University of Windsor

TRAFFIC FLOW SIMULATION

Using Agent Based Model (ABM) - Applied Artificial Intelligence

Guided By-
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Our Agenda

Introduction

With increase in the use of auto mobiles, the problem of traffic jams had also escalated.

To resolve this, it is important to have optimal road design to control the flow of traffic better.

Thus, we present an Agent-based model that can simulate the results to show the outcome of developing roadways and placements of traffic signals on the routes.

Problem and Motivation

Problem: Increase in the number of vehicles on the road network, leading to traffic jams

Motivation: The need of an efficient road network and optimal placement traffic signals that can control the flow of traffic better

Solution: Developing an Agent- based model that can simulate the traffic flow based on change/addition in the existing road network
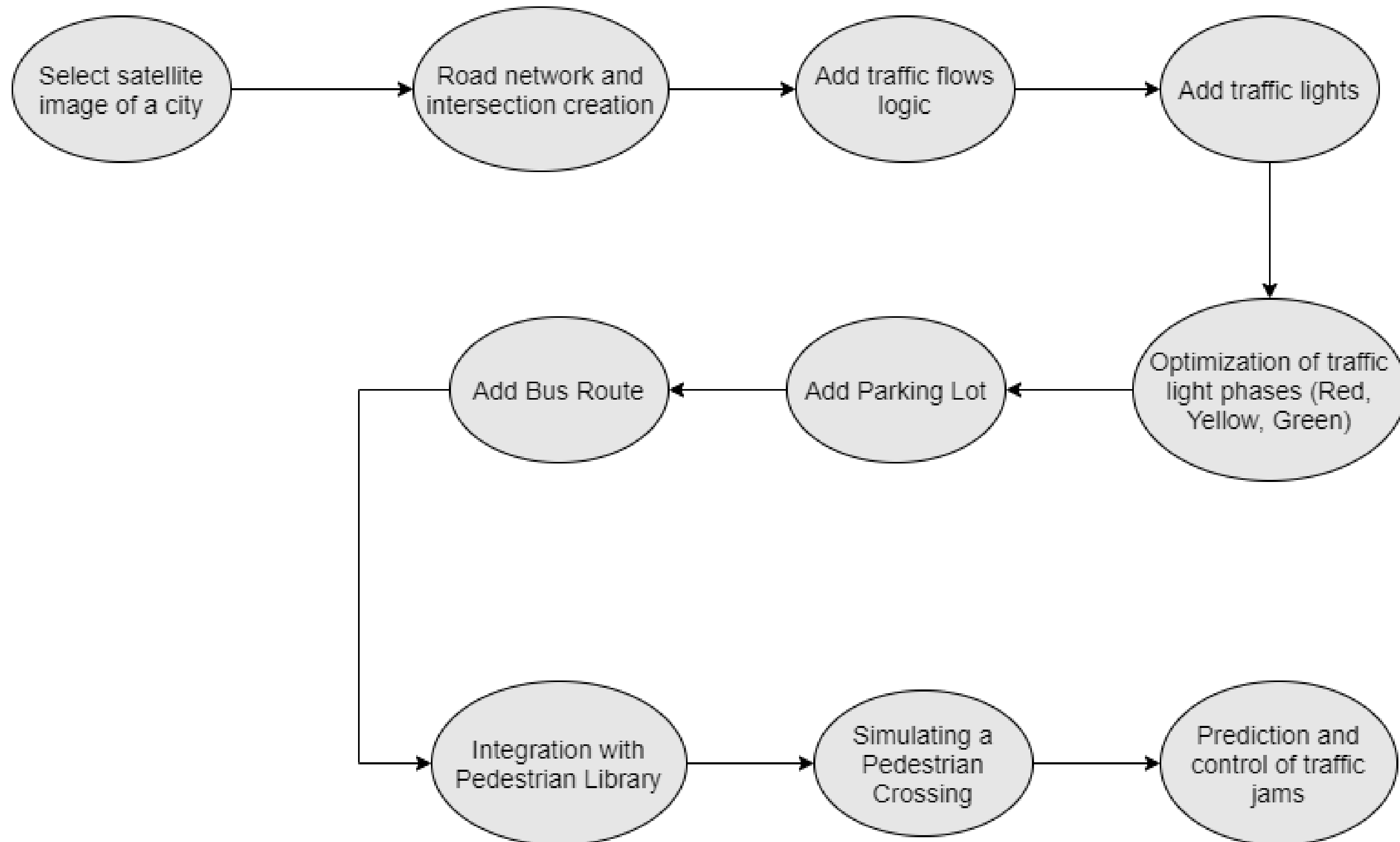
Hypothesis

The problem of traffic jams can be resolved if we have an efficient road network

The chance of accidents can be reduced exponentially by optimal placement of traffic signals

By predicting the flow of traffic, we can develop optimal strategies to develop new routes
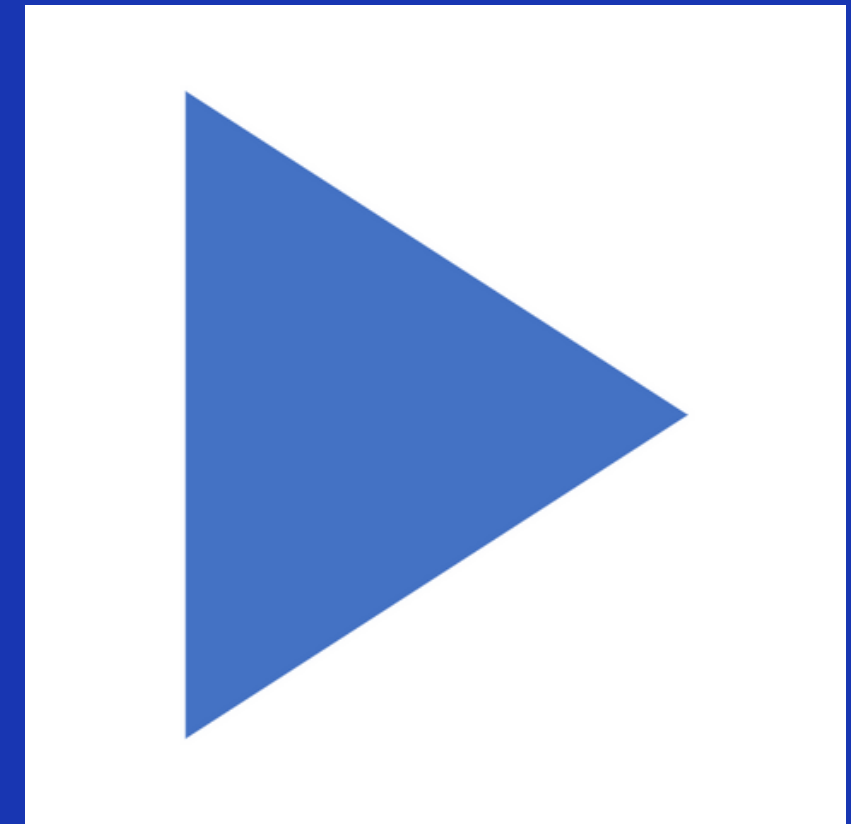
Our Approach

Tools and Technologies

We used AnyLogic as a tool to develop agent based model for traffic flow simulation.

Agents in our model:

- Car (CarSource, CarMoveTo, CarDispose)
- Bus
- BusRoute and BusStops
- Pedestrian
- Road Network Descriptor

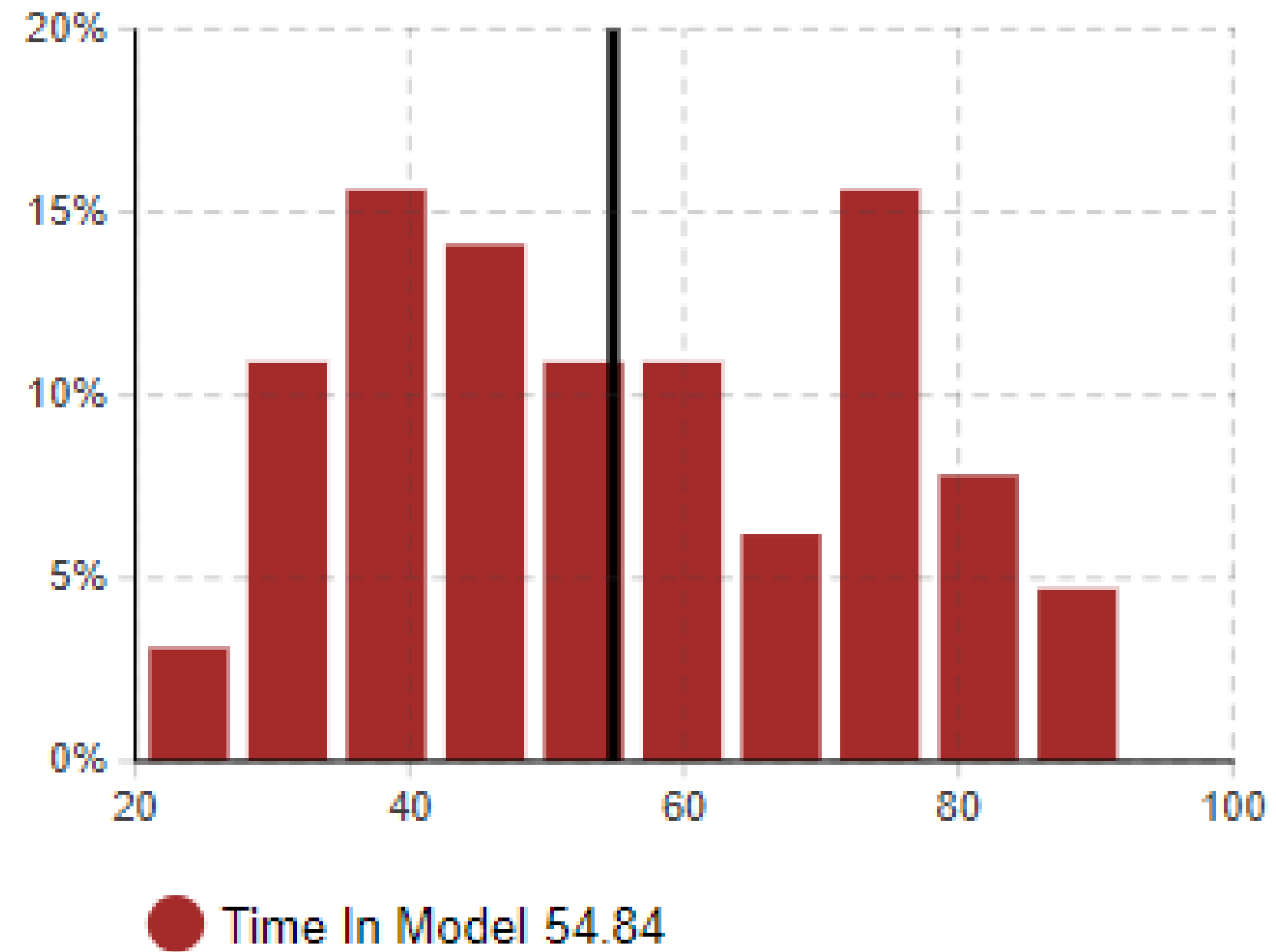# Launching our Traffic Simulation Demo

Experiments

- We have added traffic lights and logic to control the collision of vehicles on intersection.

- The direction of vehicles and their movement based on the signals is programmed in the model.

- The placement of pedestrian walkways and movement over them effects the signal, i.e. if there are pedestrians crossing the road, the signal will not turn green.
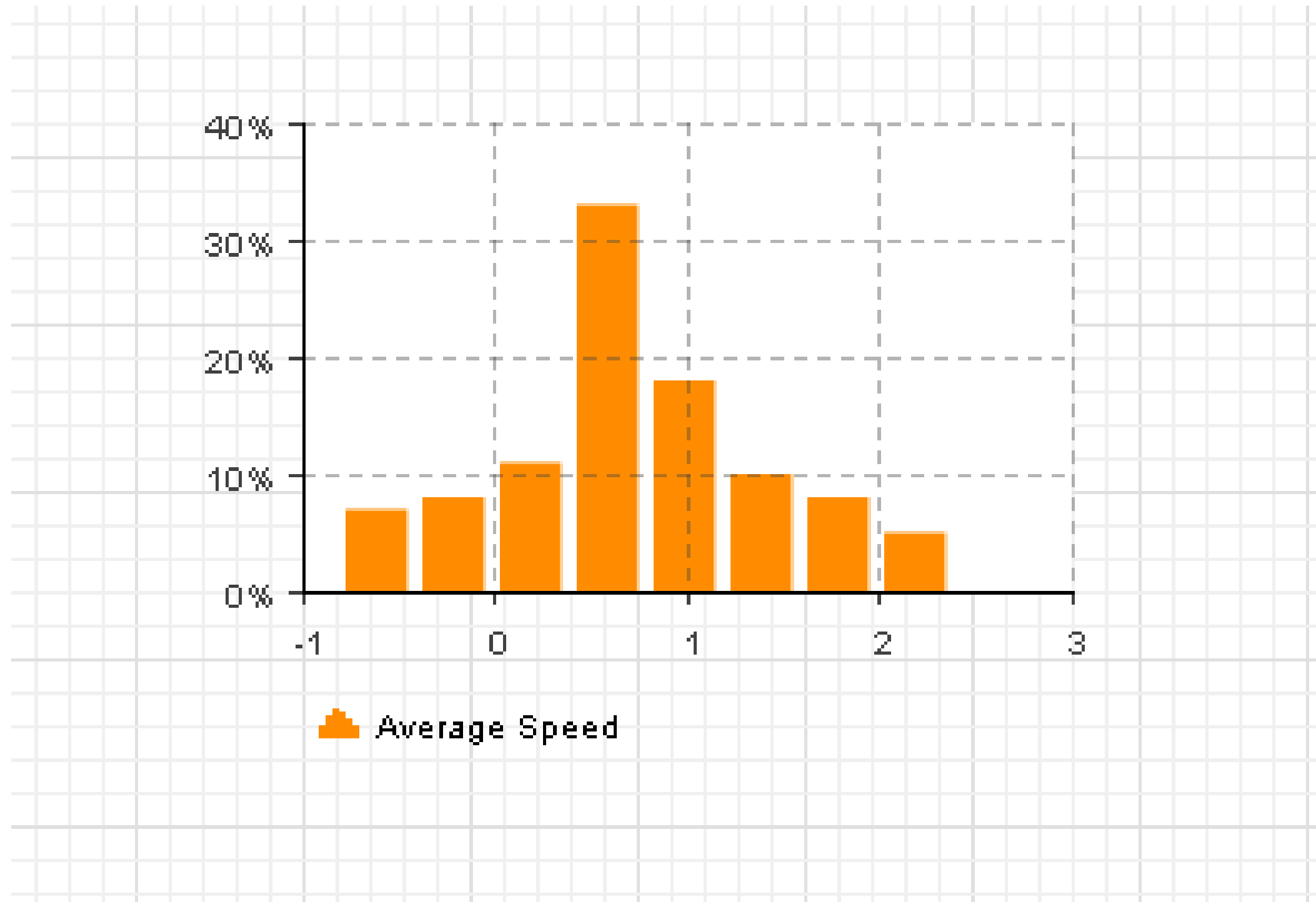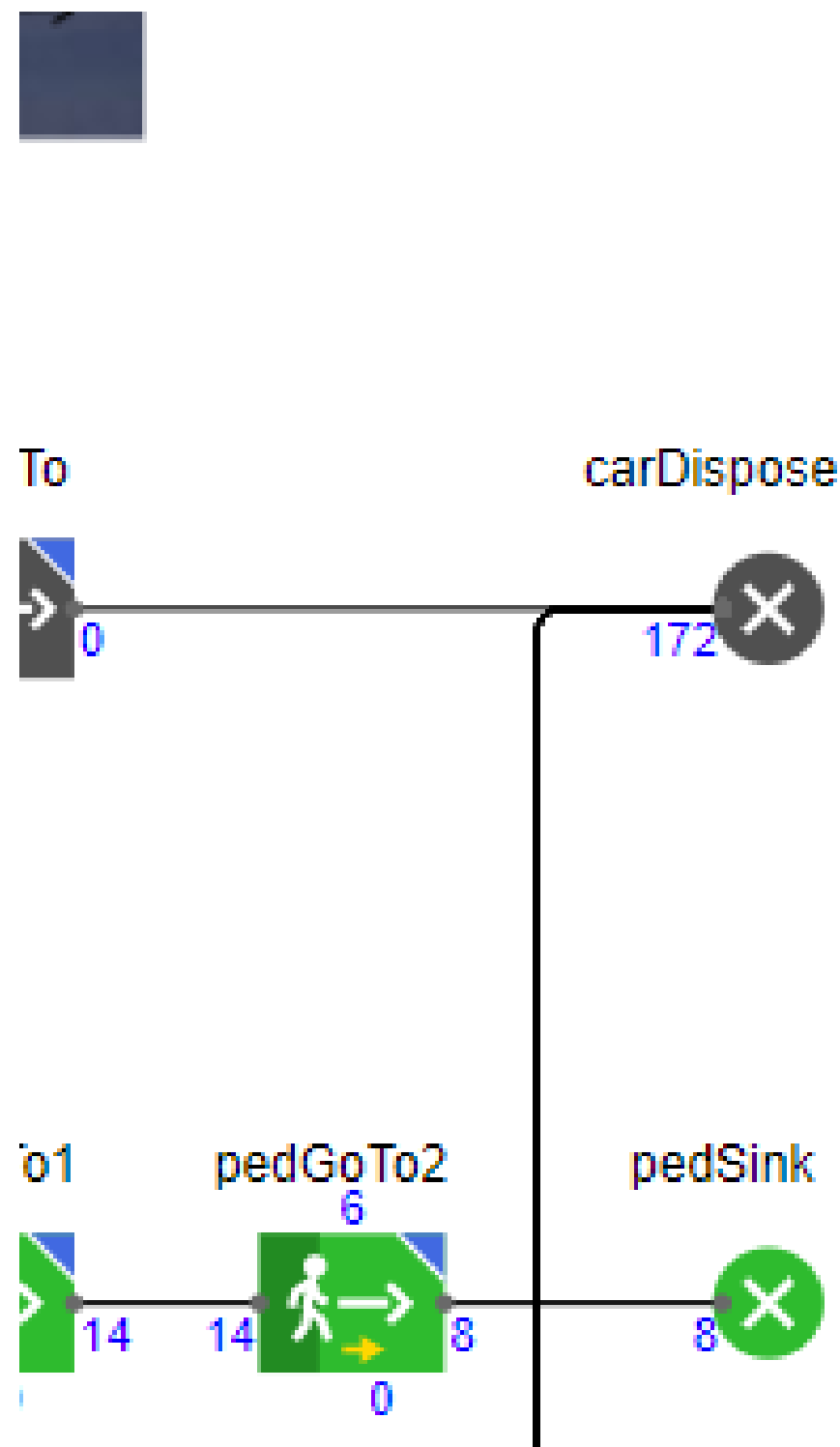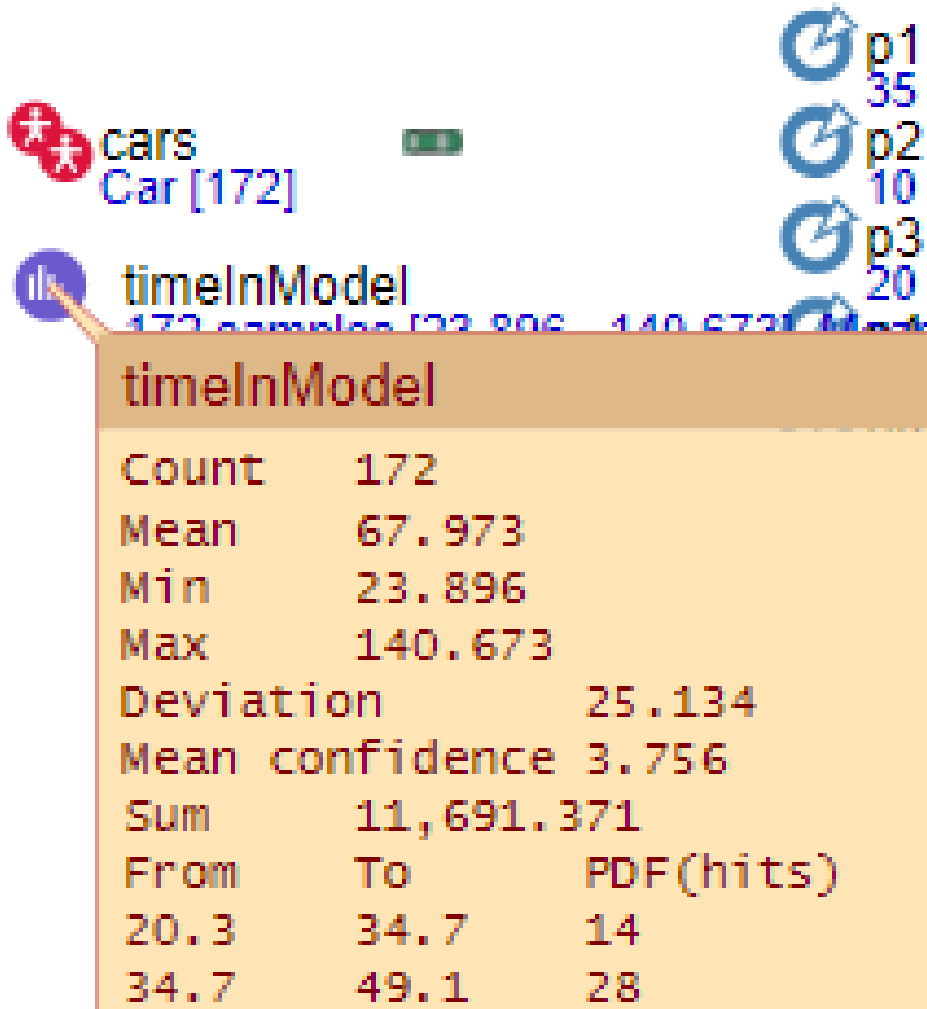
Results

Time model graph

Time In Model 54.84

Average speed of cars

Total Mean Time

roadNetworkDescriptor
173

To   carDispose
0   172

o1   pedGoTo2   pedSink
       6
14   14   8   8
       0

cars
Car [172]

timeInModel

p1
35
p2
10
p3
20

timeInModel

Count	172	
Mean	67.973	
Min	23.896	
Max	140.673	
Deviation		25.134
Mean confidence		3.756
Sum	11,691.371	

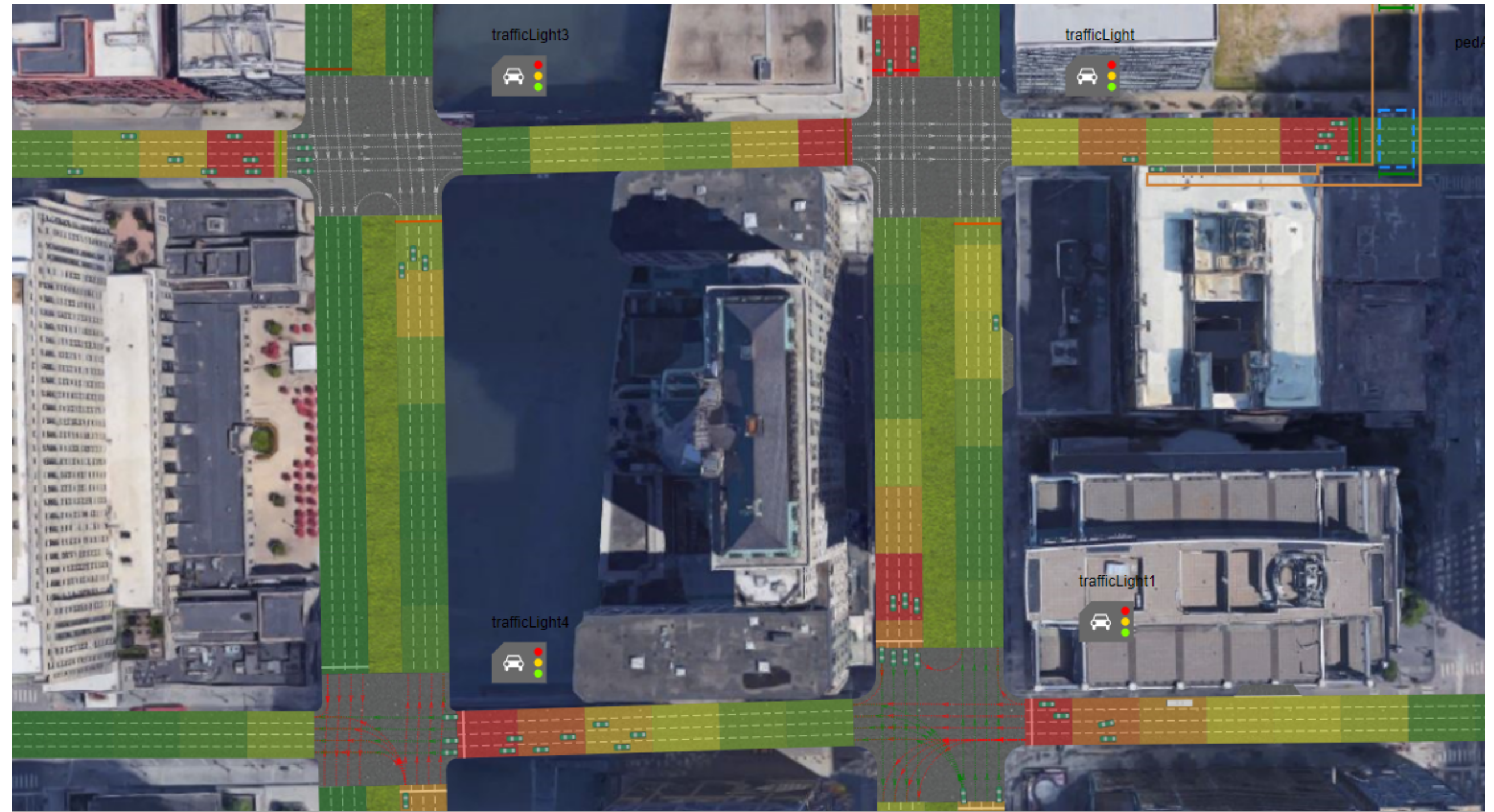| From	To	PDF(hits)
20.3	34.7	14
34.7	49.1	28

Prediction of traffic jams

Conclusion

Researched several agent- based models and few approaches to solve problems.

Predicted the flow of traffic.

Simulated the traffic flow prediction.

Developed strategies for better management using all the knowledge gathered from the models.

Future work

The model is simulated assuming all the drivers follow the driving rules. We can take the driving habits in consideration for more accurate results.

We can optimize delay times at intersections by developing better traffic signals policies, e.g. coordinating the times between adjacent signals.

References

Alqurashi, R., & Altman, T. (2019). Hierarchical Agent-Based Modeling for Improved Traffic Routing. Applied Sciences, 9(20), 4376–.https://doi.org/10.3390/app9204376

de Oliveira, L. B., & Camponogara, E. (2010). Multi-agent model predictive control of signaling split in urban traffic networks. Transportation Research. Part C, Emerging Technologies, 18(1), 120–139. https://doi.org/10.1016/j.trc.2009.04.022

Man, C.-Y., Shyr, O. F., Hsu, Y.-Y., Shepherd, S., Lin, H.-L., & Tu, C.-H. (2020). Tourism, transport, and land use: a dynamic impact assessment for Kaohsiung's Asia New Bay Area. Journal of Simulation : JOS, 14(4), 304–315. https://doi.org/10.1080/17477778.2020.1806748

Zhuang, Y., Liu, Z., Schadschneider, A., Yang, L., & Huang, J. (2021). Exploring the behavior of self-organized queuing for pedestrian flow through a non-service bottleneck. Physica A, 562. https://doi.org/10.1016/j.physa.2020.125186

Thank you!