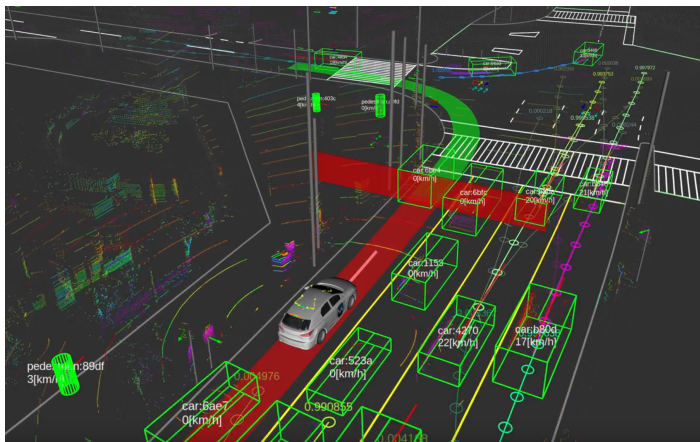


Safe Motion Planning Framework Based on CommonRoad and Autoware Platform



Background

One of the leading platforms for autonomous driving is Autoware, whose new generation Autoware.Auto¹ provides an open-source software stack based on ROS 2 for self-driving technology. To make the software more future-proof, the Autoware foundation is changing the software structure to the Autoware Core/universe architecture. However, considering motion planning, one big challenge of Autoware is that scenarios lack safety and reproducibility. In contrast, the open-source CommonRoad² benchmark suite contains diverse testing scenarios in different settings, such as highways, urban environments, dense traffic, and settings where interaction with bicyclists and pedestrians is particularly important. In addition, CommonRoad provides a safe motion planning framework in Python, which enables safety verification [1] of motion planners, along with additional tools.



Autoware in simulation.

Description

In this context, we are looking for a guided research student to support us in the development of the Autoware-CommonRoad interface. Tasks will include:

- Familiarization with the current interface between CommonRoad and Autoware
- Stabilizing the map conversion
- Improving the robustness of our motion planner when testing more scenarios
- Extending the interface to our motion planning library
- Testing and validating the framework in simulation and our research vehicle
- Documentation and modularize the interface, preparation of publishing a toolbox paper

Experiences with ROS (or ROS 2) are beneficial since the Autoware now is built on the ROS 2. Basic programming skills in C++ and Python are also necessary for establishing the interface.

References

- [1] C. Pek, S. Manzinger, M. Koschi, and M. Althoff, "Using online verification to prevent autonomous vehicles from causing accidents," *Nature Machine Intelligence*, vol. 2, no. 9, pp. 518–528, 2020.

¹autoware.auto

²commonroad.in.tum.de



Technische Universität München



Fakultät für Informatik

Lehrstuhl für Echtzeitsysteme und Robotik

Supervisor:

Prof. Dr.-Ing. Matthias Althoff

Advisor:

Gerald Würsching, M.Sc.,
Yuanfei Lin, M. Sc.

Research project:

MCube, KoSi

Type:

Hiwi

Research area:

Motion Planning, Middleware

Programming language:

C++, Python, ROS

Required skills:

Experience with ROS (beneficial),
able to work independently

Language:

English

Date of submission:

Friday 21st October, 2022

For more information please contact us:

Phone: -

E-Mail: yuanfei.lin@tum.de,
gerald.wuersching@tum.de

Internet:

<https://www.ce.cit.tum.de/air/people/yuanfei-lin-msc/>,
<https://www.ce.cit.tum.de/air/people/gerald-wuersching-msc/>