Learning to Distinguish Parked from Waiting Vehicles in Real Traffic

Technical University of Munich

Department of Informatics

Chair of Robotics, Artificial Intelligence and Real-time Systems

Background

Navigating a real autonomous vehicle is a very complex challenge due to the complexity of real world traffic. One of these challenges includes the decision whether to pass or to stay behind leading vehicles. For example, while passing a delivery van that is parked on the side of the road is desirable, passing a car that is waiting in front of a red traffic light should be avoided under all circumstances. The key challenge here is to differentiate between vehicles that are waiting and vehicles that are completely stopped.

Many approaches exist to tackle this static obstacle avoidance problem, however, none of them can cover the full complexity of real world traffic situations [1, 2]. Autoware's current static obstacle avoidance module[1] already addresses parts of this problem: it classifies vehicle-type objects as avoidance targets based on simple heuristics such as lateral offset from the lane center and stopping duration, and excludes objects located near traffic lights, crosswalks, or intersections from avoidance, since these are assumed likely to resume movement. However, this rule-based classification struggles in ambiguous situations and does not generalize well to the wide range of real world traffic scenes. Towards that end, this thesis aims to close this gap by developing a static obstacle detection module in Autoware that will be deployed on EDGAR, our real world autonomous driving platform driving in Munich city center.

(a) EDGAR autonomous vehicle

(b) A complex situation

Figure 1: EDGAR has to make many difficult decisions when navigating in traffic

Tasks

This thesis includes:

- Conduct a systematic literature review on static obstacle classification and pass/stay-behind decision-making for autonomous vehicles
- Analyze the limitations of Autoware's rule-based static obstacle avoidance module
- Develop or adapt a method for classifying static obstacles as passable or non-passable
- Integrate the developed module into Autoware's planning stack
- Evaluate the module in simulation and on EDGAR-collected data sets
- Deploy and test the module on EDGAR in real world traffic in Munich city center
- Document the results in the form of an academic thesis

References

[1] Karsten Behrendt, Olivier Mangin, Namrata Bhakta, and Stephanie Lefevre. Is this car going to move? parked car classification for automated vehicles. In *2019 IEEE Intelligent Vehicles Symposium (IV)*, pages 541–548, 2019.

[1] https://github.com/autowarefoundation/autoware_universe/tree/main/planning/behavior_path_planner/autoware_behavior_path_static_obstacle_avoidance_module

Supervisor:
Prof. Dr.-Ing. Matthias Althoff

Advisor:
Ansgar Kasselmann, M.Sc.
Marvin Seegert, M.Sc.

Research project:

Type:
BA/MA/ST

Research area:
Autonomous driving

Programming language:
Python, PyTorch, (C++)

Required skills:
Independent work

Language:
English, German

Date of submission:
26. August 2026

For more information please contact us:

Phone: -

E-Mail:
ansgar.kasselmann@tum.de

Website: www.ce.cit.tum.de/cps/

[2] Jinsoo Yang, Seongjin Lee, Wontaek Lim, and Myoungho Sunwoo. Human-like decision-making system for overtaking stationary vehicles based on traffic scene interpretation. *Sensors*, (20), 2021.

Technical University of Munich

Department of Informatics

Chair of Robotics, Artificial Intelligence and Real-time Systems