

## „Virtual Testdrive & KISS“ -

Closed loop computer simulation for the development of active safety functions

Dipl. Ing. Christian Weiss, Audi AG

Dr. Frank Keck, Audi AG

Dipl. Ing. André Neubohn, Volkswagen AG

Dipl. Inf. Kilian von Neumann-Cosel, ini.tum

Dr. Andreas Kuhn, Andata

### Summary

Remarkable improvements in traffic safety can be archived with upcoming driver assistance systems which warn the driver in case of dangerous situations and take corrective actions in the driving dynamic of the vehicle. The objective of these systems is to avoid an accident or at least reduce the accident severity.

A challenge for development engineers is to prove the reliability of the driver assistance systems in a huge number of traffic situations under different environmental conditions. Due to the high risk of testing dangerous situations in real world and the complexity of the job, new development methods have to be established. A very effective method to design and test robust active safety systems is the intensive and continuous use of closed loop computer simulations.

Audi and Volkswagen are developing a modular computer simulation system called „**virtual testdrive**“. The aim of „**virtual testdrive**“ is to design and test new active safety systems. The simulations operate in a closed loop mode to investigate the interactions of

- vehicle driving dynamics
- vehicle sensor systems
- vehicle actuating elements
- assistance systems
- drivers response
- the environment (weather, street conditions, traffic situation, ...)

Through stochastic variation of important parameters like weather, lighting conditions, velocity etc. tests can cover much more of the parameter space compared to real world tests. Additionally, the performance, the robustness and the limits of the complete system can be evaluated on a statistical basis because of the high number of cases obtained with the simulation system.

With „**virtual testdrive**“ dangerous situations can be tested under defined and repeatable conditions. In combination with „**KISS**“ (**K**ey competence **I**ntegrative **S**afety **S**ystems of Audi and Volkswagen) development environment the data archived with „**virtual testdrive**“ is used to generate high performance functional reference applications. These applications help to design and approve action concepts, to assure the function of the assistance systems, and to define important test cases for real world tests.