Fault detection and isolation for an automated vehicle: robustness for real-life circumstances

About TNO Integrated Vehicle Safety

You will work at the Integrated Vehicle Safety department of TNO on the Automotive Campus in Helmond. In this department people are working on developing software for automated driving vehicles. The developed software is tested in pilots and on the public road. (more info on the department: https://www.tno.nl/en/focus-areas/traffic-transport/expertise-groups/research-on-integrated-vehicle-safety/).

Subject

The past decade has shown a steady increase of the intelligence and robustness of Advanced Driver Assistance Systems (ADAS) for consumer vehicles. Some vehicle manufacturers even claim that their technologies could be ready for self-driving features in the coming few years. The transition towards self-driving technologies requires fail-safe operation of the vehicle under difficult and challenging circumstances. Being aware of these faults and dealing with these types of faults can be essential for the safety of the passengers. Many real-life phenomena come into play, for example, sensor/actuation delays, unmodelled dynamics, measurement noise, model uncertainty, etc. During a graduation thesis of 6-9 months, you will study the effects of these real-life phenomena and investigate and design a solution for detection and isolation of faults, while taking these effects into account.

Automated vehicle test platforms at TNO in Helmond.

Assignment

The objective of this master thesis assignment is summed up by the following research objectives:

1. Identify, both through a literature study, as well as a sensitivity analysis/theoretical study how real-life phenomena can affect the outcome of the fault detection and isolation algorithm and how this can be modelled in the system
2. Perform system identification and modeling of these real-life phenomena in a higher fidelity model
3. Design of an algorithm for fault detection and isolation, while being robust for these real-life phenomena
4. Experimental testing and evaluation of the designed solution on scaled or full-scale vehicles, using the Robot Operating System (ROS).

Steering system of an automated vehicle.

This research is done in collaboration with:

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