

Building the LA County MATSim Model for the Analysis of Shared Mobility Modes

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Outline

- 1) Introduction (Caroline)
- 2) MATSim overview (Ihab)
- 3) Building the LA model (Huajun/Ihab)
- 4) How to access and run the model yourself! (Ihab/Huajun)

MATSim Overview



MATSim = Multi-Agent Transport Simulation

Key features:

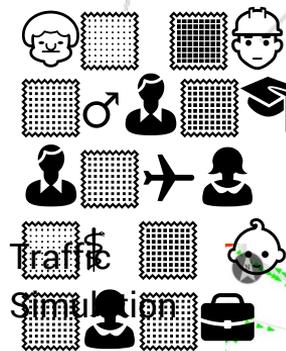
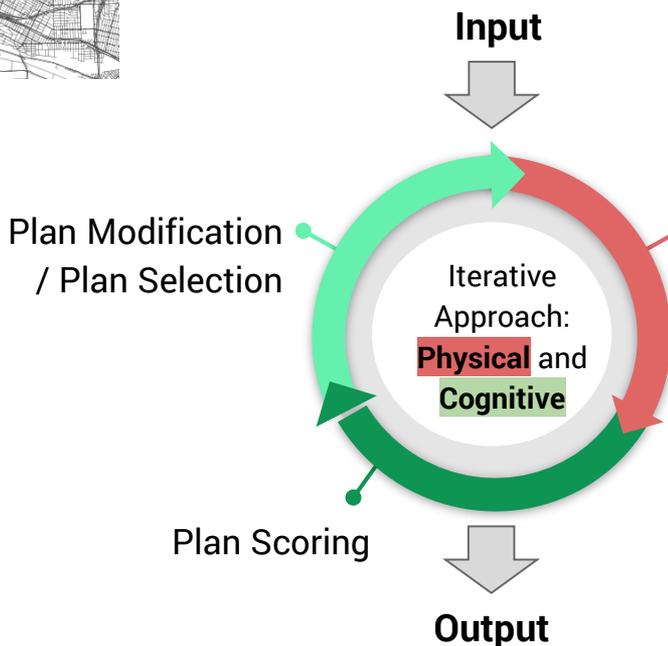
- **Agent-based:** Simulates vehicle and individuals in household context
- **Dynamic:** Entire day, traffic congestion, attributes of drivers and passengers
- **Activity-based:** Travel demand based on individual activity patterns
- **Multi-modal:** Cars, public transit, bicycles, demand responsive transit, ...
- Allows for **large-scale** simulations (city, region)
- **Modular** approach: Several extensions (taxis, MaaS, congestion pricing, ...)
- **Open-source** (<https://github.com/matsim-org>) + Active community

MATSim: How it works



Network, Public transit schedule, ...

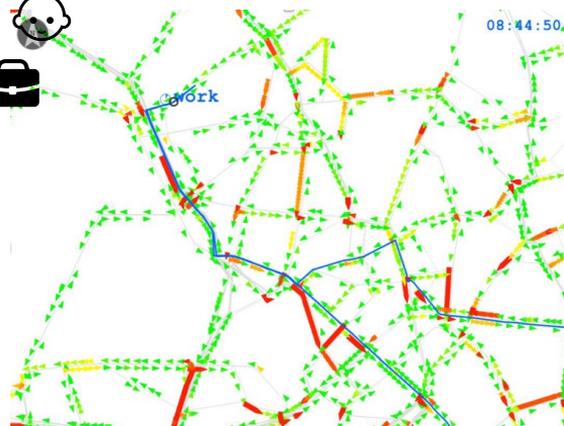
Daily plans, person attributes, ...



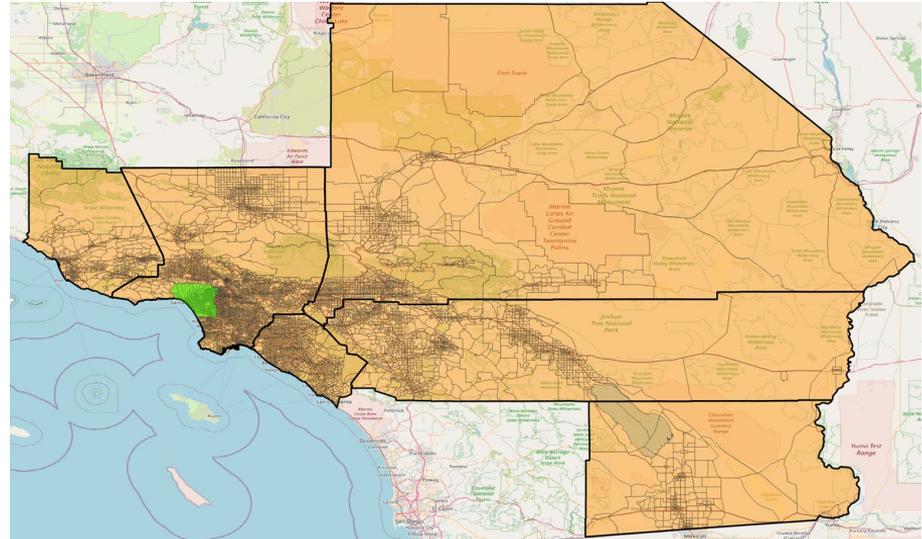
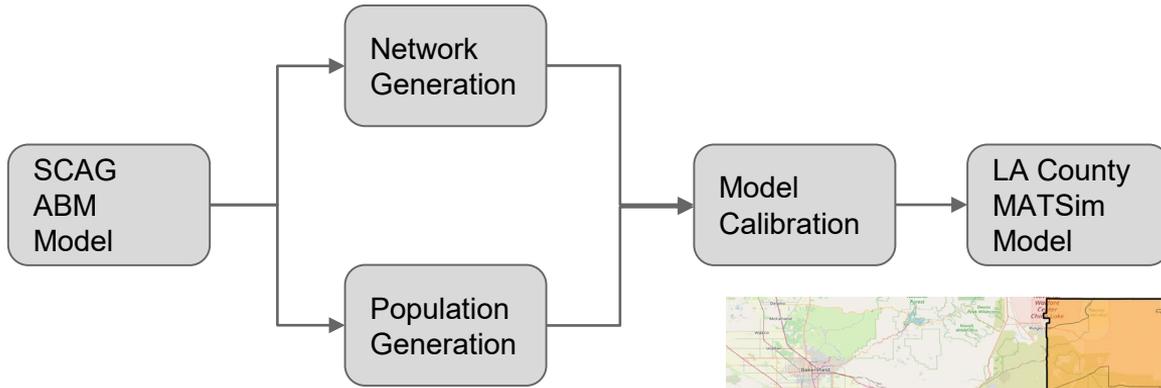
Home (dep: 06:43)
trip (car)
Work (dep: 16:04)
trip (car)
Shopping (dep:
18:04)
trip (car)
Home

Home (dep: 12:42)
trip (bike)
Shopping (dep:
14:05)
trip (bike)
Home

Traffic
Simulation

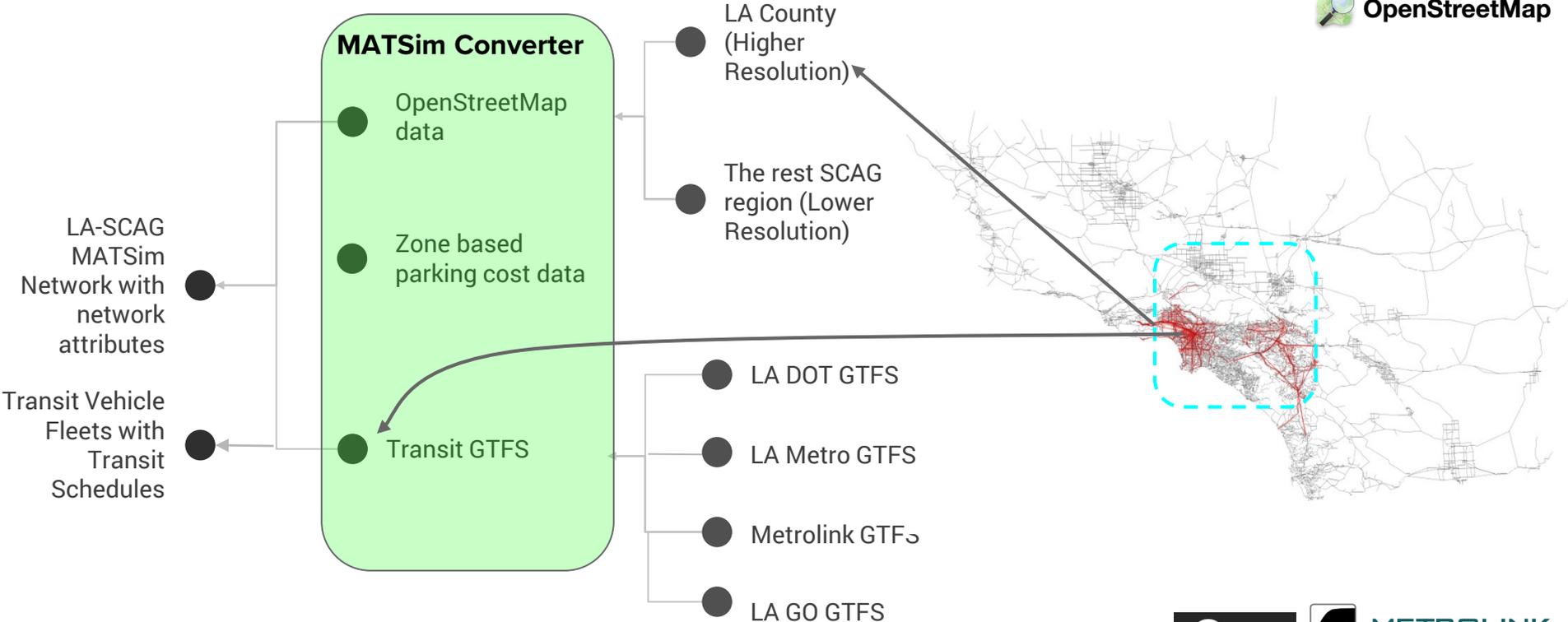


Build the LA County MATSim model



Background Map: OpenStreetMap

Network Generation



Road Network



Public Transit Network

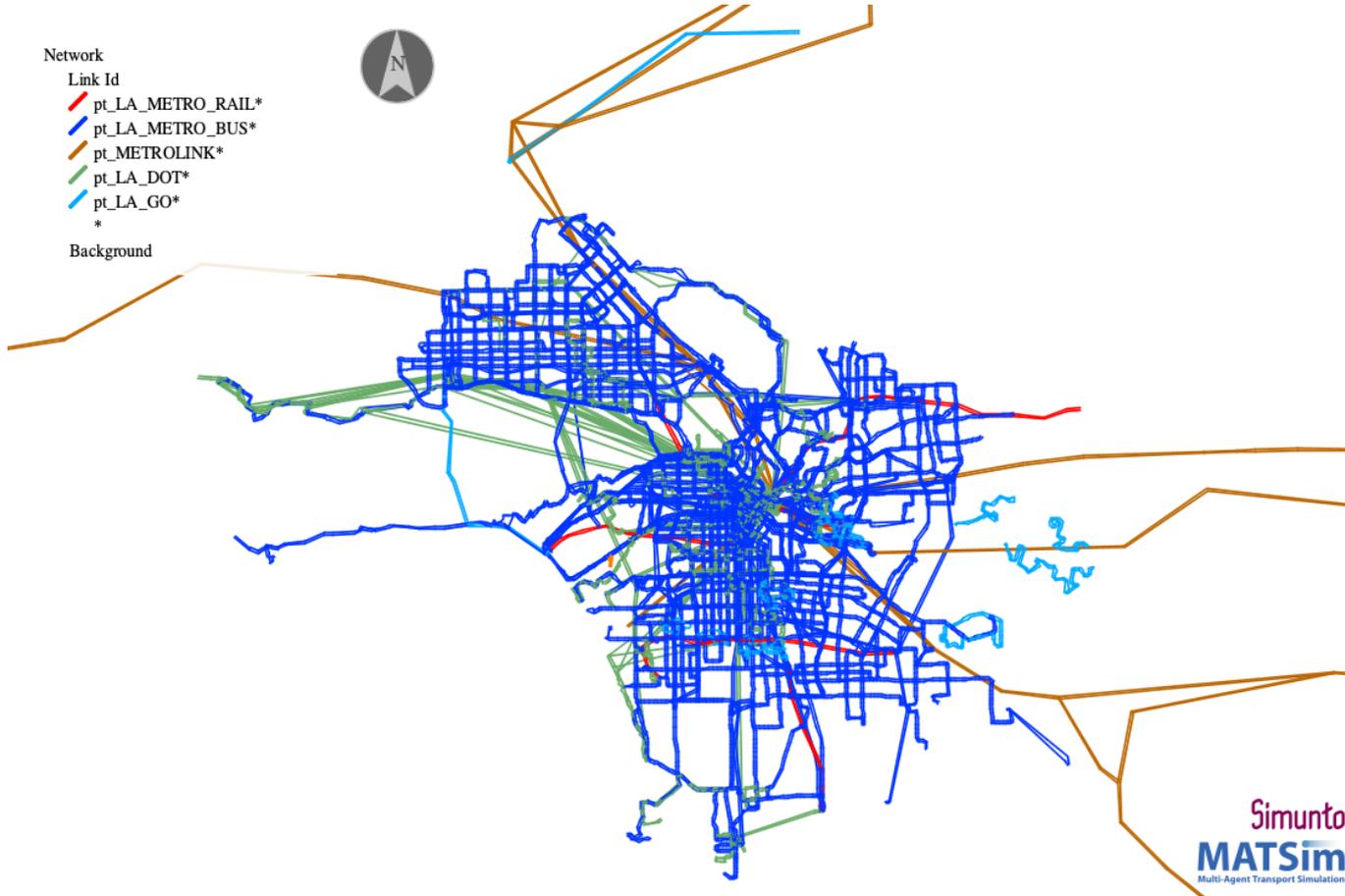
Network

Link Id

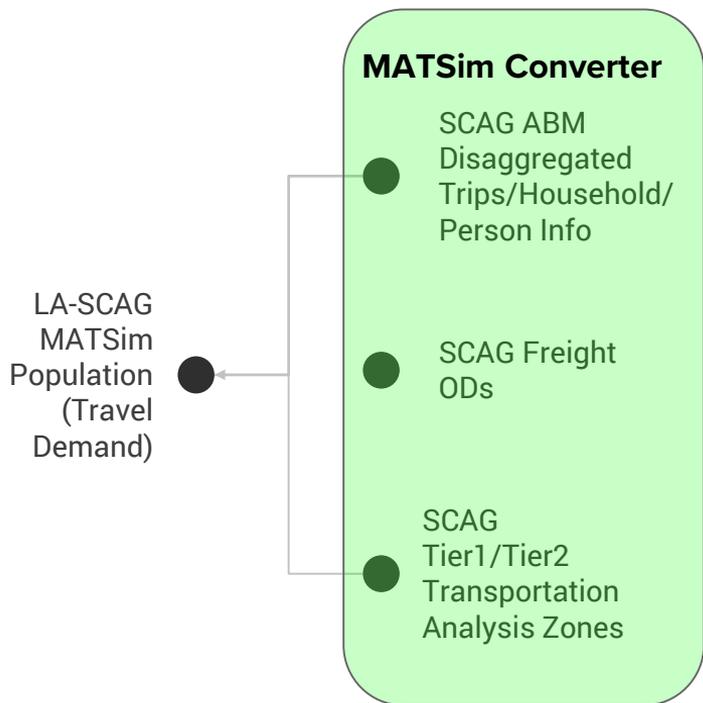
- pt_LA_METRO_RAIL*
- pt_LA_METRO_BUS*
- pt_METROLINK*
- pt_LA_DOT*
- pt_LA_GO*

*

Background



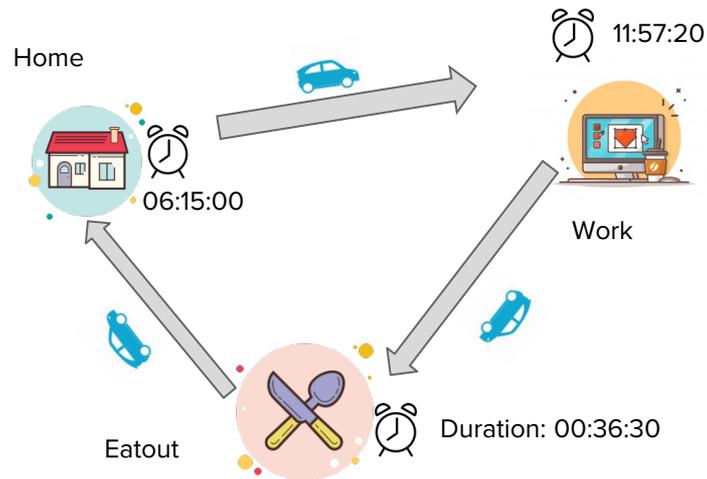
Population Activity Generation



Persons with daily activity chain and inter-activity travel modes

Trucks trips

```
<plan selected="yes">
  <activity type="home_36600" x="219308.77924934198" y="-492202.6918447277"
  end_time="06:15:00" >
  </activity>
  <leg mode="car" trav_time="00:14:01">
  </leg>
  <activity type="work_34200" x="217258.84632072653" y="-481509.10106846545"
  end_time="11:57:20" >
  </activity>
  <leg mode="car" trav_time="00:13:50">
  </leg>
  <activity type="eatout_2400" x="216306.4814485427" y="-479166.1510645319"
  max_dur="00:36:30" >
  </activity>
  <leg mode="car" trav_time="00:15:56">
  </leg>
  <activity type="home_36600" x="219308.77924934198" y="-492202.6918447277" >
  </activity>
</plan>
```



Person Attributes

```
<person id="10000099">
  <attributes>
    <attribute name="ESR" class="java.lang.String">0</attribute>
    <attribute name="age" class="java.lang.String">3</attribute>
    <attribute name="eduatt" class="java.lang.String">1</attribute>
    <attribute name="gender" class="java.lang.String">male</attribute>
    <attribute name="hhinc" class="java.lang.String">22700</attribute>
    <attribute name="hnumautos" class="java.lang.String">1</attribute>
    <attribute name="hsize" class="java.lang.String">3</attribute>
    <attribute name="householdId" class="java.lang.String">3247023</attribute>
    <attribute name="htype" class="java.lang.String">Multiple</attribute>
    <attribute name="marginalUtilityOfMoney" class="java.lang.Double">4.673641850220264</attribute>
    <attribute name="race" class="java.lang.String">NHAS</attribute>
    <attribute name="schg" class="java.lang.String">0</attribute>
    <attribute name="subpopulation" class="java.lang.String">person</attribute>
    <attribute name="ten" class="java.lang.String">3</attribute>
    <attribute name="wkind20" class="java.lang.String">0</attribute>
    <attribute name="wkocc24" class="java.lang.String">0</attribute>
    <attribute name="worker" class="java.lang.String">unemployed</attribute>
  </attributes>
```

- Taken from the person / household data in the SCAG abm
- For person-specific policy investigations
- For income-dependent utility parameters
 - income above average → marginal utility of money < 1.0
 - income = average → marginal utility of money = 1.0 (1 \$ = 1 utility unit)
 - income below average → marginal utility of money > 1.0

The LA County MATSim: Statistics

1. Model overview

	# of household	# of agents	# of trips
Original SCAG ABM Model	6,180,962	18,682,684	71,126,268
1%	183,307	186,637	708,219
5%	857,668	934,398	3,552,392
10%	1,582,433	1,867,724	7,104,799
25%	3,191,734	4,669,729	17,770,662
100%	6,180,962	18,682,684	71,126,268

2. Supported Modes

- Base case: Car, Public Transit, Ride, Bike, Freight, Walk, Ride_taxi, Ride_schoolbus
- Scenario case: Ride-Hailing
 - Single and multi passenger
 - Automated and Non-automated
 - Fares

Model Calibration: Mode Share

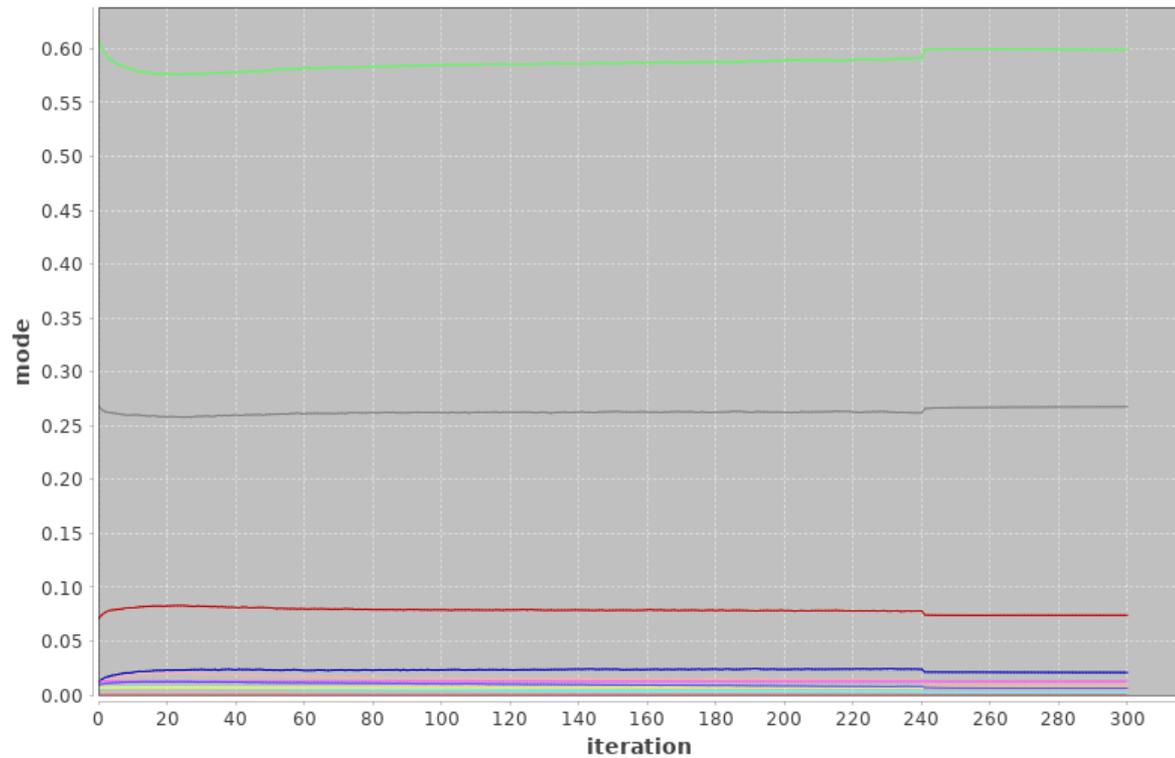
- Transport users' choice dimensions:

- Route choice
- Mode choice
- Departure time choice

- Adjusted parameters:

- Alternative-specific constants
- Marginal disutility of traveling
- Daily utility constants

Mode Statistics

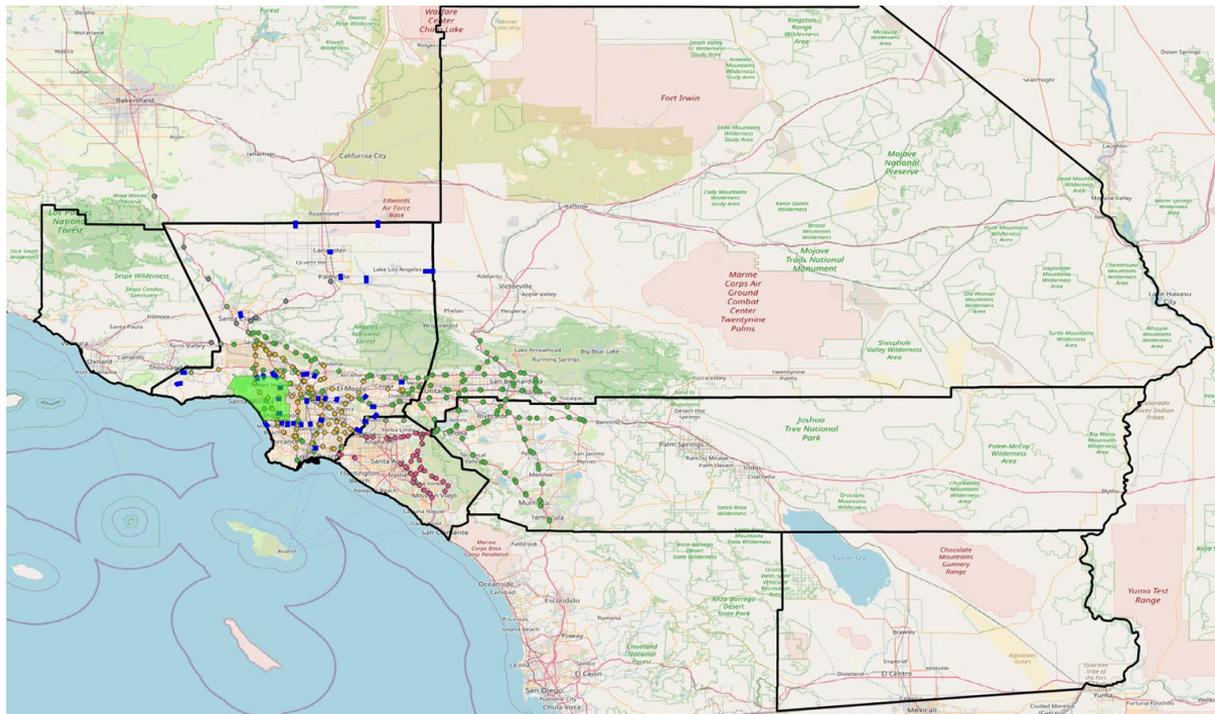


Model calibration: Link volumes

- Link volumes at certain count stations are calibrated towards “ground truth” values.

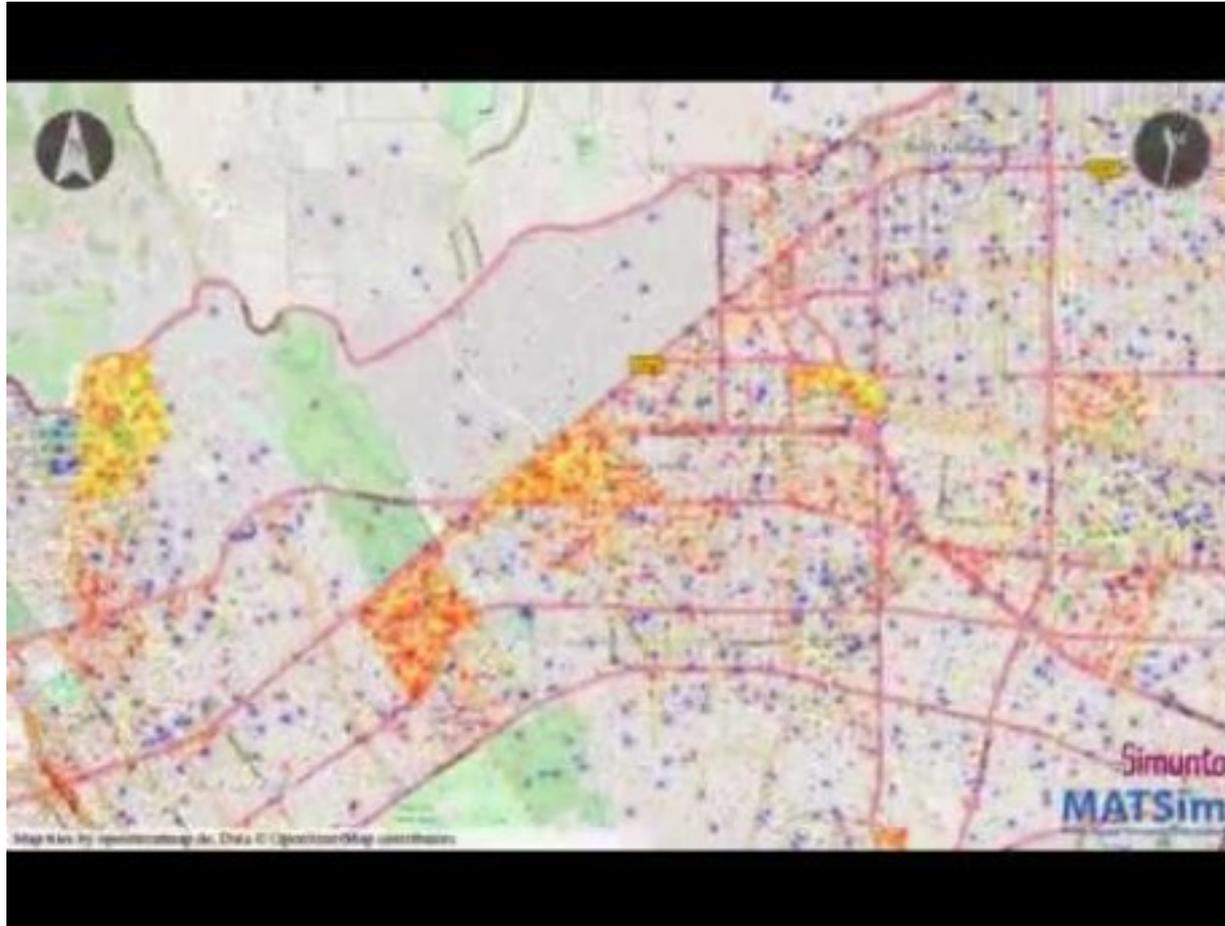
- We use several volume count data sources, including

- SCAG screenline data (Blue dots)
 - Mainly on local roads
 - Total stations: **72**
- PEMS freeway count station data (The rest dots)
 - Mainly on freeways
 - Total stations: **445**



Background Map: OpenStreetMap

Visualization of Simulated Activities



blue = home

red = work

yellow = leisure/shopping

green = education

Visualization of Simulated Vehicles



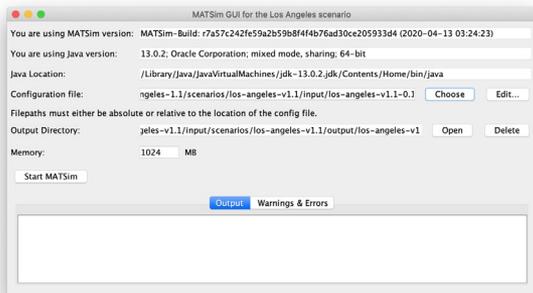
Visualization of Public Transit Vehicles



Run the model yourself!

<https://github.com/matsim-scenarios/matsim-los-angeles>

- 1) Download the project
- 2) Execute the runnable jar file (double click or “java -jar matsim-los-angeles-v1.1-jar-with-dependencies.jar”)
- 3) GUI: Choose a configuration file from ./scenarios/los-angeles-v1.1/input/... and “Start MATSim”



Or clone the project and run the JAVA run class from your IDE.

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197 commits 3 branches 0 packages 2 releases 2 contributors

Branch: v1.1 - New pull request Create new file Upload files Find file Clone or download -

ikaddoura Merge pull request #1 from matsim-scenarios/ikaddoura-patch-1 Latest commit 38cc83d 18 days ago

logos	add scag logo	5 months ago
scenarios	add config file for reduced scenario, mainly for testing purpo...	19 days ago
src	Update ReduceScenario.java	18 days ago
test	add manual score computation for test-agent_1000.99.xml	19 days ago
.gitignore	gitignore adjusted	8 months ago
.travis.yml	Update .travis.yml	19 days ago
README.md	towards a 1.1 release	21 days ago
matsim-los-angeles-v1...	add jar with dependencies	19 days ago
pom.xml	set version number v1.1	19 days ago

README.md

build passing

The MATSim Open Los Angeles Scenario

About this project

This repository provides an open MATSim transport model for Los Angeles, developed by the Institute of Transportation Studies at University of California, Davis and by the Transport Systems Planning and

Outlook

- **Multi-modal policy investigations + detailed analysis (person-specific, spatial and temporal high resolution)**
- **Autonomous ride-hailing services in the West Side Cities Area (MATSim extensions: dvrp, av, drt)**
- **Road pricing concepts (MATSim extensions: roadPricing, decongestion)**
- **Submitted SGC proposal to add one-way carsharing with BlueLA user data to explore concepts for planned expansion**
- **Submitted UC SB 1 proposal to use LA County MATSIM model to simulate contact human frequency, duration, and intensity patterns for a COVID-19 virus infection dynamic model with USC's School of Medicine**

Thank you!

Acknowledgements

We are grateful to the Southern California Association of Governments (<http://www.scag.ca.gov/>) for supporting this model developing effort with data and staff time. We are also grateful to the California Department of Transportation (<https://dot.ca.gov>) for funding this research through their sustainable planning grant programs.