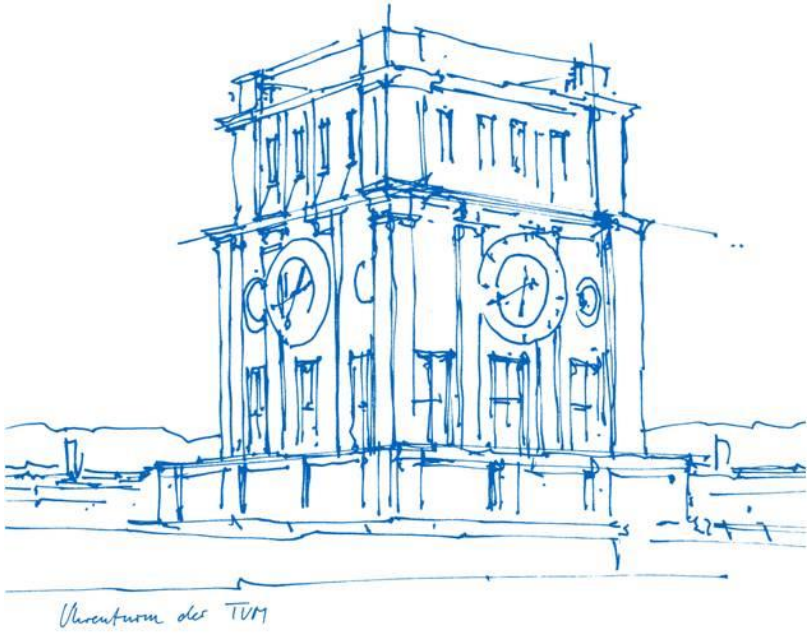
Technical University of Munich
TUM School of Engineering and Design
Chair of Traffic Engineering and Control

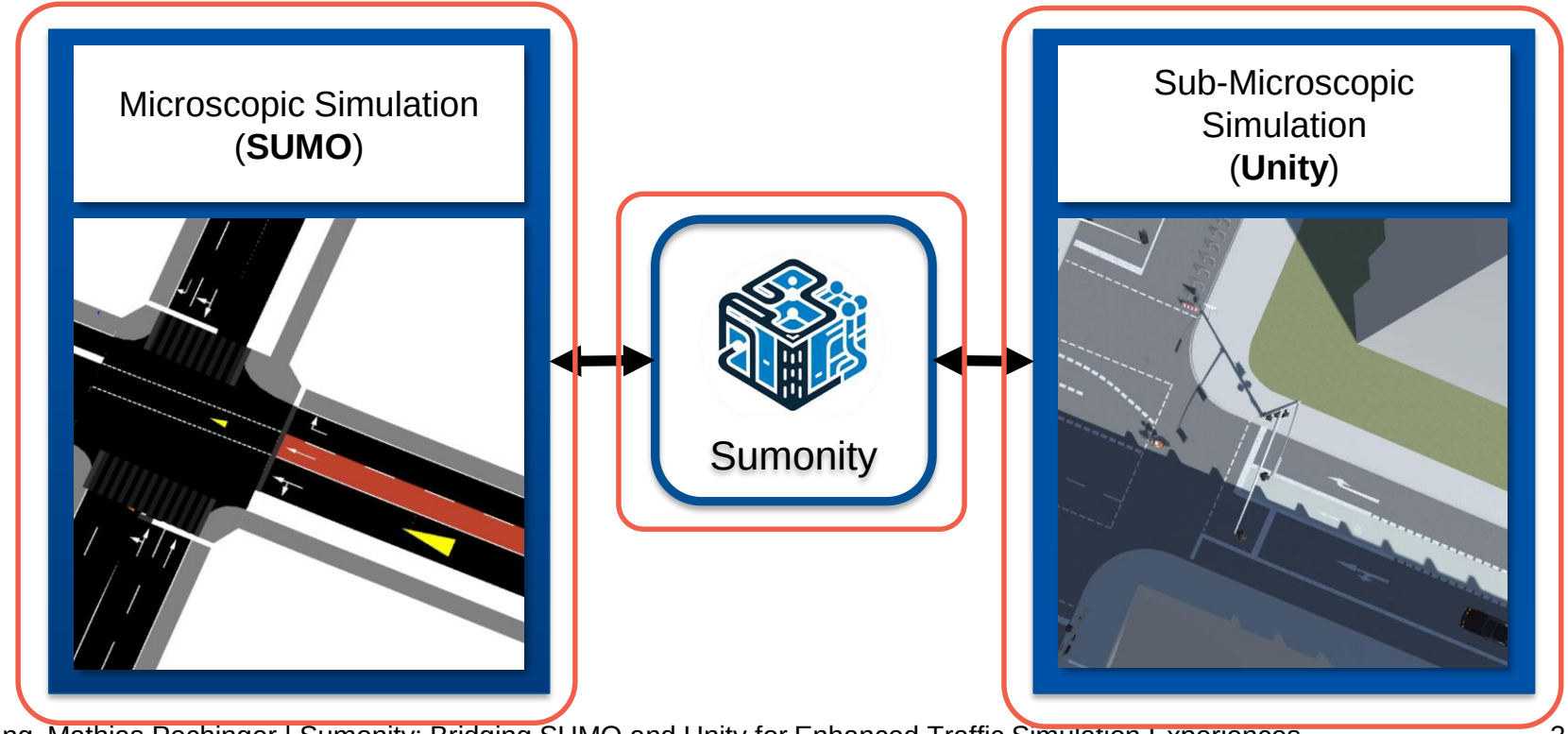
Sumonity: Bridging SUMO and Unity for Enhanced Traffic Simulation Experiences

Dr.-Ing. Mathias Pechinger

Johannes Lindner, M.Sc.



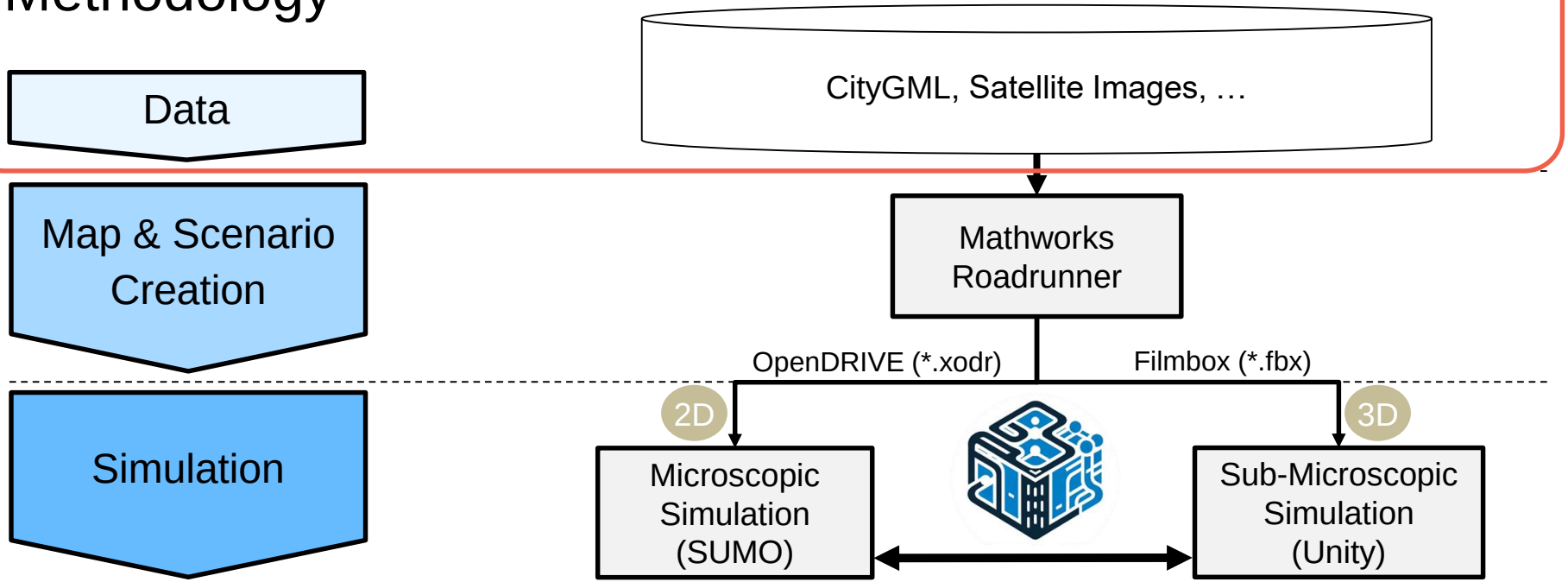
Introduction

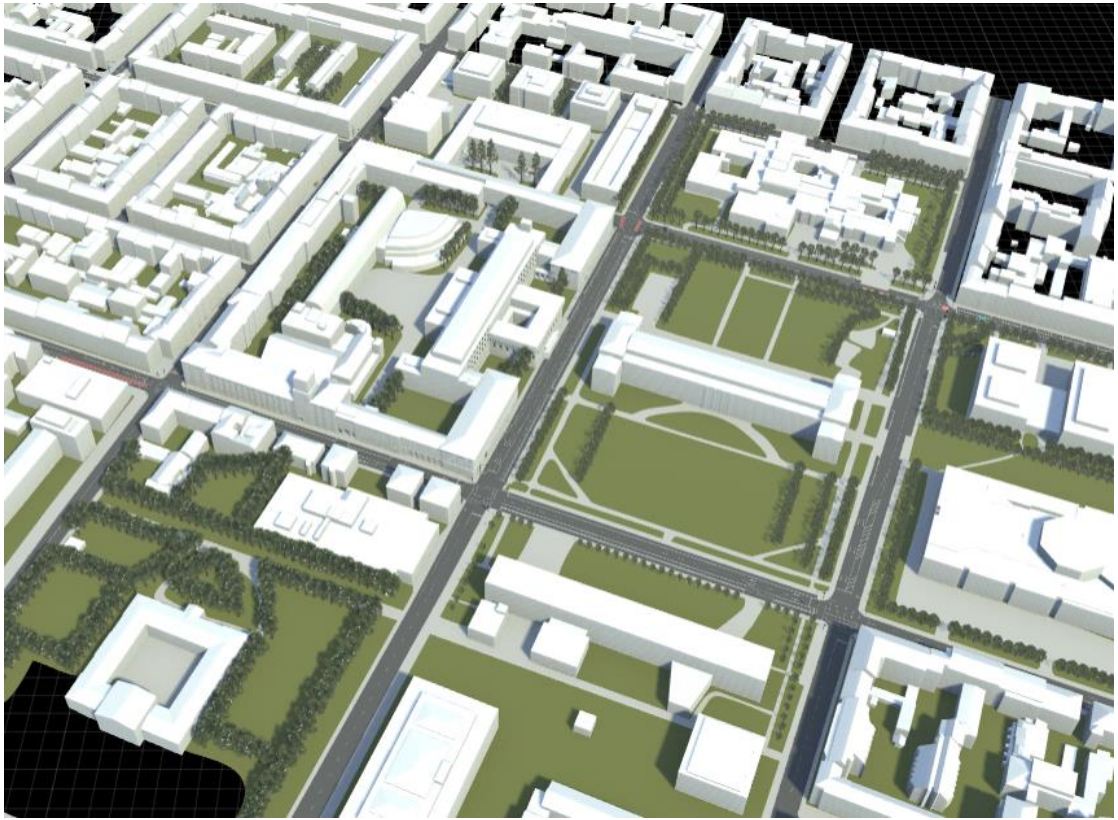


Introduction

- Open Source
- VR/AR Framework
- Micromobility Simulators
- Digital Twins
- Proper Traffic

Methodology



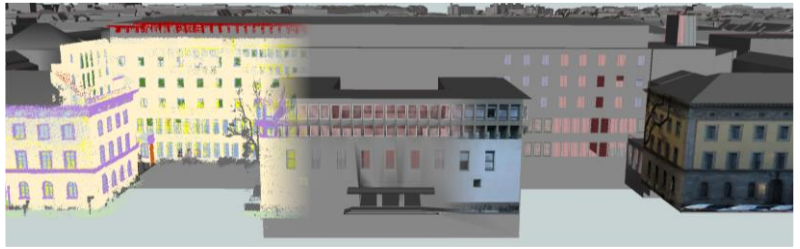


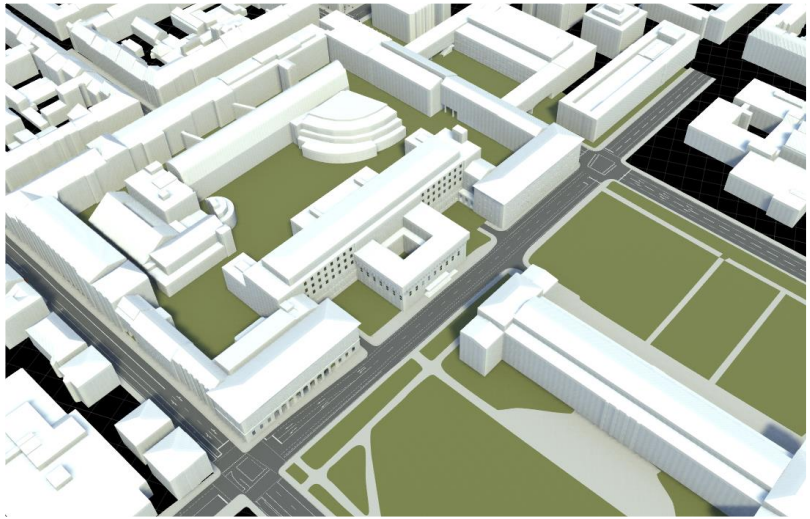
TUM 2 TWIN

The interdisciplinary project at TUM for creating high-quality digital twin.

Creating detailed digital twins is **time-intensive** and requires a wide range of **expertise**.

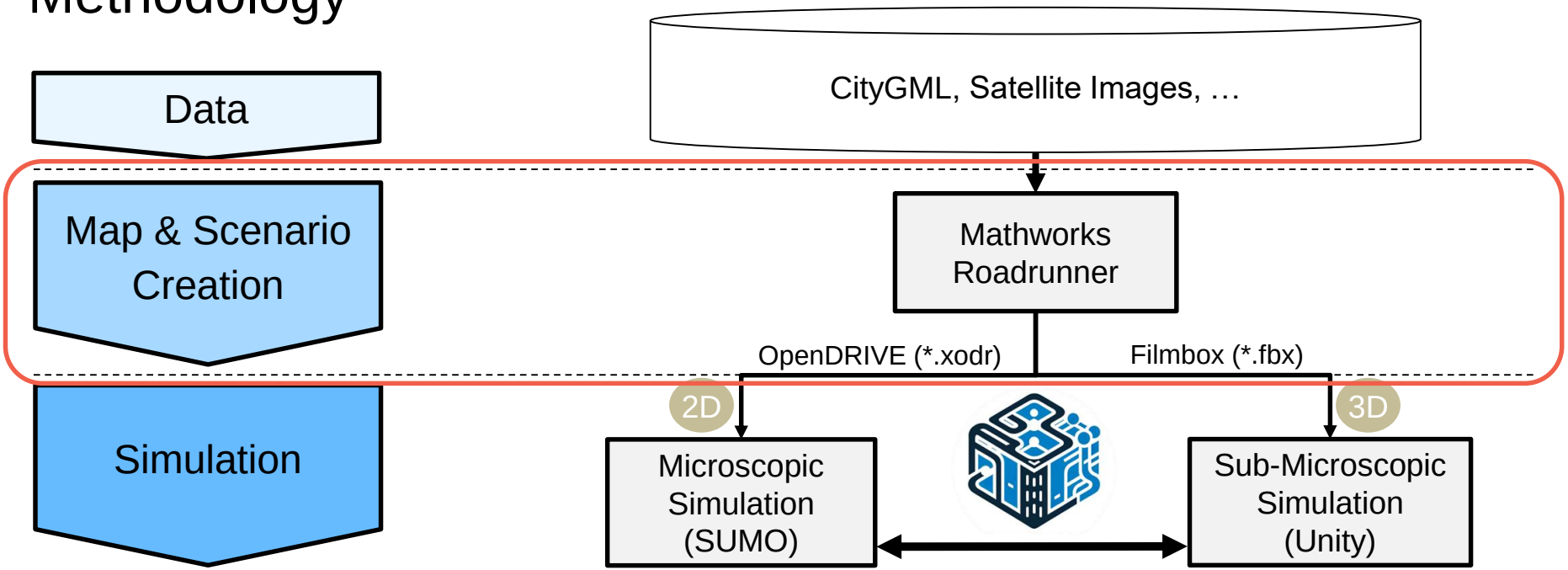
Five research groups from the engineering and computer science department.

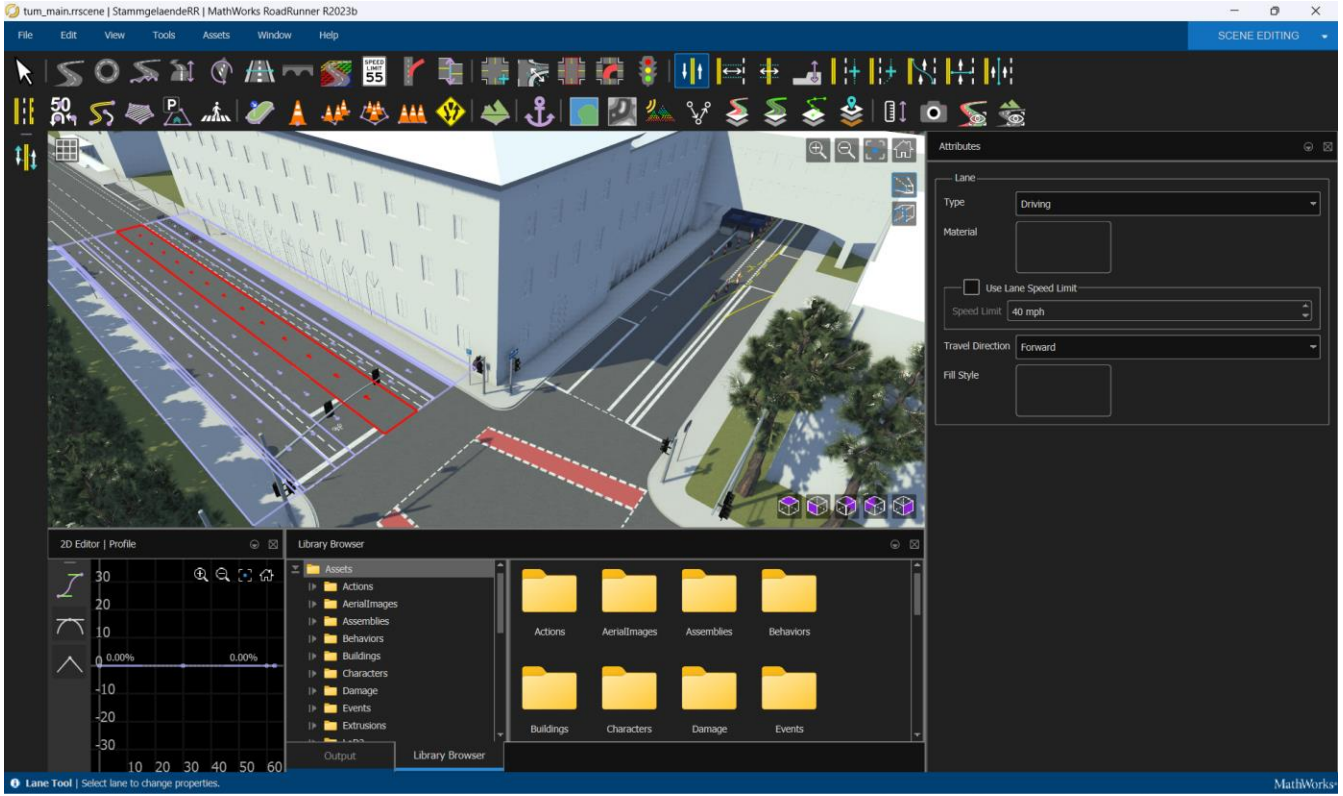




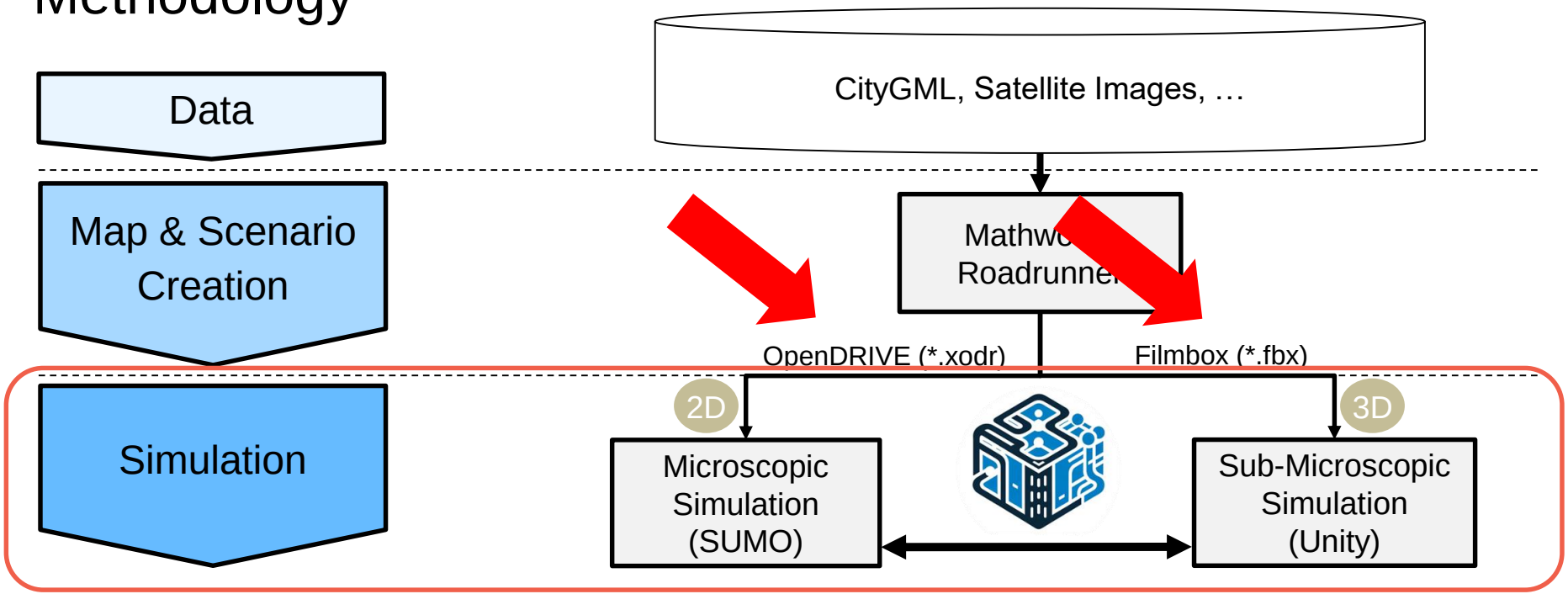
Reference: https://github.com/tum-gis/tum2twin/blob/main/docs/screenshot.png

Methodology

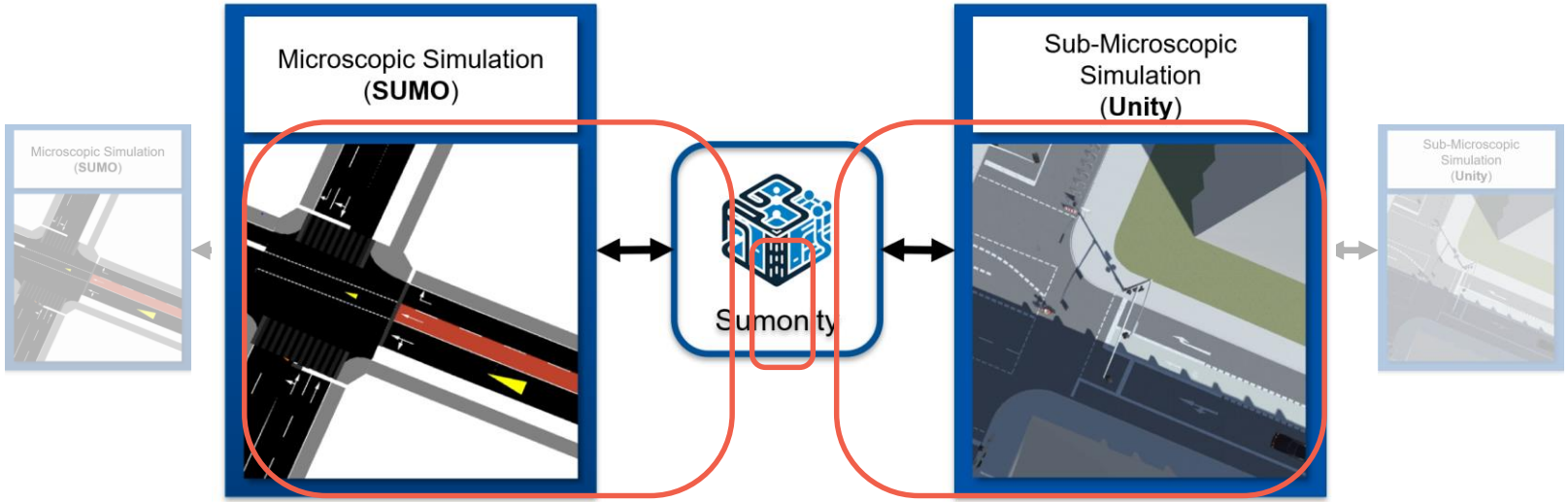



tum_main.rrscene | StammgelaendeRR | MathWorks RoadRunner R2023b
File
Edit
View
Tools
Assets
Window
Help
SCENE EDITING
Attributes
Lane
Type
Driving
Material
Use Lane Speed Limit
Speed Limit
40 mph
Travel Direction
Forward
Fill Style
2D Editor | Profile
Library Browser
Assets
Actions
AerialImages
Assemblies
Behaviors
Buildings
Characters
Damage
Events
Extrusions
Output
Library Browser
Lane Tool | Select lane to change properties.
MathWorks

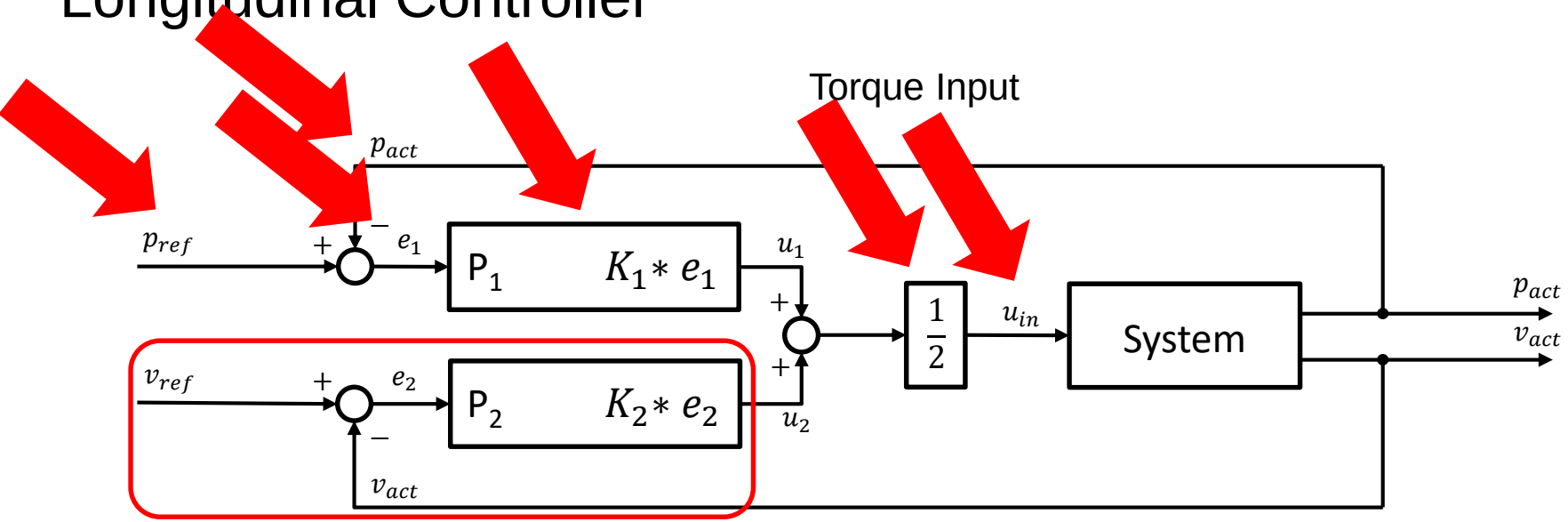
Methodology



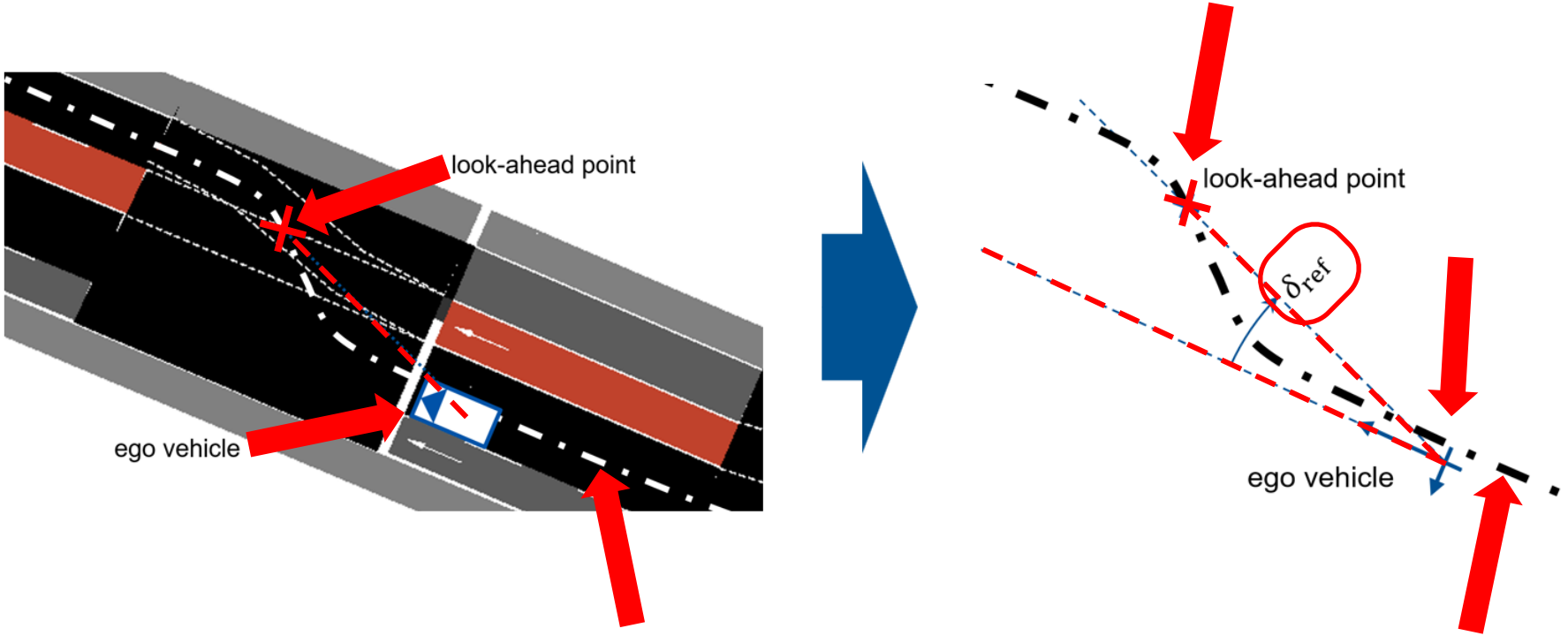
Architecture



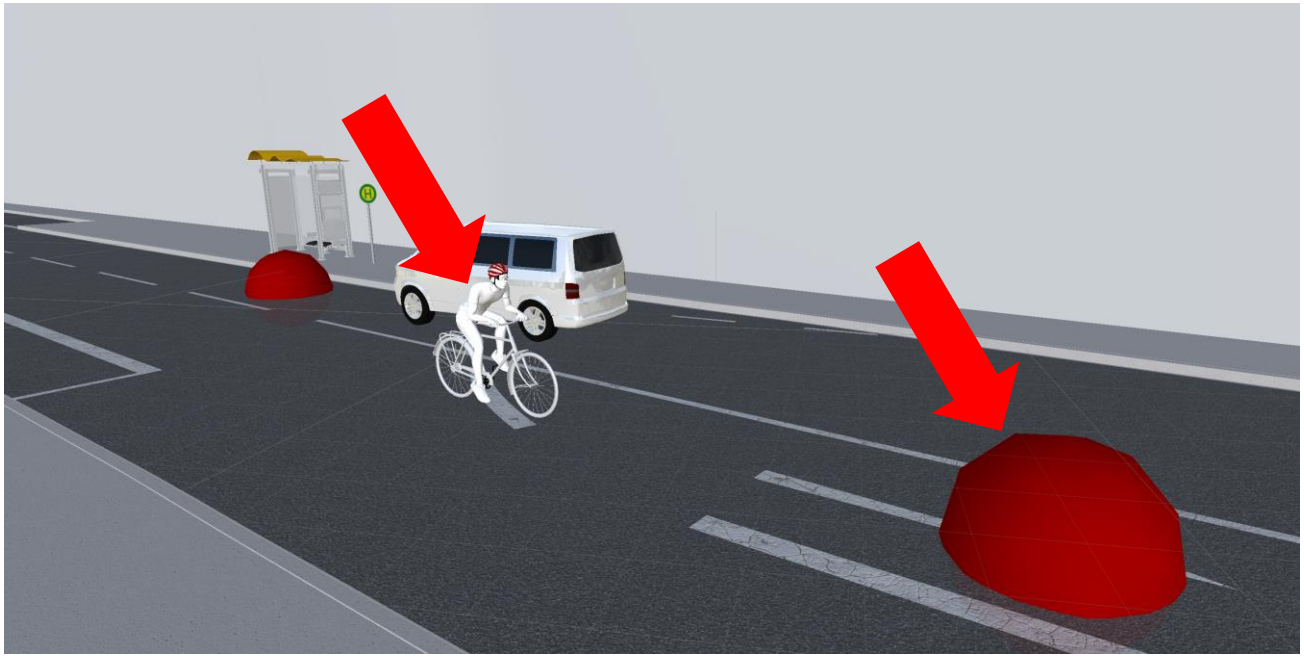
Longitudinal Controller



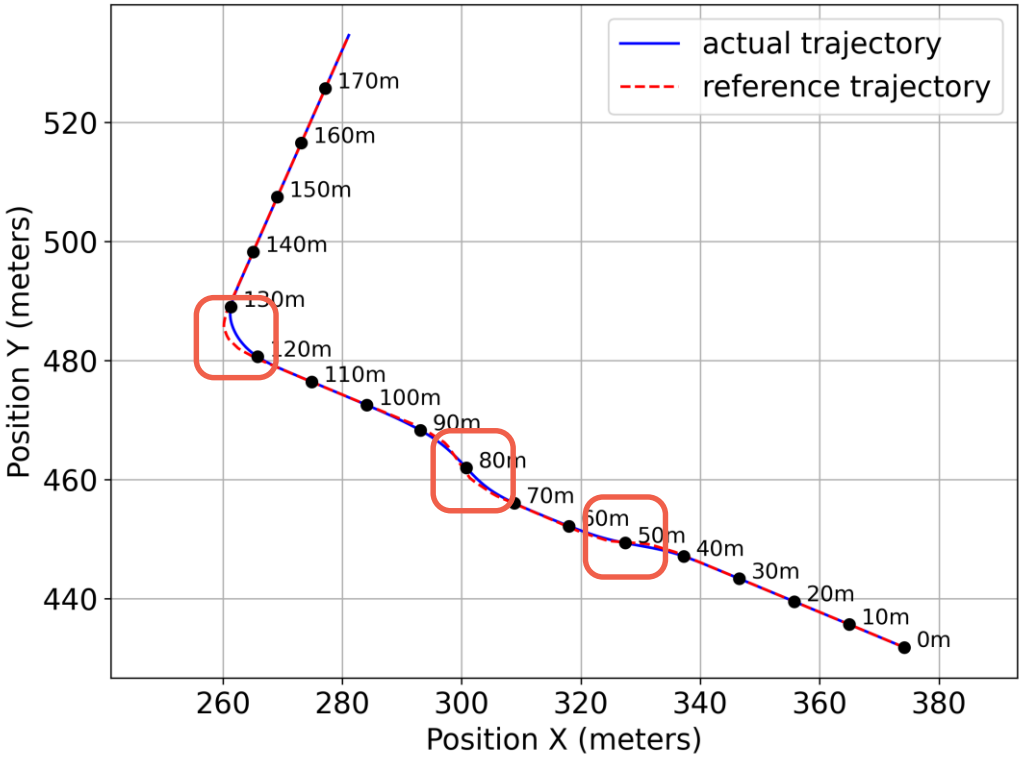
Lateral Controller – Pure Puresuit



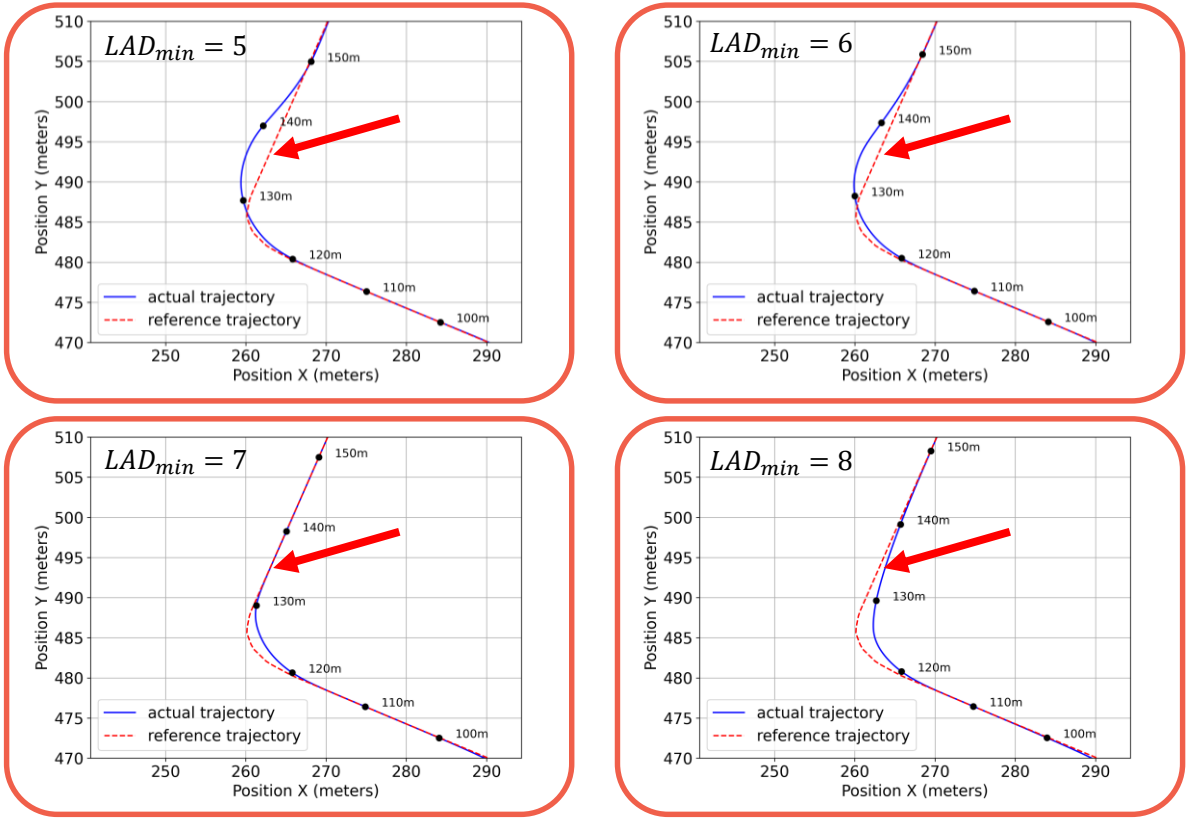
Results



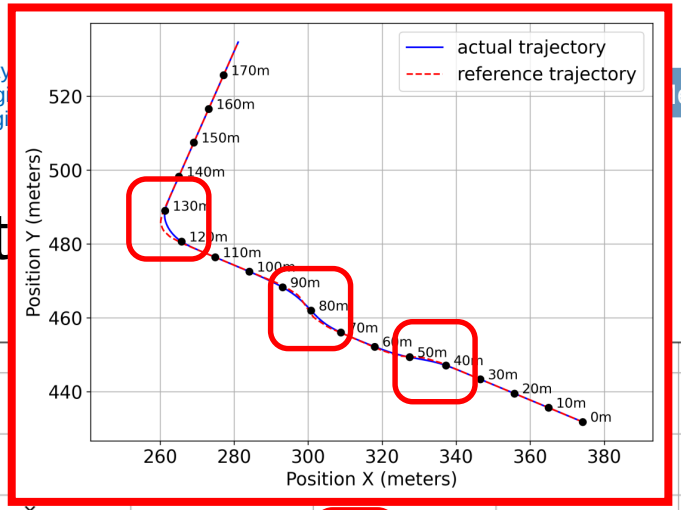
Results

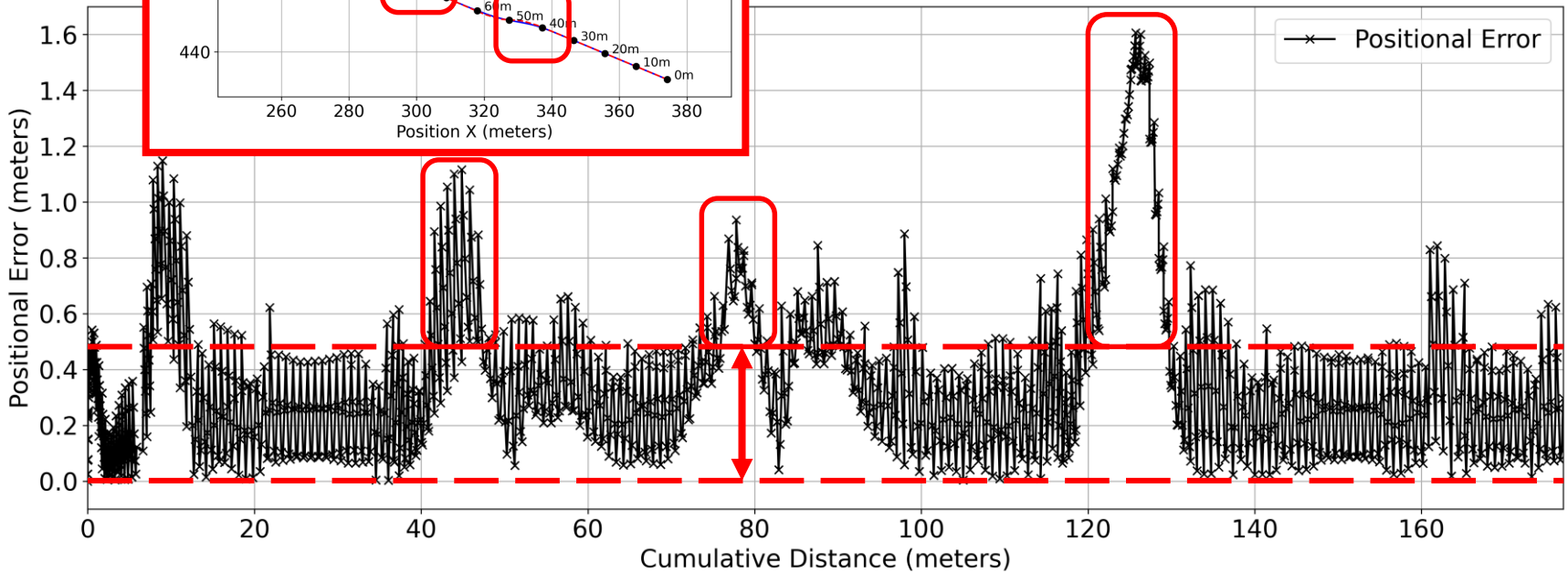

actual trajectory
reference trajectory
170m
160m
150m
140m
130m
120m
110m
100m
90m
80m
70m
60m
50m
40m
30m
20m
10m
0m
520
500
480
460
440
260
280
300
320
340
360
380
Position Y (meters)
Position X (meters)

Results

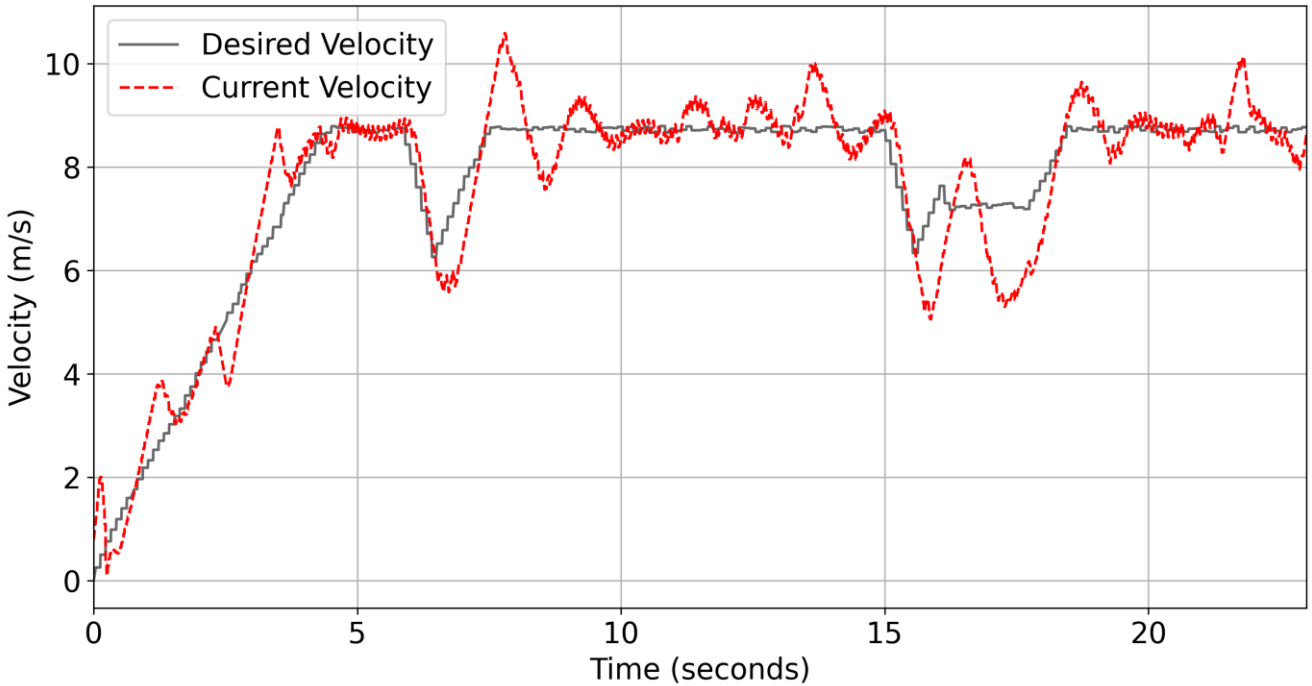

$LAD_{min} = 5$
$LAD_{min} = 6$
$LAD_{min} = 7$
$LAD_{min} = 8$
Position Y (meters)
Position X (meters)
actual trajectory
reference trajectory
150m
140m
130m
120m
110m
100m

Result


actual trajectory
reference trajectory
Position Y (meters)
Position X (meters)
170m
160m
150m
140m
130m
120m
110m
100m
90m
80m
70m
60m
50m
40m
30m
20m
10m
0m

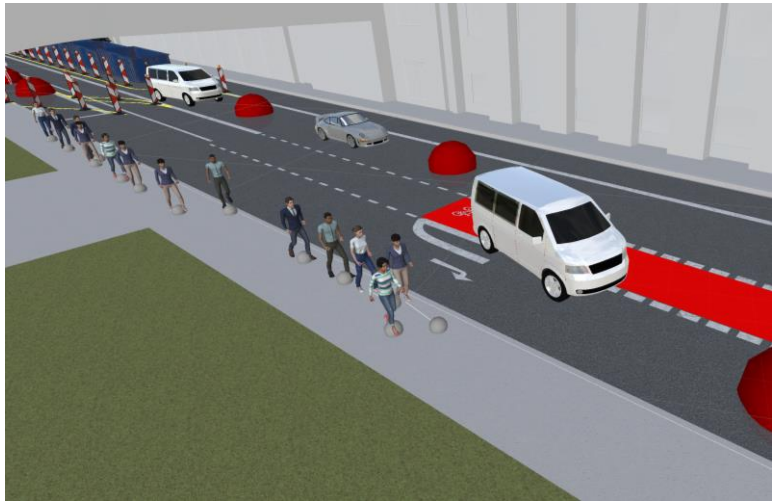

Positional Error
Positional Error (meters)
Cumulative Distance (meters)

Results


Desired Velocity
Current Velocity
Velocity (m/s)
Time (seconds)
0
2
4
6
8
10
0
5
10
15
20

Conclusion

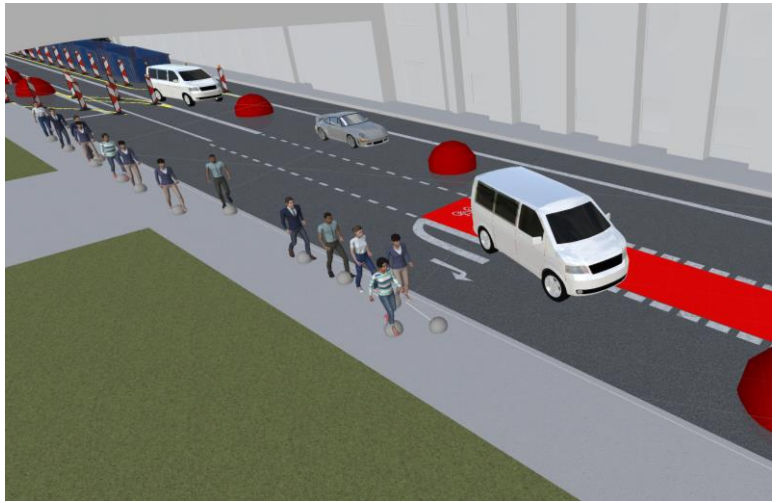
- Track Movement of SUMO vehicles in Unity
- More realistic/natural lateral driving behavior
- Get SUMONITY on GitHub:

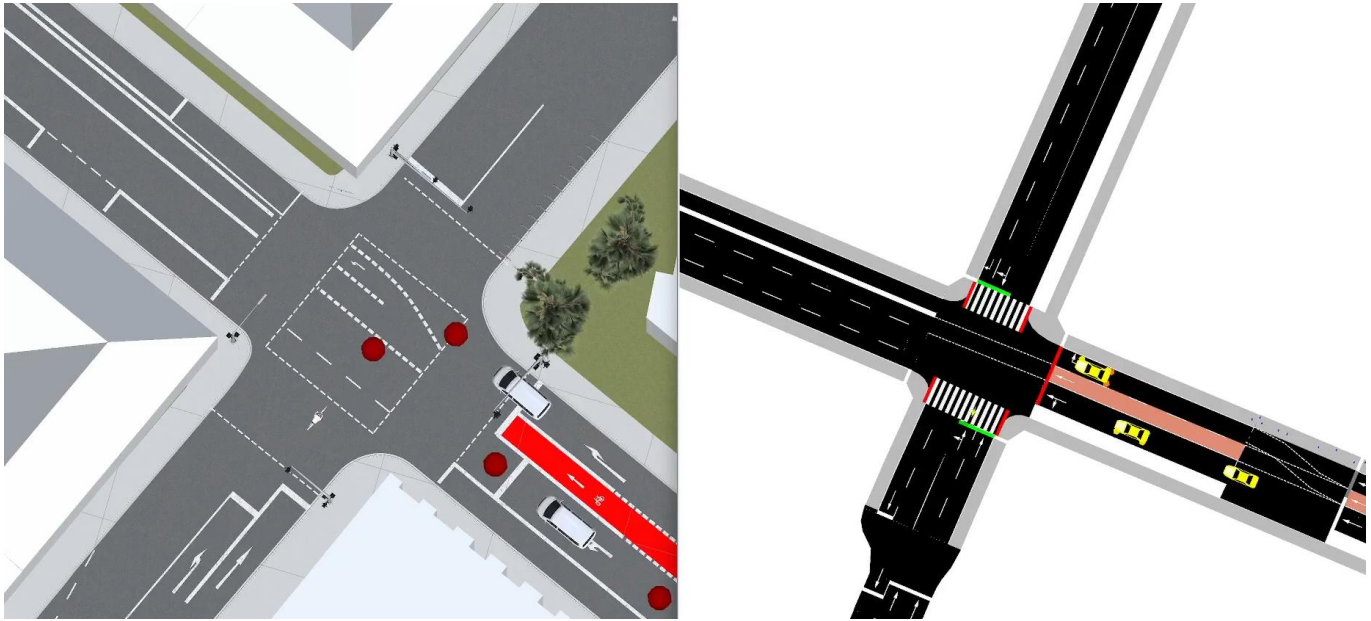


Future Work

Release of new features:

- Traffic lights
- Pedestrian Simulation





Thank you for your attention!

Dr.-Ing. Mathias Pechinger

M.Sc. Johannes Lindner