent attribute divisions, trip mode split, activity participation rate and a good match with the Brussels real-world traffic count data.

With our open synthetic travel demand generation pipeline plus all relevant simulator settings, our simulation can be reproduced after acquiring the ubiquitous raw data. We wish to steer the existing ABM studies toward more open, replicable and reproducible.

QUESTIONS?

Contact: jingjun.li@vub.be

VRIJE
UNIVERSITEIT
BRUSSEL