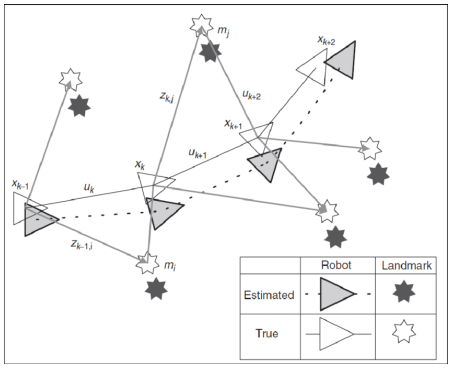
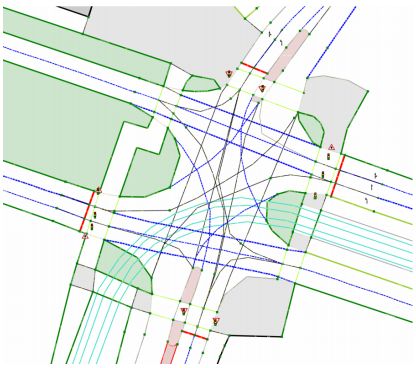
Karlsruhe Institute of Technology

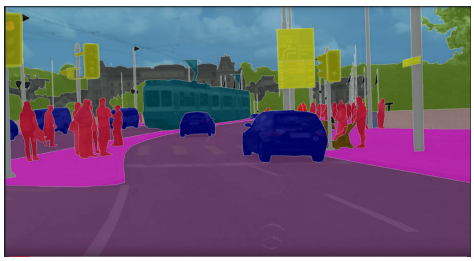
Bachelor Thesis / Master Thesis

Localization With Semantic Data in Planning Maps





SLAM principle (left), Lanelet Map (right)



Topview semantic segmentation (left), Front view semantic segmentation (right)

Classic SLAM approaches detecs features in sensor data such as LiDAR scans or camera images and solve the corresponding SLAM optimization problem. Many of the created maps are sensor-specific and don't provide additional benefits apart from being useful for Localization. Compare this to a planning map (right image): Features that are useful for automated driving such as lane borders or traffic lights are present. However, those features are not immediately detectable in sensor data. Modern approaches for semantic and instance segmentation deliver promisingly accurate results. The task of this thesis is to investigate to what extent it is possible to use this data for localization in the birds-eye view

The proposed thesis consists of the following parts:

+ Literature research about SLAM and Localization
+ Formulating an Optimization Problem from Sensor data and Maps
+ Implement Sampling in sensor or map data
+ Evaluate the results on semantic KITTI data

I am happy to answer any questions you might have. Feel free to ask for an appointment or directly ask at my office!

Institute of Measurement and Control Systems (MRT)
Prof. Dr.-Ing. Christoph Stiller

Advisor:
Johannes Janosovits, M.Sc.

Programming language(s)[1]**:**

C++	intermediate
Python / MATLAB	basic

System, Framework(s):
Linux, Ceres Optimizer, Lanelet2

Required skills:
- Optimizer Fundamentals
- Work on your own

Language(s):
German, English

For more information please contact:

Johannes Janosovits

Room: 237 → just come by!
Phone: +49 721 608-42343
Email: janosovits@kit.edu

Or directly send in your application including your current grades as well as our questionnaire!

[1] **skill levels:**

beginner	< 500 lines of code (LOC)
advanced	500 – 5000 LOC
proficient	> 5000 LOC