Master's thesis project

Analysis of truck drivers' behavior during the interaction with VRUs in a test-track experiment

Research project title
Analysis of truck drivers' behavior during the interaction with VRUs in a test-track experiment

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Keywords
Driver behavior; test track experiment; driver models; glance behavior, VRU interaction

Mandatory requirements

- Proficiency with Matlab or other programming languages
- Good analytical skills
- Fluency in English
- Good statistics skills

Optional requirements

- Basic knowledge about driver behavior analysis and driver behavior modelling
- Basic knowledge in planning, conducting and evaluating experiments

Workplace
This is a joint research project to be performed partly at Chalmers University of Technology (Crash Analysis and Prevention group, division of Vehicle Safety) and partly at AB Volvo

Learning objectives

- Plan and conduct a test-track experiment
- Analyze and interpret data collected during a test-track experiment
- Formulate hypotheses about driver behavior
- Understand how to model driver behavior using experimental data

Highlight

- Plan and conduct a test-track experiment at AstaZero
- Work with automotive industry (AB Volvo) in a challenging project

Number of students	Scholarship provided
1-2	Yes, at completion of Master's thesis

Background and Ideas

In 2015, there were more than 1 million crashes within whole Europe, out of which 24,000 resulted in fatalities. Out of those overall crashes, 49,000 involved a heavy goods vehicle (HGV) as one of the crash partners. Around 3,400 of those crashes resulted in fatalities, leading to 3,800 fatally injured persons. Although crashes involving HGV's account for only 4.5% of all crashes on European roads, their share of fatal crashes with 14.2% percent is much higher, leading to an overrepresentation of HGVs in fatal crashes.

Among the crash scenarios involving trucks, crashes with VRUs occur less often than crashes with passenger cars and commercial vehicles but the consequences for the VRUs in these crashes are extremely serious, due to the weight difference and therefore higher energy transfer as well as the lack of a protective shell around the VRU. Based on the analysis of GIDAS database, two high priority scenarios can be defined for crashes between trucks and VRUs: 1) Crashes at junctions when a truck turns to the right and enters into a conflict with a bicycle, travelling alongside in the same direction on

a bicycle path on the right side of the road; and 2) Crashes between a truck travelling straight and a pedestrian crossing the road in perpendicular direction of travel respect to the truck.
Despite crash databases containing a substantial amount of crashes, little information is collected about the behavior of drivers and VRUs in the pre-crash and crash phase.

Goals and Purposes

The current project aims to understand the factors that induce truck drivers' braking or steering reaction in the two scenarios previously defined. Based on the knowledge acquired from this project, driver models will be developed to enhance the current algorithms of active safety systems. This information is important for the development of active safety systems which could avoid crashes or mitigate their consequences.

Research project work

The students will plan, design and conduct a test-track experiment at AstaZero to assess truck driver behavior (e.g. glance behavior, avoidance maneuver) in the scenarios reported above, to study the interaction with VRUs. Then, they will analyze the data to provide relevant information for the development of driver models. The detailed plan of the research project includes the following steps:

1. Review the literature about driver behavior during the interaction with VRU.
2. Plan, design and conduct the test-track experiment at AstaZero.
3. Analyze the data collected during the experiment.
4. Provide inputs for the development of driver models for the specific scenarios.
5. Write the final thesis report.