Simulation Project

Team B

Improve Throughput of the Main Road

Hannoversche Str. / Diesdorfer / Ummendorfer Str.

Milestone 6

Presented by

Oleeviya Babu Poikarayil

Overview

1. Validation Process
2. Setup
3. Scope of Validity/Assumptions
4. Changes Made to the Model
5. Validation Results
6. Problems Encountered
7. Conclusion
8. Lessons Learned

Idea of validation

- ★ Compare the real system with the simulation model
- ★ Building the correct model
- ★ Mean of real world data lies within the confidence interval of our simulation replications.
- ★ Can then be used to prove or not disprove that our model represents the real world

Setup

- ★ Made changes to the model for the new output variables
- ★ Implement replications for our simulation in AnyLogic using parameter variation
- ★ 100 samples (replications)
- ★ Set confidence level as 99%
- ★ Set significance level as 0.01
- ★ If the mean of real world data lies within the confidence interval, then it would be a success if not we had to figure out why and maybe make alterations to the model

Scope of validity/assumptions

- ★ Cars initial speed is set to 10 km/h and max preferred speed of 60 km/h
- ★ Traffic lights use fixed time plans
- ★ All cars have the same length
- ★ All cars follow the traffic rules

Changes made to the model

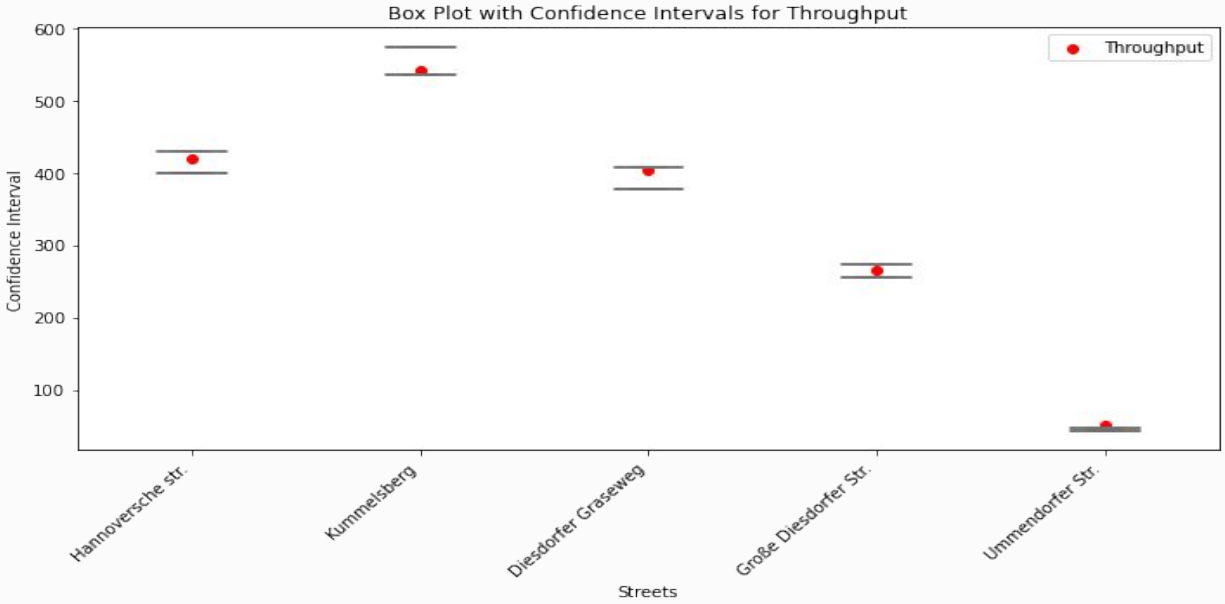
- ★ Added pedestrian crossings
- ★ Adjusted the road length, so that more cars can spawn in
- ★ Corrected the turning probabilities in input data
- ★ Changed the car properties like acceleration and initial speed
- ★ Created a custom distribution for Große Diesdorfer straße

Validation Results

Throughput

STREET	LOWER	UPPER	REAL WORLD THROUGHPUT
Hannoversche str.	400.362	428.898	420
Kummelsberg	534.987	574.533	542
Diesdorfer Graseweg	377.768	407.892	404
Große Diesdorfer Str.	255.081	272.739	266
Ummendorfer Str.	43.233	47.567	51

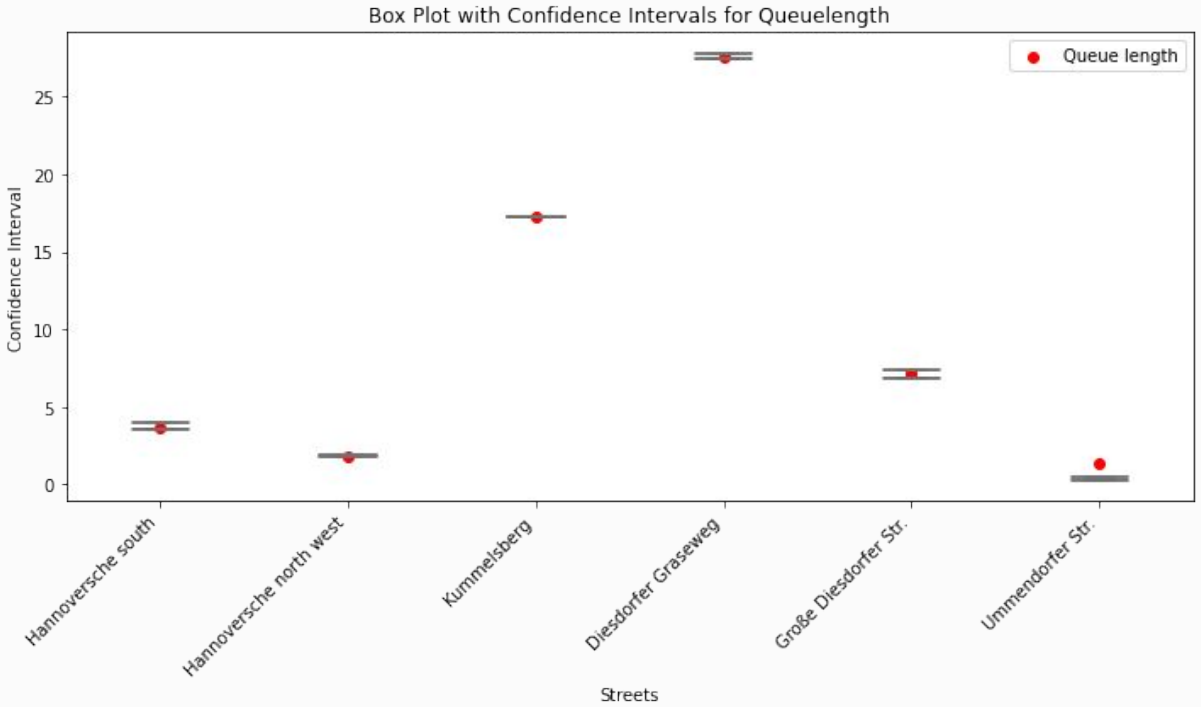
Box Plot with Confidence Intervals for Throughput



Average queue length

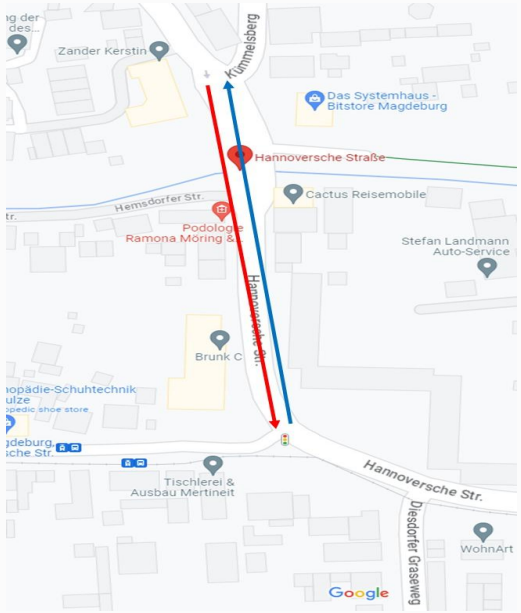
STREET	LOWER	UPPER	REAL WORLD AVERAGE QUEUE LENGTH
Hannoversche South	3.564	4.022	3.714
Hannoversche North West	1.761	1.954	1.857
Kummelsberg	17.237	17.31	17.294
Diesdorfer Graseweg	27.445	27.8	27.525
Große Diesdorfer Str.	6.839	7.381	7.138
Ummendorfer Str.	0.314	0.5	1.4166

Box Plot with Confidence Intervals for Queue length

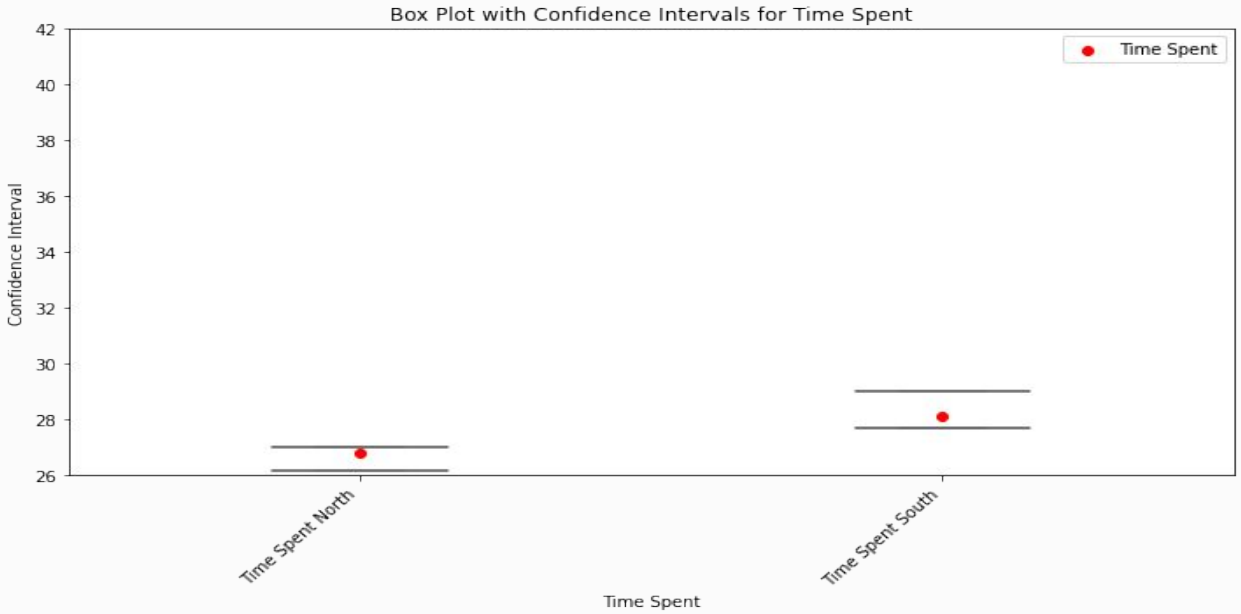


Average time spent in the system

STREET	LOWER	UPPER	REAL WORLD AVERAGE TIME
Time Spent North	26.186	26.989	26.78
Time Spent South	27.716	29.04	28.12



Box Plot with Confidence Intervals for Time Spent



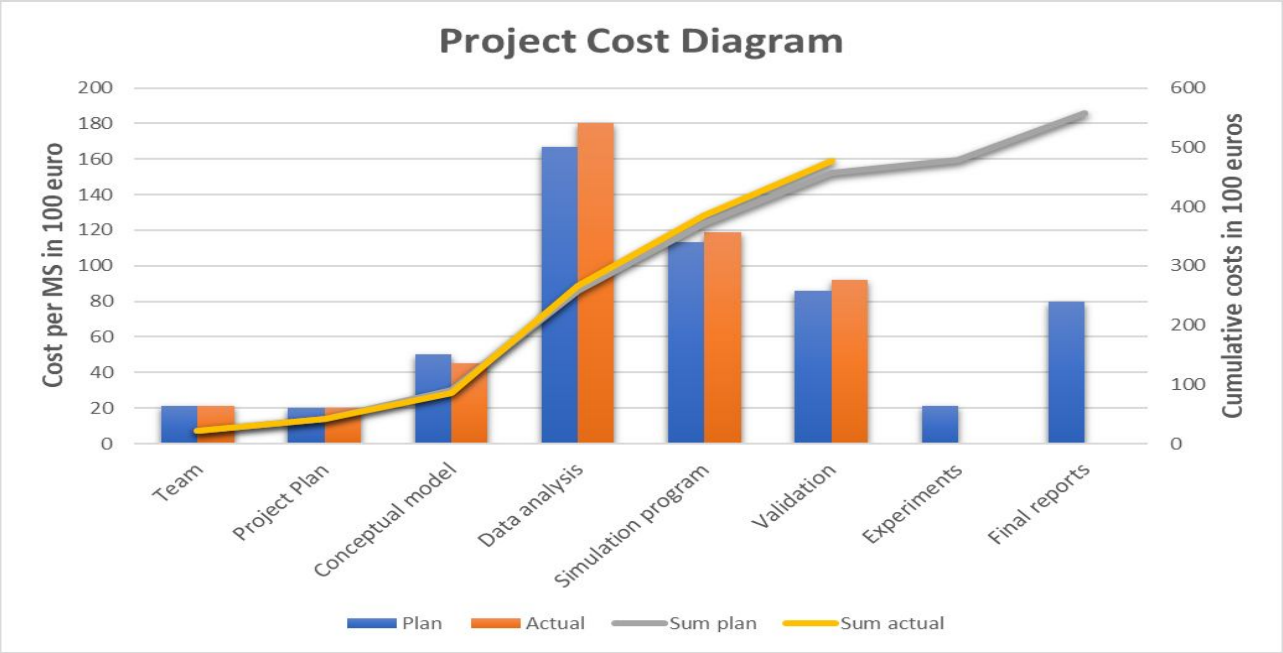
Problems encountered

- ★ Traffic signal patterns varied widely from fixed plan during data collection
- ★ The data from Ummendorfer str does not fit inside the confidence interval due to several reasons such as low traffic volume, inefficient traffic signal timing and other real world factors that limit the road's capacity to handle traffic
- ★ City data was not completely reliable so we collected some data again

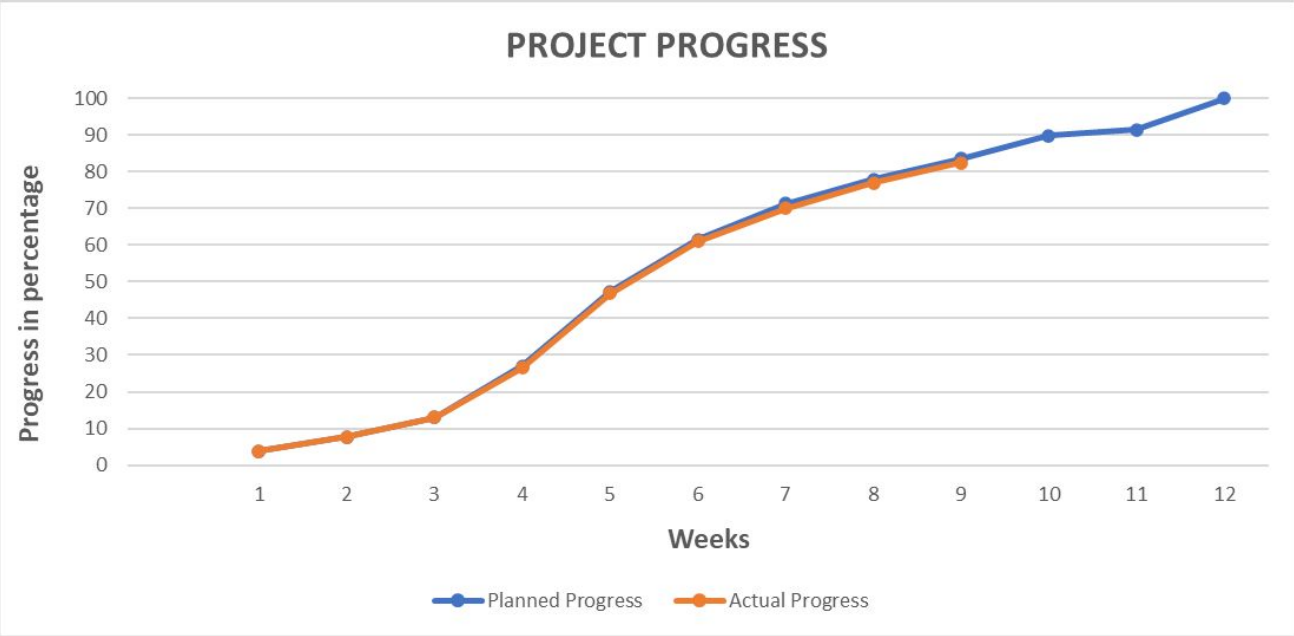
Conclusion

- ★ Our system considers factors like traffic volume, signal timing and road capacity for accurate traffic flow estimation
- ★ All streets except Ummendorfer str. fits within the confidence interval
- ★ It is evident that this deviation has minimal impact on the overall working of the system
- ★ Considering these reasons, we accept the model as it provides reliable estimations for the majority of streets

Project Cost



Project Progress



Lessons Learned

- ★ Traffic signals are very complicated, very precise timings needed
- ★ Rectification of model takes very long time
- ★ Replications have long run time, so planning must be done accordingly

Thank You

Questions?