Institute of Automotive Technology
TUM School of Engineering and Design
Technical University of Munich

Master thesis

Remote Assistance of Higly Automated Vehicles: Design and Evaluation of the Perception Modification Concept

Motivation

Autonomous vehicles (AVs) are confronted with a multitude of challenges in the form of unusual and unforeseeable scenarios, known as edge cases, which can include changing weather conditions, unconventional road layouts, and unanticipated obstacles. Due to the vast number of potential edge cases and their inherent complexity, it is unlikely that all of them can be accounted for during the development of AVs. As a result, it is inevitable that AVs will encounter edge cases during their operation on public roads.

To address edge cases during the operation of AVs, teleoperation can provide a fallback solution by enabling a Remote Operator (RO) to remotely control or assist the AV. One approach for remote assistance of AVs is to interact with its perception and interpretation of the surrounding environment. The RO can provide support to the AV by classifying objects or disregarding false-positive detections. Given the additional information from the RO, the AV is enabled to continue its mission autonomously. Such teleoperation concepts are summarized under the umbrella term *Perception Modification.*

Project description

This project aims to evaluate an existing *Perception Modification* system against the teleoperation concept *Direct Control*, where ROs remotely drive the AV, within a user study. It includes further development of the human-machine interface and the preparation and conduction of the user study. The study should primarily be conducted in the CARLA simulation environment, but may also be partially conducted with the research vehicle EDGAR.

The following **work packages** comprise the student research project:

- Literature research including the topics teleoperation, automated driving, human-machine interface (HMI) design and user study design
- Familiarization with the Perception Modification system, specifically the HMI
- Further development of the existing human-machine interface
- Design of the user study
- Selection, design and implementation of scenarios for the user study
- Preparation of questionnaires for the user study
- Conduction of the user study
- Statistical Analysis of the user study's results
- Documentation and Discussion of the obtained results

Prerequisites

- Intrinsically motivated and interested in the topic of autonomous driving
- Creativity as well as independent and accurate working style
- Experience with HMI design and user studies
- Programming experience, ideally with Python and C++
- Ideally, prior experience with CARLA

Contact

If you are interested in this project, just send an email with a short motivation, your CV, and current transcript of records to:

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