Technische Universität Graz
Erzherzog-Johann-Universität

Institut für Fahrzeugtechnik

PhD Thesis/ Dissertation

Ego vehicle state estimation and target motion prediction

In a bilateral research project with China, involving Tongji University, Wenzhou University along with Austrian and Chinese industry partners, a hardware demonstration of an electric autonomous shuttle bus involving collaborative perception will be developed. In the project TU Graz will contribute to **develop and validate automated vehicle control.**

The optimum motion planned within the automated vehicle depends on the anticipated motion of other traffic participants in the near. Specifically, the probability of others e.g. to cut in in front of the vehicle or to brake will influence the motion planning and decision making.

Another factor is the dynamic state of the bus itself, especially the vehicle's side-slip angle, is an important measure for the vehicle's stability and thus the safety. This is especially true for public transport where occupants are not required to wear seatbelts and may be in standing position during transport. It is a pre-requisite for motion planning when deciding on braking, accelerating and steering interventions.

Contents of PhD thesis:

- Motion prediction of passenger cars described by probabilities to change lane, brake or accelerate using observations of the vehicle behavior in the past (when entering the observed area) and assigning this to different driver types. Data from traffic flow simulation will be used to develop and test these models. The predictions of the target traffic motion including probabilities of these predictions will be made available in the emulated cloud.
- Side-slip angle estimation approach in Matlab/Simulink using both in-vehicle dynamic sensors (steering angle, accelerations, yaw rate wheel speeds, etc.) from the individual bus as well as the in-vehicle environmental sensors (camera, radar and/or lidar) using state observer. The observer will be tested mainly with simulated data from the combined simulation of traffic flow and multi-body simulation.

Requirements:

- Master in Mechanical, Electrical/Electronic Engineering or Informatics
- Expertise in control theory, parameter identification and multi-body simulation is welcome
- Expertise in machine and deep learning is welcome
- Excellent Programming skills

Duration: 3 years
Start: 1.1.2023
Location: FTG

80% employment contract at TU Graz (32hours per week)

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