

Advanced trajectory control for heavy vehicles, a pre-study

Trajectory control is a collective term that describes the system entirely or partially take over control of engine, powertrain, braking and steering, and have knowledge of the vehicle's and driver's response. This enables the implementation of security features in a safety-critical traffic situation that can control the vehicle better than the driver himself can. The consequences are a reduced number of injured and killed on the roads in a traffic environment which is becoming increasingly cluttered and busy.

The pre-study has resulted in a well-established cooperation between industry and academia and a broad knowledgebase and toolkit for further work in the continuation project iQDrive.

Objective

The purpose of the pilot study in trajektoriekontroll was to lay the groundwork and define the continuation project of investigating how the overall vehicle control can be used in heavy vehicles to improve traffic safety.

By extension, the project aims to create opportunities for a number of systems in road safety whose primary mission is to reduce the impact of incorrect driver behaviour and be able to act in safety-critical traffic situations.

Results and deliverables

A primary results of the study of the main is an inventory of research and active management definition and the start of the continuation project iQDrive. However, there are several milestones that contributed to this:

- Compilation of traffic accident data involving heavy vehicles (domestic and international)
- Compilation of a range of alternative technologies for realizing active steering.
- A concept study rig with a selection of actuators for active steering.
- Identification and specification of the customer functions.
- A simulation model of an articulated heavy vehicle.
- FMEA analysis of the system with active steering.
- Published articles.
- two masters degree theses.
- Increased expertise for active steering in the Swedish automotive industry.
- Increased expertise for active steering in the Swedish Academy.
- Report with conclusions for the continuation project.
- Project plan for the continuation project relating to trajectory control with two academic partners.

Project realization

The project was implemented during 2009 - 2010 in a collaboration between Scania CV AB and Linköping University to benefit from each party's specific skills.

The execution was planned for an as large an information transfer and knowledge exchange as possible to take place. That was achieved through work and study visits, both at Scania R&D and Linköping University, and at times co-location of staff.

Since the project deals with safety-critical systems, much emphasis was placed on minimizing risk in the development and testing. Modeling and simulation has been used extensively for the safe, timely and cost effective way to test ideas and concepts.

To confirm the experience of the simulation so also has a concept study rig designed and used.

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Project outcomes

The pre-study has resulted in effects primarily on expertise development and knowledge diffusion, in industry and academia and between industry and academia. The newly acquired knowledge of the research field has enabled the project planning of the continuation project iQDrive which will be carried out by the two parties in the pre-study and further an academic party.

Concrete results as the vehicle model has already been used in several masters theses, both within and outside the project. The concepts study rig is also something that lives on and will be utilized in both the continuation project iQDrive as well as the parallel IVSS Project *Steering system with active safety in heavy vehicles*¹, enabling more advanced studies than would otherwise have been possible. The exchange of knowledge has not only taken place between industry and academia within the project, but also between the three projects, ATC², NGDS³ and *Steering system with active safety in heavy vehicles*.

Participating parties and Contact person

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Publications and dissemination of results

Alessandro Dell'Amico, Jochen Pohl, Petter Krus - Modeling and simulation for requirement generation of heavy vehicles steering gears. Draft accepted to Bath/ASME Symposium on Fluid Power & Motion Control in September 2010.

Åke Huttunen, Kombinerat hydrauliskt och el-mekaniskt styrservosystem, Master thesis, Linköpings universitet - Department of Management and Engineering, ISBN: LIU-IEI-TEK-A--09/00663--SE

¹ *Steering System with Active Safety in Heavy Vehicles*, Malte Rothhämel, Lars Drugge (KTH), Jolle Ijkema (Scania).

² Advanced Trajectory Control

³ Next Generation Distance Sensor, Pär Degerman (Scania), Lars Andersson(LiU), Jon Andersson (Scania)