Master thesis project

Modelling drivers' takeover under supervised steering automation

Thesis title

Modelling driver takeover under supervised steering automation

Publication date	*Contact information:*
2018-12-03	**Supervisors:** Esko Lehtonen (Chalmers), esko.lehtonen@chalmers.se, Giulio Bianchi Piccinini (Chalmers), giulio.piccinini@chalmers.se, Selpi (Chalmers), selpi@chalmers.se Mikael Ljung Aust (Volvo Cars) mikael.ljung.aust@volvocars.com) **Examiner:** To be defined

Keywords

Automated driving, driver behaviour modelling, eye movements, Bayesian statistics

Requested experience

- Good skills in data processing and analysis using MATLAB, Python, or R
- Interest in (Bayesian) statistical modelling
- Interest in human factors and eye tracking applications (optional)

Workplace

This is a master thesis work at Chalmers University of Technology, within the group Crash Analysis and Prevention in the Department of Mechanical and Maritime Sciences (division of Vehicle Safety). The workplace will be SAFER in the Lindholmen Science Park on the Lindholmen Campus.

Background

Pilot assist (PA) is a SAE level 2 automation function intended to keep the vehicle within the lane. However, even state-of-the-art PA functions have sensor system limitations (e.g. lane tracking limitations). Due to these limitations, the PA function may at any time stop to maintain its lane keeping. The driver therefore needs to continuously supervise the system and be ready to take over whenever the function is no longer keeping the vehicle in the lane. Currently, little is known about how drivers would take over control in case of a failure of the PA system and this Master thesis project aims to investigate this aspect.

Thesis objectives

1. Create hypotheses about what visual cues drivers use to decide if a takeover is needed or not, based on a literature review and exploration of existing eye tracking data.
2. Analyze existing simulator and/or test track data to quantify relevant visual cues used by drivers to decide if a takeover is needed or not.
3. Create a (Bayesian) statistical model to show the relationship between the relevant visual cues and drivers' takeover decisions.
4. Investigate if the patterns of eye movements can be used to predict takeovers decisions.

Motivation

The results of the thesis work could be applied to predict the distribution of the takeover times and for designing driver monitoring systems, which could detect if the driver is actively supervising the automated vehicle or not. The results of the Master thesis project will provide insight in the project *Quantitative Driver Behaviour Modelling for Active Safety Assessment Expansion* (QUADRAE), where Chalmers is collaborating with the Swedish automotive industry (AB Volvo, Volvo Cars, Veoneer) and the research institute VTI.

Number of students	*Scholarship provided to the student(s)*
2	Yes, by VCC