Master Project

Robustness in Fault Diagnosis applied in the Lateral Control of Automated Vehicles

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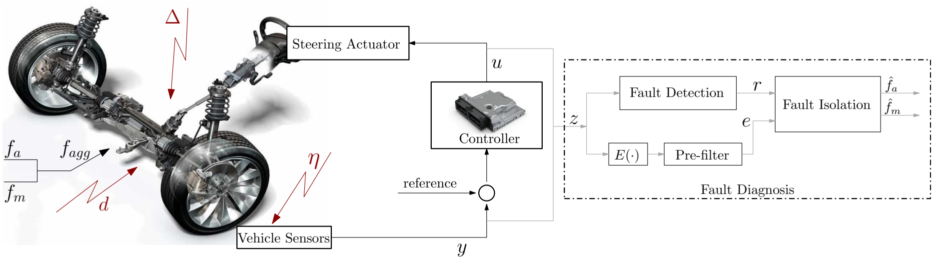
Context

During the 21st century, the focus in the automotive industry changed from passive safety systems to active safety systems such as ADAS (advanced driver assistance systems). The evolution of technology and the need to reduce fatal crashes pushed the industry to automate certain driving tasks. Gradually removing the driver from the driving task also means that the responsibility of monitoring the health of the vehicle now also lies on the system. An example of such is in the lateral control of automated vehicles where a fault diagnosis algorithm shall be able to identify faults acting on the steering system.

A common challenge in fault diagnosis is the detection and isolation of faults under real-life circumstances. Real-life phenomena such as model uncertainties Δ, measurement noise η or external disturbances d could pose a risk to the fault detection task leading to possible missed or false detections. The focus of the current research is to isolate two faults (additive fault f_a and multiplicative fault f_m) acting simultaneously on the steering actuator while being robust against real-life phenomena. The starting point is an algorithm developed in partnership with TNO, TU Eindhoven and TU Delft which was developed considering a deterministic model. A consequence of assuming a deterministic setting is that the algorithm lacks the robust capabilities required to be deployed in a real platform and used under real-world circumstances.



Project Tasks

The current research aims at developing a robust fault diagnosis algorithm for the lateral control of an automated vehicle. The new algorithm shall be able to work under real-life circumstances, detecting and isolating both faults while being insensitive to real-life phenomena. To fulfill the desired outcome, the following tasks are proposed:

1. Robustify the diagnosis algorithm against model uncertainties Δ, measurement noise η and external disturbances d
2. Implement the algorithm in the real platform
3. Test the algorithm in real-world scenarios

This thesis is conducted in partnership with the Integrated Vehicle Safety (IVS) department of TNO.