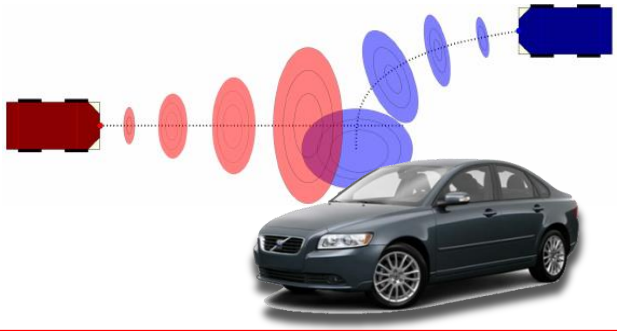
Division of Control, Automation and Mechatronics
Department of Signal and Systems (S2)
Chalmers Institute of Technology

Academic year 2014/2015

Master thesis proposal



Intelligent transportation systems:

Threat-assessment and decision-making protocols for safety applications

Keywords

Threat-assessment, decision-making, collision avoidance, active-safety

Background

Recent advances in sensing and vehicle technologies have enabled significant progresses in the area of the active safety of passenger cars. Traffic control at intersections, however, still remains a particularly challenging problem for new intelligent safety/control systems. Indeed, road intersections are among the most complex and accident-prone elements of modern traffic networks. Therefore, new Advanced Driver Assistance Systems (ADAS) have to cope with highly complex traffic scenarios, as urban intersections with many lanes, where the behavior of the different road users is hardly predictable. In such scenarios, sensing the surrounding environment and assessing possible threats are challenging problems.

Problem description

In this thesis, we are interested in threat-assessment and decision-making algorithms for traffic intersections scenarios. Given an unknown, complex intersection with many lanes, the objective is to provide to each vehicle mechanisms enabling decision-making with respect to a potential threat. This thesis should focus on the fundamental aspects of the underlying prediction algorithms and decision-making problems.

DENSO

Purpose and goals

The goal is to study, develop and demonstrate formal decision-making and control algorithms, with a particular attention to complex traffic intersection scenarios with several lanes. Furthermore, formal analysis methods verifying safety requirements should also be provided for novel, intelligent control strategies. The resulting threat-assessment/decision-making/control algorithms should be integrated in cutting edge simulation environments such as, for instance, PreScan. Furthermore, experimental validation tests should be driven, in collaboration with the DENSO's test technical staff, using fully equipped Volvo S60 demo vehicles. Scientific publications can also result from this thesis project.

Requirements

- a highly motivated student(s) from the master program in Systems, Control and Mechatronics or student with a similar background. Knowledge in automatic control and signal processing is required.
- the ideal candidate(s) should have interest in both the theoretical and experimentation aspects of the problem.
- solid programming skills are required and a particular experience with MATLAB/SIMULINK is an asset.
- good communication skills in English both oral and especially written are also appreciated.

The student should also be interested in developing further skills and competences during this thesis project.

The master student(s) will gain

- Competences on
    - modelling and control;
    - safety systems;
    - simulation and implementation techniques and tools;
    - automobile applications;
- Industrial experience with one of the world's largest automotive components suppliers and contacts within the automobile industry;
- Technical and scientific expertise within a dynamic academic group;

Further information and contacts

This thesis project is the result of collaboration between DENSO and Chalmers. For any question, please contact:

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- Klas Alenljung (k.alenljung@denso.se or 0762-139 184);