Realistic Transport Simulation with Open Data

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The Problem
MATSim: agent-based transport simulation

User survey: 451 people with their day plans

Persons with 4 Legs

Laws of a Uber Driver

The Problem: to generate a realistic population from the survey as an input to MATSim for simulation

The simulation model can be used to study traffic problems such as road congestions, and impact of Uber traffic flow

The Challenges
Conventional Approach: Iterative Proportional Fitting (IPF) according to agents’ attribute distribution in the US Census

Challenges: the small data problem (tackled with open data)

IPF only generates # of people in each region; missing details like locations and activities

Sampling day plans?

Our Solution
Data-Driven Approach: modeling (1) time, (2) location, (3) activities and (4) mode using generative machine learning models, with the help of open data.

Time Modeling using Kernel Density Estimation (KDE)
Activity start and end time distributions:

We can model the travel time using KDE similarly

Location Modeling with Open Data
Zip Code Tabulation Areas (ZCTA) from TigerWeb

Real addresses from OpenAddresses

IPF Source ZCTA marginal:
From American Community Survey (ACS), Variable “P03_0018E: COMMUTING TO WORK”

Destination ZCTA marginal: Birmingham Business Alliance

Evaluation
Comparison with real traffic data

Future Work
OpenStreetMap POI

Video Demo
https://youtu.be/ZIm0WsmKB4E