interactive

Accident avoidance by active intervention for Intelligent Vehicles.

News | 01

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www.interactIVe-ip.eu

The participants of the interactIVe kick-off at Ford Research & Advanced Engineering in Aachen, Germany

Dear reader,

This is the first newsletter published by the European automotive R&D project **interactIVe - Accident avoidance by active intervention for Intelligent Vehicles**. interactIVe targets active safety systems as integrated and affordable solutions for all vehicles. interactIVe aims at paving the way for broad deployment of advanced driver assistance systems (ADAS) for continuous driver support and emergency intervention.

interactIVe is planned for three and a half years and joins the expertise of 29 partners from ten European countries. The project started in January 2010 with a kick-off at Ford Research & Advanced Engineering in Aachen. Over 110 participants followed the invitation of the project Coordinator. During the first twelve months major progress was made: The overall project use cases and requirements were defined. With these use cases interactIVe laid the corner stone for progress beyond state-of-the-art technologies.

A further significant result is the determination of perception requirements on sensor interfaces, sensor data fusion, and the perception horizon interface.

The first newsletter provides insights on the use cases and novelties with regard to perceiving the surroundings of the ego vehicle as a pre-requisite for active safety applications.

Work progress in interactIVe between newsletters will always be published on the interactIVe website: **www.interactIVe-ip.eu**. We hope you will enjoy learning more about the advancements of driver support and active safety systems during the next pages and the upcoming project news.

February 2011, Aria Etemad, Coordinator
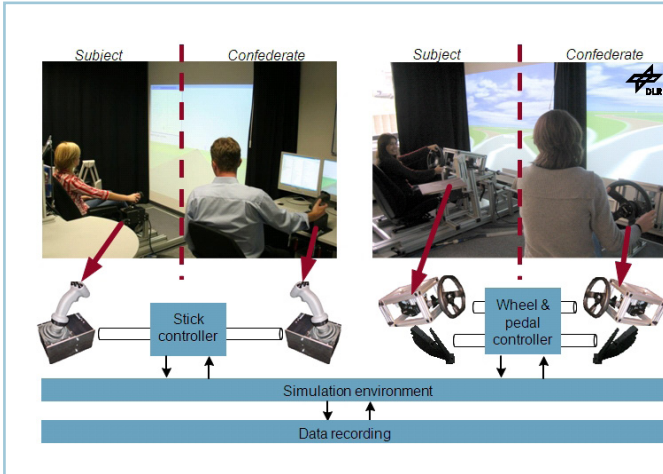
The theatre technique

The part of the future automation is simulated by a team-member called "a confederate". This is facilitated by a lab setup with two identical simulators located next to each other. As a special feature, the respective inceptors of the subject – either steering wheel and throttle, or the side-stick – are mechanically or electronically linked to the inceptors of the confederate so that they move synchronously.

Reference: Flemisch et al. 2008, Schieben et al. 2009

▸ Demanding use cases defined

Starting from accident analysis, 48 use cases were defined, leading to system requirements and specifications relevant for the demonstrator development.
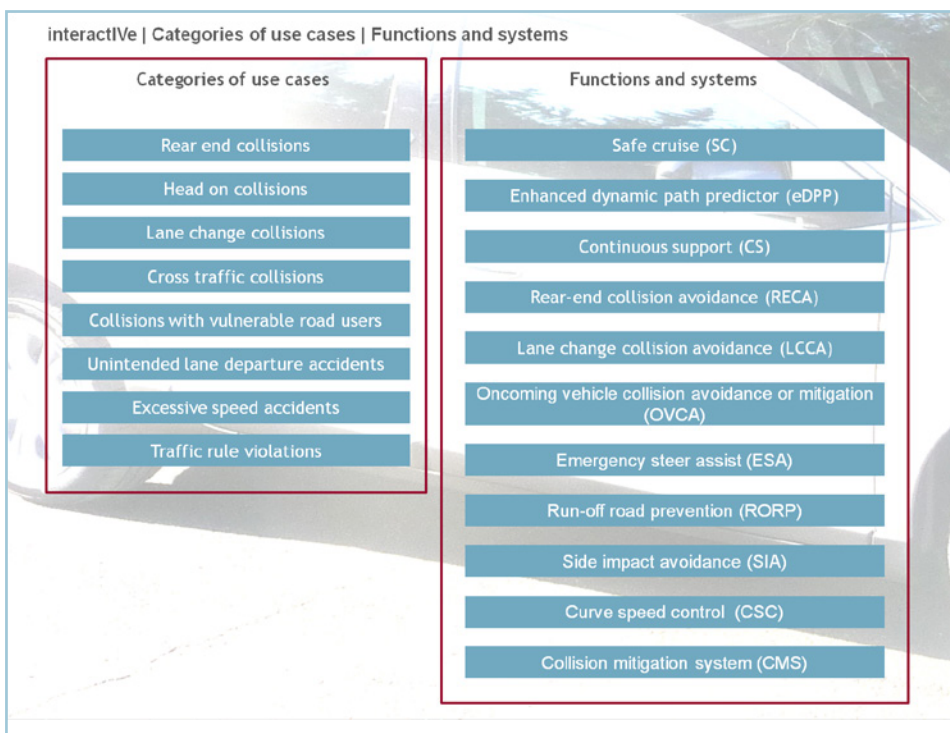
interactIVe research covers three areas of applications: continuous driver support, emergency intervention, and collision mitigation. With the use cases chosen, interactIVe goes beyond state-of-the-art technologies within these fields. To avoid and mitigate collisions, the use case "Head on collisions during overtaking and turning manoeuvres" was defined. Current ADAS do not consider this case, which is particularly challenging for long range and all around perception. A second use case

within the same context comprises "Rear end collisions including steering and braking manoeuvres". interactIVe considers joint autonomous steering and braking in combination. The system will trigger the steering and breaking at an early stage.

To pursue the goal of continuous driver support, the use case "Unintended lane departure accidents" was defined. The amount of control between the driver and the system is split in a continuous manner. New IWI strategies using multiple channels, such as haptic, acoustic, and visible signals are introduced.

▸ Theatre technique used

To define the use cases, project experts met under the lead of Volvo Technologies for a workshop at the German National Research Center for Aeronautics and Space (DLR) in Braunschweig in May 2010. They assessed their expectations and identified mental images on how the interactIVe systems are envisioned to interact with the driver. The resulting use cases are based on target scenarios implemented on the DLR theatre system. The theatre system is a "simulator" that allows direct haptic interaction to aid verbal and visual communication.

interactIVe | Categories of use cases | Functions and systems

Categories of use cases	Functions and systems
Rear end collisions	Safe cruise (SC)
Head on collisions	Enhanced dynamic path predictor (eDPP)
Lane change collisions	Continuous support (CS)
Cross traffic collisions	Rear-end collision avoidance (RECA)
Collisions with vulnerable road users	Lane change collision avoidance (LCCA)
Unintended lane departure accidents	Oncoming vehicle collision avoidance or mitigation (OVCA)
Excessive speed accidents	Emergency steer assist (ESA)
Traffic rule violations	Run-off road prevention (RORP)
	Side impact avoidance (SIA)
	Curve speed control (CSC)
	Collision mitigation system (CMS)

Uri Iurgel (Delphi), leader of sub-project "Perception"

Angelos Amditis (ICCS), co-leader of "Perception"

▶ Interview with perception experts

During the first year the perception requirements on sensor interfaces, sensor data fusion, and the perception horizon interface were defined. In an interview the leaders of the project's largest sub-project "Perception" talk about their work within interactIVe.

What is your specific task in interactIVe?

**Uri Iurgel, Delphi:** We ensure that the individual contributions of the partners fit together to deliver a successful perception platform. The challenge is to ensure that the numerous requirements, software modules, interfaces, concepts and conditions, fit within one framework.

Angelos Amditis, ICCS: The perception platform is the system's brain, responsible for real-time merging of information coming from obstacle sensors, digital maps, and car-to-car as well as car-to-infrastructure communication in order to provide the applications side with a unified interpretation of the road environment. As a research unit, the ICCS I-Sense team supports manufacturers and suppliers with the development of data fusion algorithms and tools for the perception platform modules.

What is the particular challenge of your work on the perception platform?

Uri Iurgel: In the predecessor project PReVENT the individual demonstrator cars used independent approaches, which led to duplicated work. One of the main goals of our work now is to deliver a novel common perception framework.

interactIVe | Architecture of the perception layer
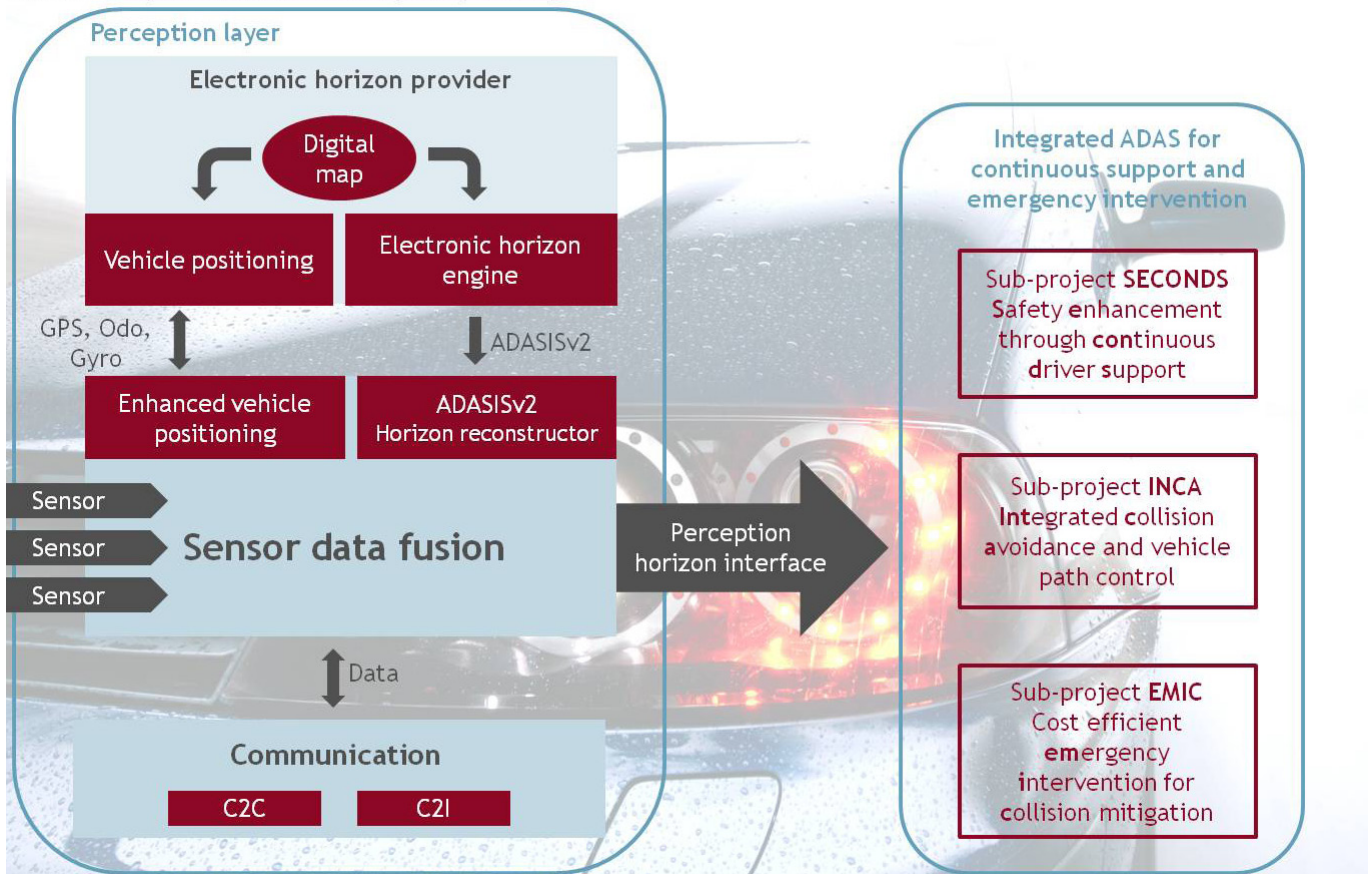
Angelos Amditis: The novelty lies in the design of a common fusion framework that will allow integrating multiple applications into a unified perception framework. That includes the design of standardised interfaces between multiple sensor inputs and the perception platform as well as between the perception platform and the applications.

Uri Iurgel: A new, unified perception horizon interface will deliver information to the applications. Sensors will be attached using the novel concept of a general sensor interface, allowing to obtain various types of input information such as classical sensors, digital maps, and communications.

Angelos Amditis: New sensor data fusion approaches allowing access to lower level information will contribute to enhanced road environment monitoring and will be evaluated in interactIVe demonstrator vehicles.

How will interactIVe perception technologies improve driver support and active safety systems?

Uri Iurgel: The interactIVe technology will lead to a more robust and more reliable perception of the vehicle's surroundings. Integrating functions, which were previously stand-alone, will largely increase the number of situations where the driver can benefit from the safety and support applications.

Angelos Amditis: interactIVe will contribute to a broader market penetration of the ADAS systems in lower-class vehicles. Monitoring the road environment based on multiple sensors and sensor fusion concepts is expected to enhance both continuous support and active safety in-vehicle applications. Through the early introduction of new active safety features, Europe will establish and maintain world-wide safety standards for road transportation.

▶ **Improve perception functionalities**

The interactIVe approach to perception is to cover common perception elements by one perception framework. For the first time, the perception platform will incorporate general sensor interfaces.

To simplify the system's architecture and the software application in interactIVe, all incoming information such as digital map or car-to-car information are treated as "sensors". Requirements for the perception functionalities cover the general sensors' interfaces, thus allowing the different sensors to be attached to the platform, the various data processing modules, and the output interface. OEMs, fusion experts, and sensor suppliers closely cooperated to select optimal and complete requirements. Intense interactions between the partners ensure high quality and usability of each requirement.

▶ **interactIVe at the 17th ITS World Congress in Busan, Korea**

For the first time the project was presented to a large international audience during the 17th ITS World Congress. Angelos Amditis from ICCS participated in the special session "The Benefits of ADAS Connected to Navigation - How Digital Maps Bring Value for Safe, Clean and Smart Vehicles" presenting interactIVe and especially the perception platform and the way previous results are taken into account. Angelos Amditis also pre-

Maxime Flament, Ertico speaker | Vincent Blervaque, Ertico moderator | Alexander Bracht, Daimler-speaker | Angelos Amditis, ICCS | Jean-Michel Henchoz, DENSO (from left to right)

sented the paper "Enhanced perception suitable for active intervention in automotive safety applications - the interactIVe project". It mainly addresses issues related to the extended perception of the environment. The paper also contains information on the architecture of the interactIVe systems and a description of demonstrator vehicles. interactIVe partners Navteq and BMW introduced

"interactIVe - High precision maps for sustainable accident reduction with the enhanced dynamic pass predictor" – a paper written in cooperation with the Chinese Tsinghua University. interactIVe received a lot of attention from the European Commission and the expert community focusing on particular questions regarding the data fusion process.

▸ Save the date

...for interactIVe at the ITS Europe 2011 from June 6th to 9th 2011 in Lyon, France

▸ Brochure available
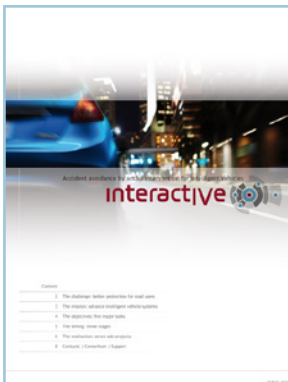
The interactIVe brochure is now available for download on **www.interactIVe-ip.eu**.

interactIVe is a common project of leading European Original Equipment Manufacturers, suppliers, research institutions and small enterprises. interactIVe is co-funded by the European Commission, DG Information Society and Media under the Framework Programme 7 and is supported by EUCAR, the Council for European Automotive R&D.

In interactIVe the **next generation of Advanced Driver Assistance Systems** (ADAS) for **driver support** and **emergency intervention** is developed. **interactIVe systems** will

increase the perception horizon: environment information is recognised through a new integrated and comprehensive sensor platform.

improve decision strategies for ADAS: the systems are using new prediction techniques and integrating advanced human-machine interface (HMI) concepts, balancing human and system interventions.

suit the ordinary driver: several tests enhance the knowledge about driving behaviour and impact of the systems.

be affordable: system cost is reduced by the implementation of low cost sensors and the integration of previously independent functions.

apply to all vehicle classes: six passenger cars of different vehicle classes and one truck are being built.