

ABSTRACT FOR A CONTRIBUTION OF A PAPER TO FISITA 2008

Title: Analysis of the driver behavior in autonomous emergency hazard braking situations

Objective: Vehicle Safety & Human-Machine-Interface

Author: Dr.-Ing. Norbert Fecher , Dipl.-Ing. Jens Hoffmann, Dipl.-Ing. Klaus Fuchs, Sebastian Geyer,
Dr.-Ing. Bettina Abendroth

Co-Author: Univ.-Prof. Dr.-Ing. Ralph Bruder, Prof. Dr. rer. nat. Herrmann Winner

Affiliation: Technische Universität Darmstadt
Automotive Engineering Department
Head: Prof. Herrmann Winner (formerly Prof. emeritus Dr. Bert Breuer)
and
Institute of Ergonomics
Head: Prof. Ralph Bruder (formerly Prof. emeritus Dr. Kurt Landau)

Address: Petersenstraße 30
D-64287 Darmstadt
GERMANY
Tel.: +49-6151-16-6575
Fax: +49-6151-16-5192
Email: fecher@fzd.tu-darmstadt.de

Scope and State of the Art

This paper describes the methods and results of test drives with 80 test persons for the assessment of driver behavior in using autonomous braking systems. The main focus was placed on the drivers' responses on autonomous hazard braking situations and drivers responses on malfunctions of autonomous hazard brakes. Test drives with passenger cars and trucks were preceded with the Darmstaedter Dummy Target EVITA, a tool for inducing emergency braking situations with test drivers. Within the last three years, several concepts for collision mitigation through braking were presented. The Honda Collision Mitigation Brake System (CMBS) [1], the Mercedes BAS PLUS [2], the Audi Braking Guard [3] or the Lexus PCS [4] are some examples. For the assessment of different designs of autonomous braking systems, an interdisciplinary research team of automotive and ergonomic engineers of the Technische Universität Darmstadt, worked on behalf of six German OEMs and suppliers (Audi, Bosch, BMW, MAN, Opel, SIEMENS VDO) within the scope of the German research initiative "Aktiv" (Adaptive and Cooperative Technologies for the Intelligent Traffic) in the subproject "Active Hazard Braking".

Approach, Method and Tool

The Dummy Target EVITA (Experimental Vehicle for Unexpected Target Approach) was used for the tests with 80 drivers, categorized by gender and age. EVITA enables the execution of highly safety-relevant situations with risk of collision for the first time under real driving conditions (also see in the submitted FISITA 2008 abstract "EVITA – The Testing Method for Collision Warning and Collision Avoidance Systems" in "Simulation & Testing, Vehicle Safety" by Dipl.-Ing. Jens Hoffmann et al. This abstract contains the method and the results of another project).

On the basis of several test series the effects on driver behaviour under different designs of autonomous braking systems such as full- or part-decelerations were investigated. Within the study the efficiency of possible energy-reduction in authentic collision situations was focused. Also driver behavior and their acceptance were regarded when autonomous hazard brakings were realized as well in case of faulty activation or in absence of activation.

Another goal was to provide vital data of driver behavior in near-crash scenarios necessary to understand driver behavior. Due to that objective information like CAN data, eye movement behaviour, physiological responses like various muscular activities and electrocardiograms, as well as subjective data from questionnaires were used to support the development of autonomous braking systems for crash avoidance.

Results, Conclusions and their Significance

The analysis, which is still in progress, is evaluating the measurement categories statistically. Significant differences of drivers' behavior are expected. This paper is due to produce an overview of the project, the testing method as well as a presentation of selected results and the deduced conclusions.

Previous Papers

This is the first application for a publication.

References

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