

Capable Co-Drivers

Modern cars think ahead. Does dSPACE?

Intelligent driver assistance systems are a prime issue in the automobile industry. Product Manager André Rolfsmeier explains why, and how dSPACE stays on top of this trend.

Why are advanced driver assistance systems attracting so much attention?

In Europe, tens of thousands of people die in road accidents every year. More than 90% of these accidents are due to human error. The number of accidents could be dramatically reduced by driver assistance systems. Assistance systems can also help solve problems caused by other challenges, such as global warming, demographic change, and increasing traffic density.

Which intelligent systems are playing a pioneering role in development?

Advanced driver assistance systems are intervening more autonomously in driving procedures such as braking and steering. The aim of future innovations will be above all to avoid accidents such as collisions with pedestrians, cyclists or other vehicles. In concrete terms, work is being performed on emergency brake assistants, intersection assistants, overtaking assistants and emergency steer assistants.

Other development focuses are reducing fuel consumption by means of predictive data and networking with other vehicles and the traffic infrastructure. Driver assistance systems optimize the energy and fuel management of modern drive concepts, for example, by evaluating the topography of the road ahead. Our customers are also working on systems to monitor the driver's attention and to stop the vehicle safely and call for help if the driver has a medical emergency.

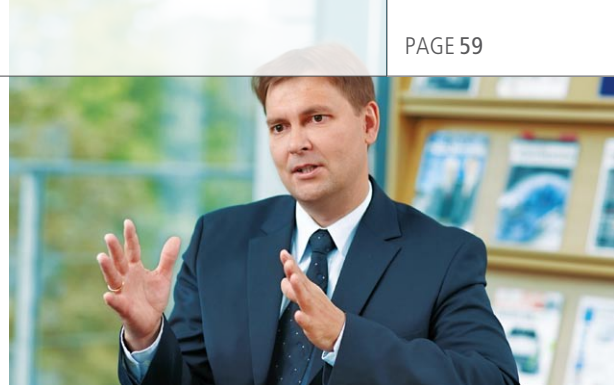
What requirements arise for function development and testing these systems?

Video sensors will be a major component in the driver assistance systems of the future. Integrating video sensors and fusing video data with data from other sensors makes new demands on current rapid control prototyping systems. The same

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“Integrating video sensors makes new demands on established development tools.”

André Rolfsmeier, dSPACE GmbH



applies to the coupling of digital maps for predictive evaluation of the road ahead, and wirelessly networking the vehicle with its environment. It is important to support the relevant standards in this context. Testing driver assistance systems for production requires the ability to simulate complex traffic scenarios and run virtual test drives reproducibly in the laboratory. Simulation based on real roads and the auto-



matic generation of test scenarios are two issues that are becoming more important.

How is dSPACE meeting these challenges?

For several years now, dSPACE systems have been used successfully for developing and testing driver assistance systems. We already took the knowledge and experience gained from previous customer projects and put them back into product development, and product extensions incorporating this know-how will arrive soon. We are also actively engaged in partnerships for advancing strategies and solutions that unite different fields.

How is the new knowledge being turned into product extensions, for example in rapid prototyping systems?

In the development of video-based

systems, there is a basic distinction between image processing, which is typically implemented in C/C++ on PC architectures, and the driver assistance function itself, which is implemented in MATLAB®/Simulink® on rapid prototyping systems. What we have done is create a connection between various embedded solutions and the dSPACE systems, for example, by providing powerful Ethernet interfaces and dedicated blocksets for coupling development tools such as ADAS RP from NAVTEQ and EB Assist ADF. Our AutoBox and MicroAutoBox systems are making a fundamental contribution to the fast, iterative development of driver assistance functions.

What is the situation regarding hardware-in-the-loop simulation?

The dSPACE Simulator also provides an interface to EB Assist ADF to connect to corresponding simulation environments in order to perform virtual test drives. In addition, there are various interfaces available like SPI for emulating sensors that are directly installed in an electronic control unit. Our Automotive Simulation Models (ASMs) already support the simulation of various driver assistance applications such as adaptive cruise control, brake assistants, and predictive drive controls. The ASMs are open Simulink models for modeling the vehicle, its sensors, the road, and the surrounding traffic. They can be coupled with ADAS RP, for example, to run simulations on real roads. What's attractive is that the models can be used for early concept development on PCs as well, so that algorithms can be tested by model-in-the-loop or software-in-the-loop simulation. Our customers

benefit immensely from this when developing their innovative driver assistance functions in a shorter period of time and verifying production maturity with the aid of hardware-in-the-loop simulation.

What other innovations can dSPACE customers look forward to?

In the future, dSPACE will focus on simulating and visualizing complex traffic scenarios in virtual test drives. In doing so, we will continue the further development of our tools ASM, ModelDesk and MotionDesk. To make it even easier to connect EB Assist ADF to the HIL real-time environment, our roadmap includes implementing GigaBit Ethernet and a comprehensive protocol stack on one core of the quad-core DS1006 Processor Board. In addition, we are planning to add an integrated



embedded PC platform to MicroAutoBox II so that digital maps, EB Assist ADF, and Car2x software frameworks can be implemented on the MicroAutoBox directly. Support for the ADASIS V2 standard for transmitting predictive road data is also planned.

As you can see, dSPACE tool users are already one step closer to the vehicles of tomorrow – because dSPACE thinks ahead.