DATE: 12/19/24

PROJECT OVERVIEW

Simulating Traffic Impacts in San Francisco:

Powered by

MATSim

BY ADRIAN VASQUEZ

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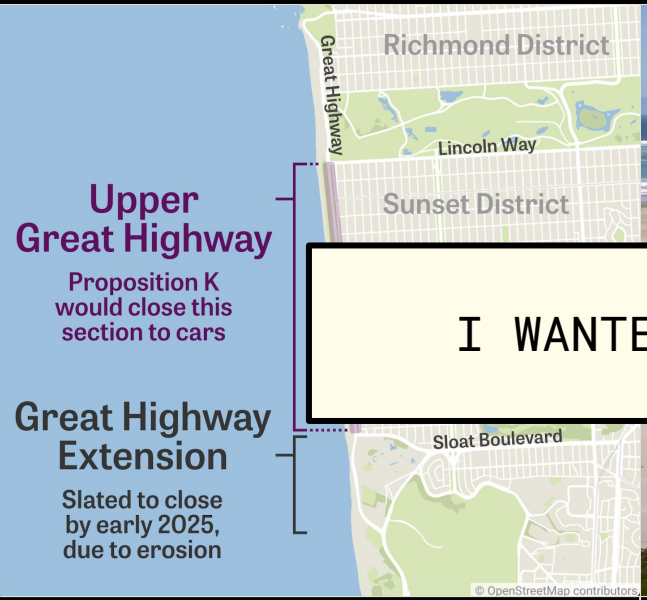
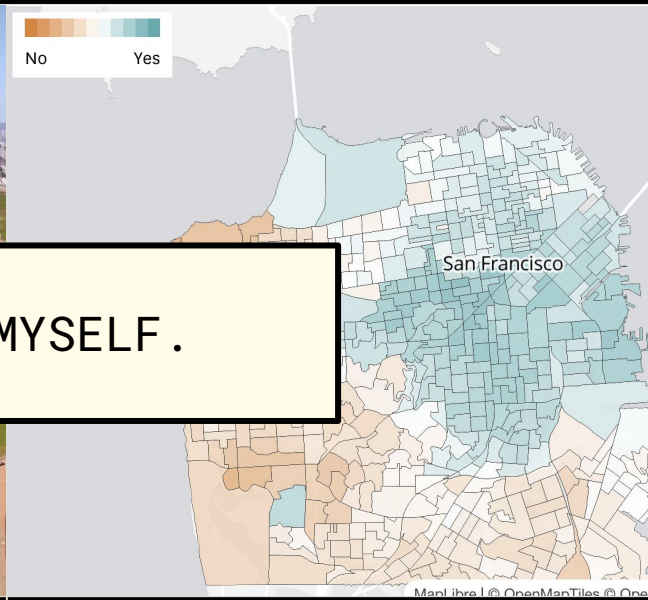
INTRODUCTION

My Connection





I WANTED TO INVESTIGATE FOR MYSELF.

LATE AUGUST PROPOSITION K IS ANNOUNCED

As voting season rolled around, one proposition on the ballot stuck out to me the most: Proposition K, a proposition to permanently close the Great Highway, a long stretch of road along Ocean Beach.

PROPONENTS

I spoke with many supporters of the ballot, who argued that it would create a beautiful beachfront promenade, give more public spaces to enjoy, and help disincentivize the usage of cars.

OPPONENTS

Many opponents, who lived much closer to the Great Highway, said that it would not be completed soon, and that it would significantly worsen traffic.

SF-CHAMP

A very well documented traffic modeling software designed by the SFMTA specifically for forecasting travel demand, possible traffic volumes, and how they adapt to changes in the system. Has SF's transit system, SF residents' travel patterns, and population and employment data all built into it.

It is closed source and not available for public use.

DTA (Dynamic Traffic Assignment)

An open source traffic modeling system that has an even more fine-grained view of the traffic patterns in San Francisco. It has also been used by the SFMTA, and was even used in the planning of a few city projects.

It runs on a platform called Dynameq, which was recently purchased by Bentley Systems, who bundled it into their OpenPaths software. It now costs $11,500 to license and use.

Home > Software > Mobility Simulation > OpenPaths

OpenPaths

USD 11,550.00

Taxes not included. Purchase includes 2 Keys

Choose One *

USD 11,550.00 - OpenPaths Ultimate

Qty

1

ADD TO CART

ADD TO COMPARE

Transportation modeling and simulation software

- **OpenPaths Advanced** | All the essential capabilities needed for multimodal transport modeling and classic travel demand modeling

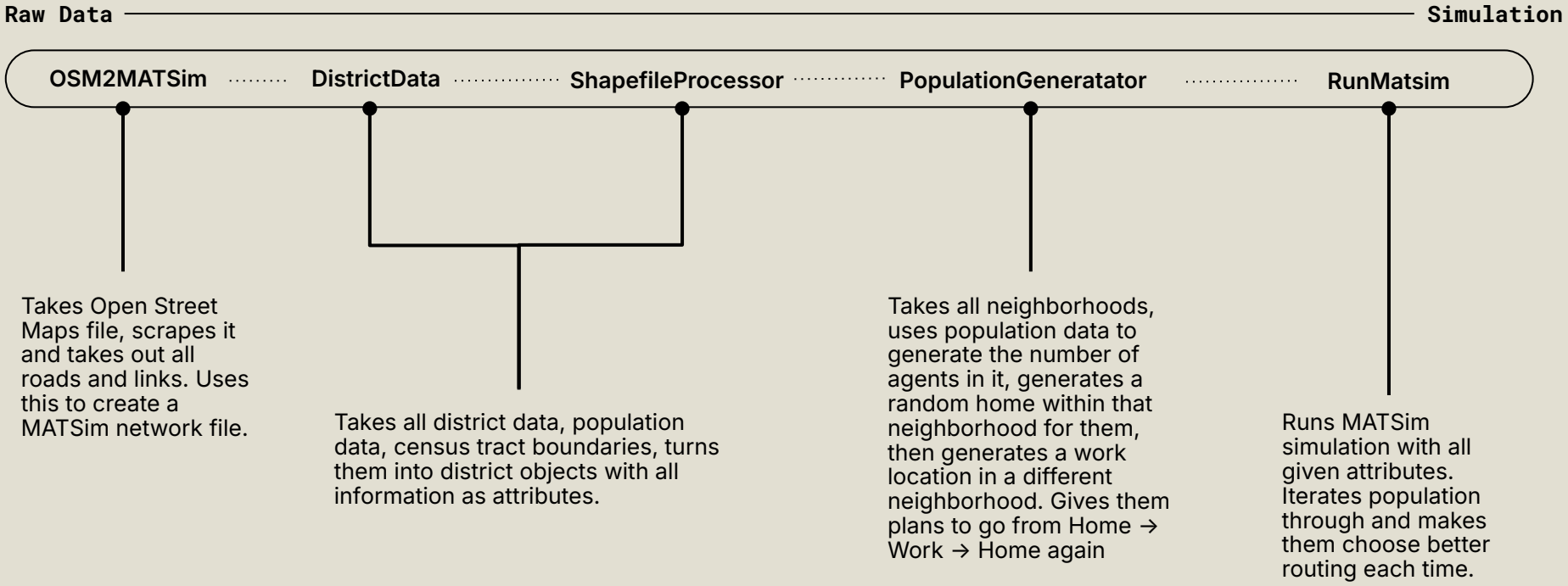
MATSim

To the rescue! Kind of...

MATSim is an open-source framework for large-scale agent-based transport simulations.

PROJECT OVERVIEW

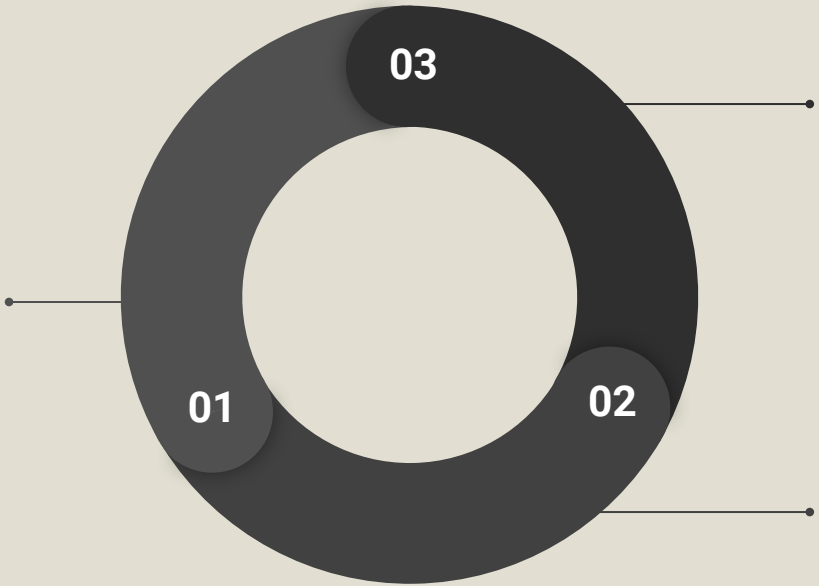
CODE PIPELINE



PROJECT PIPELINE

Run Base MATSim Simulation

First stimulation was ran with completely standard and unaffected data on the city.



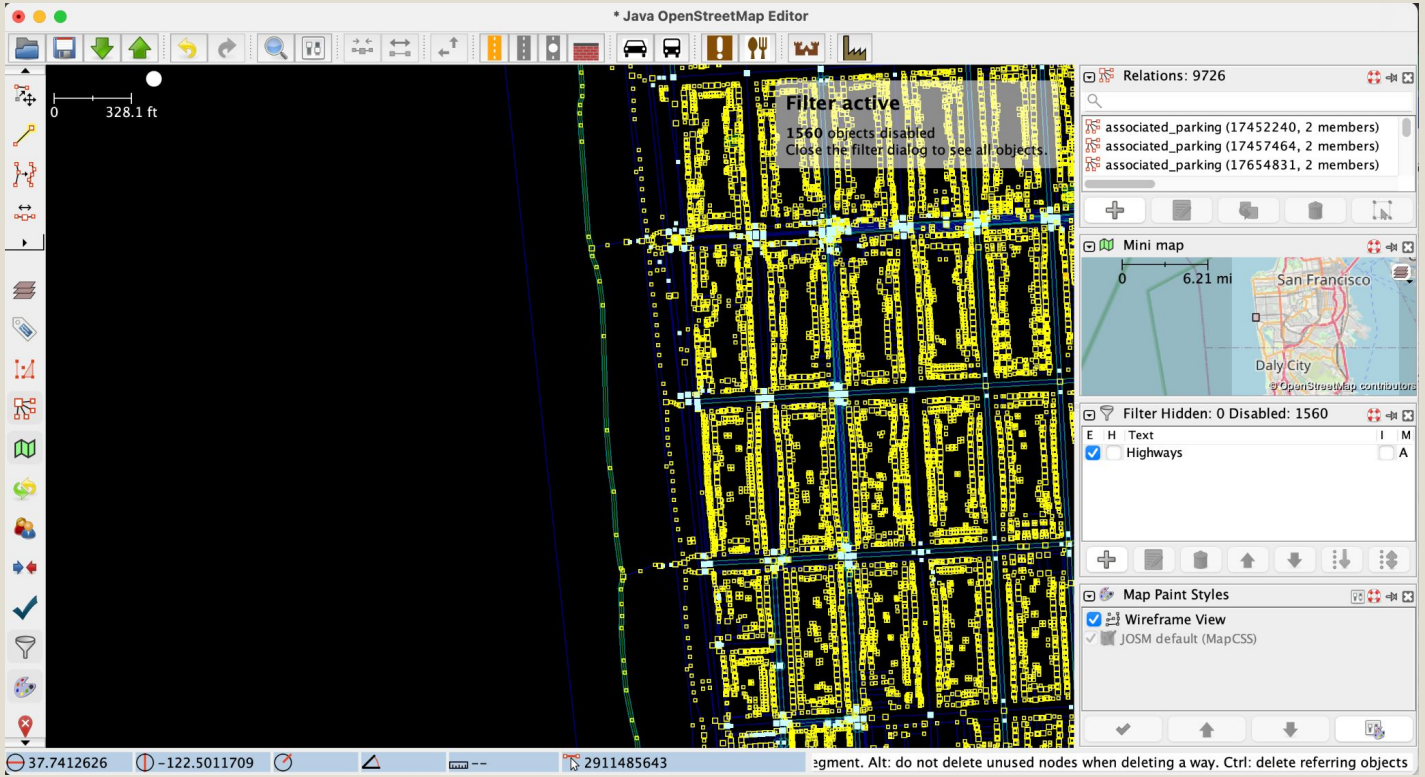
Run Updated MATSim Simulation

Find all important roads where changes occurred in traffic times, find actual meaningful differences.

Delete Great Highway

Go into OSM file, delete Great Highway, run it back through all the same preprocessing steps.

Delete Great Highway



TOOLS AND SKILLS USED

- ➔ Learned MATSim (of course)
- ➔ Learned Java for this project.
- ➔ Learned how to use cloud computing, specifically Oracle Cloud. Had to use a 16GB RAM and 16 Core CPU VM to run code.
- ➔ Learned how to use OSM tools
- ➔ Learned/used git for project management and version control

PROBLEMS FACED

TECHNICAL HURDLES

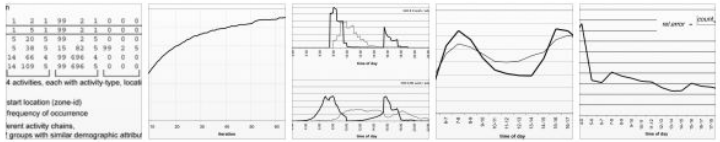
- Learning Java, setting up cloud computing and git was very difficult.
- Debugging MATSim (total: 10 hours)
  - Fairly sparse documentation, mainly example-based.

RESEARCH

- Most documented examples are by teams of researchers, or city governments commissioning MATSim research.
- Ex: Transportation Research Record Journal of the Transportation Research Board

Abstract and Figures

The typical method to couple activity-based demand generation (ABDG) and dynamic traffic assignment (DTA) is time-dependent origin-destination (O-D) matrices. With that coupling method, the individual traveler's information gets lost. Delays at one trip do not affect later trips. However, it is possible to retain the full agent information from the ABDG by writing out all agents' plans, instead of the O-D matrix. A plan is a sequence of activities, connected by trips. Because that information typically is already available inside the ABDG, this is fairly easy to achieve. Multiagent simulation (MATSim) takes such plans as input. It iterates between the traffic flow simulation (sometimes called network loading) and the behavioral modules. The currently implemented behavioral modules are route finding and time adjustment. Activity resequencing or activity dropping are conceptually clear but not yet implemented. Such a system will react to a time-dependent toll by possibly rearranging the complete day; in consequence, it goes far beyond DTA (which just does route adaptation). This paper reports on the status of the current Berlin implementation. The initial plans are taken from an ABDG, originally developed by Kutter; to the authors' knowledge, this is the first time traveler-based information (and not just O-D matrices) is taken from an ABDG and used in a MATSim. The simulation results are compared with real-world traffic counts from about 100 measurement stations.



The structure of activity… | The agents' average sco… | The number of trip… | A comparison of average… | Average relative erro…

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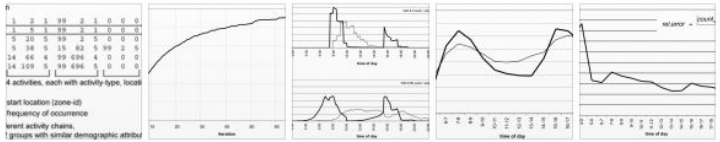

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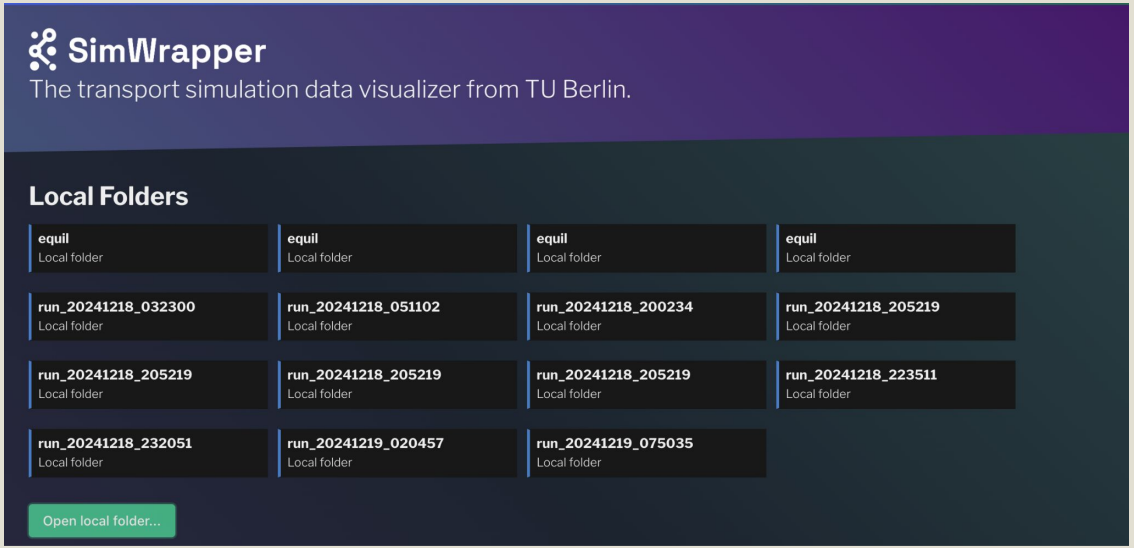
Debugging


SimWrapper
The transport simulation data visualizer from TU Berlin.
Local Folders
equil
Local folder
equil
Local folder
equil
Local folder
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Local folder
run_20241218_032300
Local folder
run_20241218_051102
Local folder
run_20241218_200234
Local folder
run_20241218_205219
Local folder
run_20241218_205219
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run_20241218_223511
Local folder
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run_20241219_020457
Local folder
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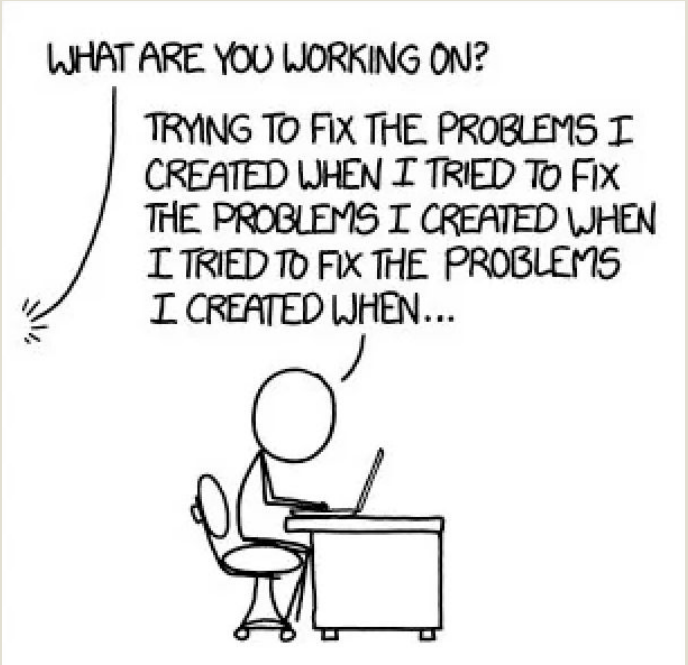
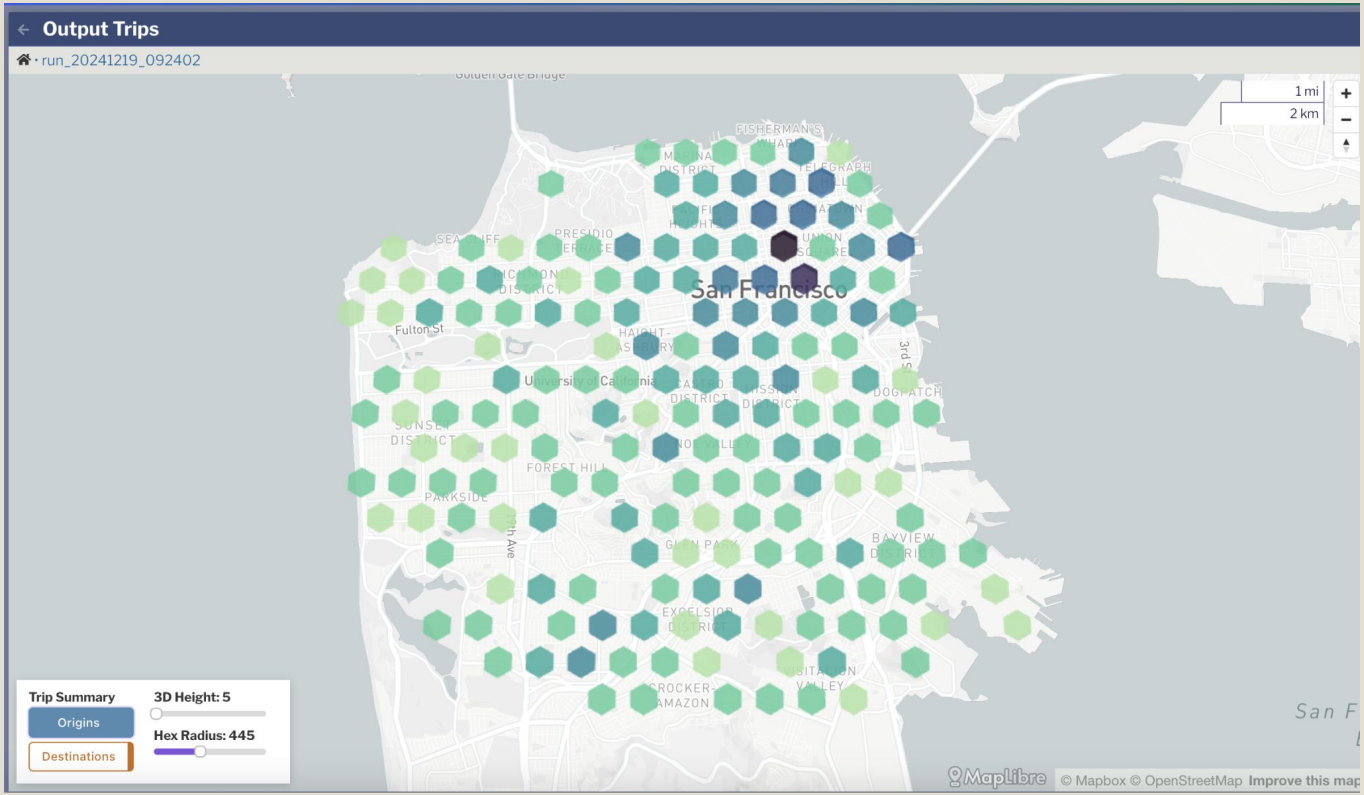
Local folder
Open local folder...

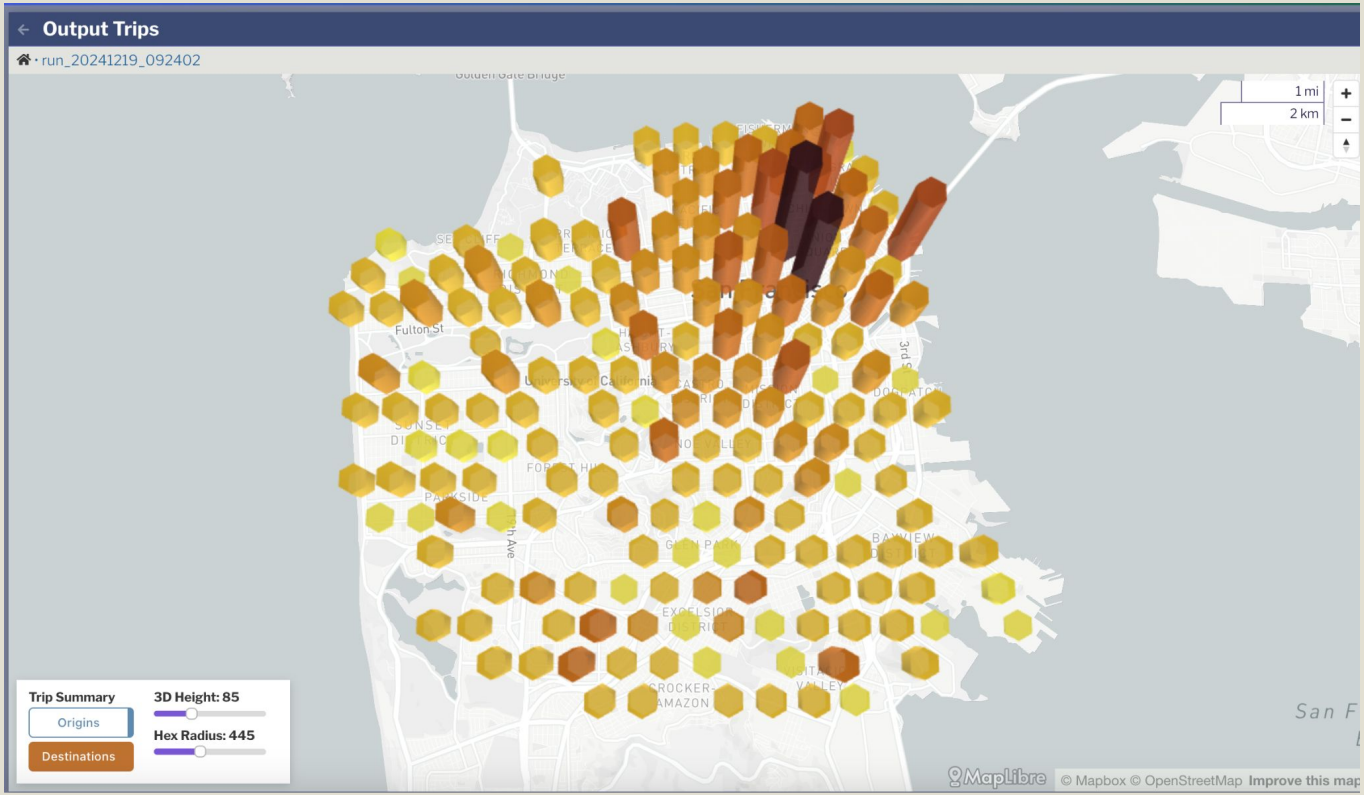

WHAT ARE YOU WORKING ON?
TRYING TO FIX THE PROBLEMS I CREATED WHEN I TRIED TO FIX THE PROBLEMS I CREATED WHEN I TRIED TO FIX THE PROBLEMS I CREATED WHEN...

RESULTS

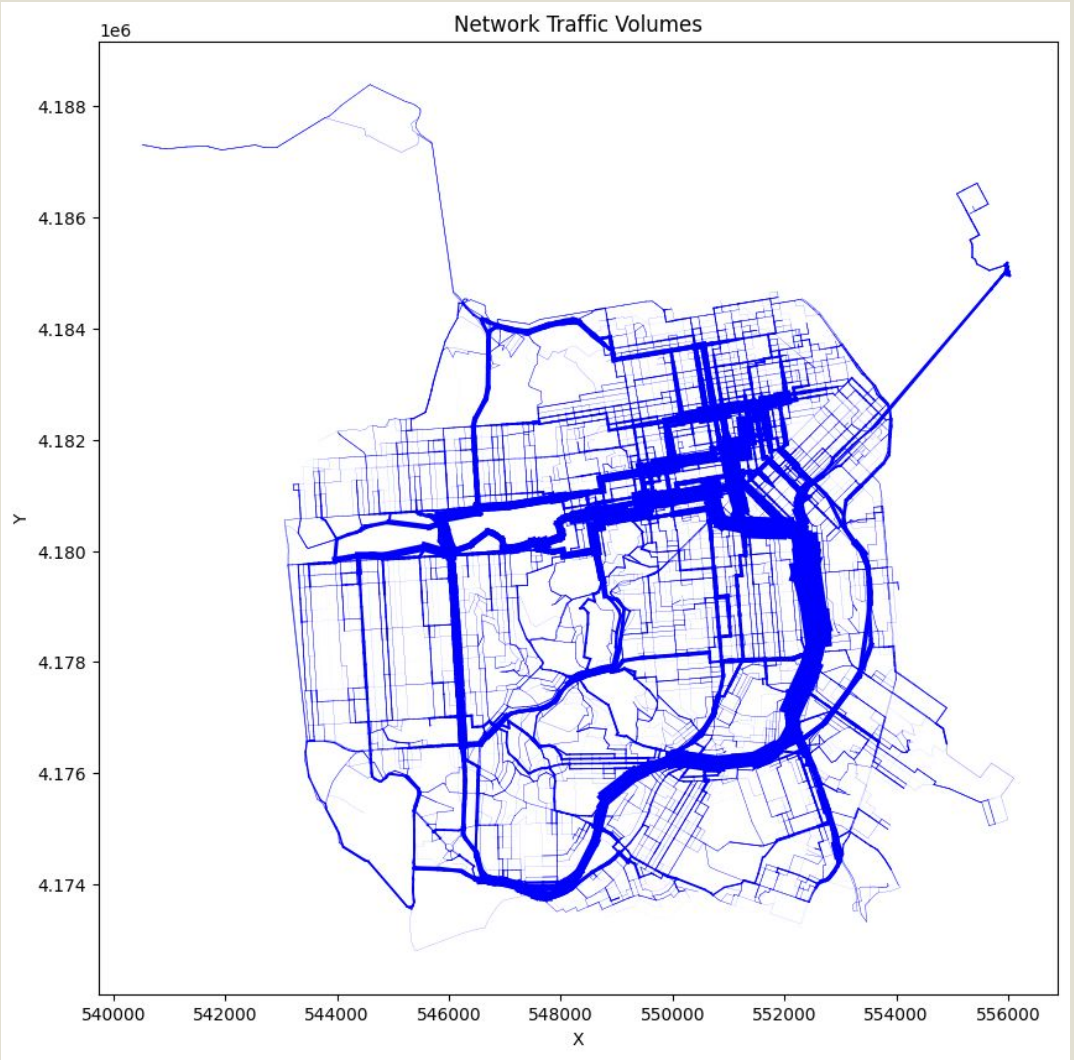
Home and Work



Home and Work

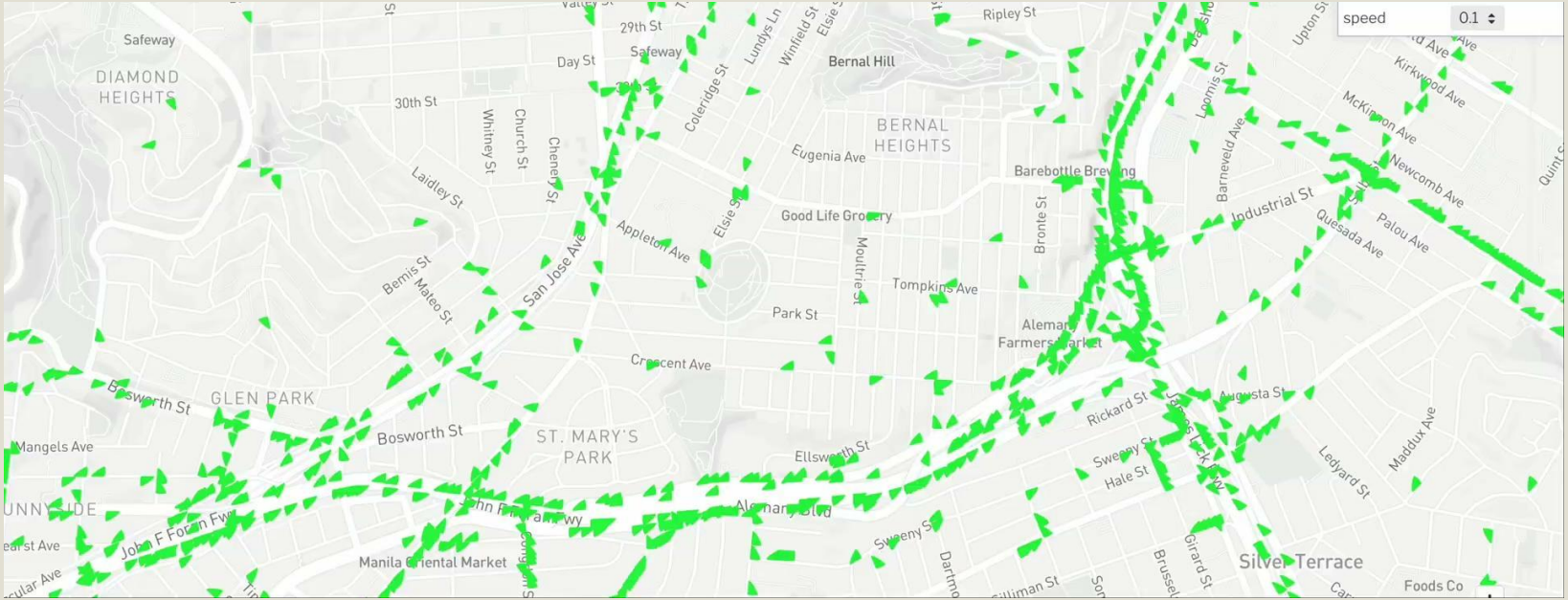


Traffic Volume



MATSim in Action

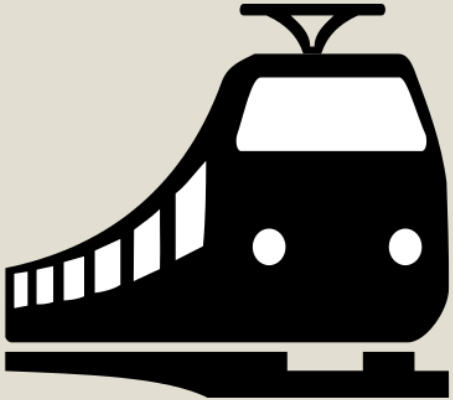
Detail


speed
0.1
Safeway
DIAMOND HEIGHTS
29th St
Safeway
Day St
30th St
Whitney St
Church St
Cheney St
Coleridge St
Lundys Ln
Winfield St
Elsie St
Bernal Hill
Ripley St
BERNAL HEIGHTS
Eugenia Ave
Laidley St
Elsie St
Good Life Grocery
Barebottle Brewing
Loomis St
Barneveld Ave
Kirkwood Ave
McKinnon Ave
Newcomb Ave
Industrial St
Quesada Ave
Palou Ave
Bronte St
Moultrie St
Appleton Ave
San Jose Ave
Bemis St
Mateo St
Tompkins Ave
Park St
Crescent Ave
Farmers Market
GLEN PARK
Bosworth St
Mangels Ave
ST. MARY'S PARK
Ellsworth St
Rickard St
Augusta St
Sweeny St
Hale St
Maddux Ave
Ledyard St
John F Foran Fwy
Manila Oriental Market
Silver Terrace
Girard St
Foods Co

Final Result: Did anything change?

Next Steps

If I had more time, what could I have done?



Please feel free to reach out with any Questions, compliments, or concerns.

➔ Email: adrian.vasquez@berkeley.edu ➔ SID: 3035671105

THANK YOU !