

CeBIT: Autonomous Driving and Other Glimpses into the Future

Driving without Traffic-light Stops – Skilled Robots – Computers Understanding Language – Eye Tracking at Home – More Fun for Paragliders – Symposium: Robotics in the 21st Century



For cars to drive alone through Karlsruhe in the future, route data have to be collected during test drives. (Photo: FZI)

A test area for autonomous driving, sensors enhancing the skills of robots, quality management with the help of virtual reality, computers that better understand texts, an eye tracking lab for use at home, a vibrating altimeter for paragliders, and a symposium on latest trends in robotics – at the joint CeBIT stand of Karlsruhe Institute of Technology (KIT) and FZI Research Center for Information Technology at the Karlsruhe Institute of Technology, visitors are invited to experience fascinating research from March 20 to 24 in Hanover (hall 6, stand A30).

Future Mobility – Test Area for Autonomous Driving:

Enhanced safety, reduced fuel consumption, and less time needed – Karlsruhe Institute of Technology (KIT) and the FZI Research Center for Information Technology will present a virtual test drive through the city of Karlsruhe to illustrate the opportunities associated with autonomous and networked driving. They are planned to be studied and tested on the Baden-Württemberg Test Area for Autonomous Driving.

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A special setup at the stand will demonstrate communication between a networked car and a traffic-light system. It does not only take place via light signals and optical sensors, but also by radio. While the vehicle is approaching the traffic light, it is already informed about the latter's status and can adapt its maneuvers accordingly, i.e. decelerate or accelerate to reduce unnecessary energy consumption while waiting for the red light to turn green.

On the test area, various types of vehicles, including busses, private cars, commercial vehicles, and municipal cleaning vehicles, will be tested and developed for automated and networked driving under real road traffic conditions. Extensive preparatory work is needed: The test area covers selected routes in urban regions with car, bicycle, and pedestrian traffic as well as district roads and motorways. These routes are presently being recorded for the generation of highly precise 3D maps and equipped with special sensors to measure road traffic and the factors influencing it. Test operation of the area is planned to start this year.

Things Thinking – Computers Learn to Understand Language:

KIT's spinoff "Things Thinking" develops artificial intelligence understanding text and thus helping find deficiencies in technical documents.

Natural language is a revolution in man/machine interaction. Machine learning, statistics, and other approaches will not overcome the obstacles in communication between man and computer as long as machines do not understand the meaning of language, but try to grasp it by a mathematical or statistical approach. Unlike common natural language processing methods, the "Things Thinking" software understands the semantics of a language.

It understands, processes, and uses semantic concepts and, hence, can be applied in many ways, e.g. for Industry 4.0, in software production or by consulting companies. Future customer service might be improved by virtual assistants or legal-tech solutions might help interpret contracts.

Rüttelflug – The Ultimate Gadget for Paragliders:

"Rüttelflug" is a variometer that informs pilots about vertical velocities via vibration patterns. This vertical velocity indicator is a less disturbing alternative to indicators with an auditory or visual output for paragliders and balloonists and can simply be worn on the wrist.

A barometric sensor determines vertical velocity and allocates the values to relevant classes of climb and descent values. These are then transmitted to the paraglider via vibration patterns that can be distinguished clearly. Thanks to this novel concept, climbs and descents as well as information about airflows and weather conditions during paragliding can be transmitted in a comfortable and less disturbing way. Rüttelflug is the ultimate gadget for all paragliders wishing to enhance and improve the momentum of paragliding by making it a special, tactile experience.

Market Research – Eye Tracking Lab for Use at Home:

“Eyezag“, a spinoff of KIT, develops a technology to calculate the exact gaze position on the screen by using a conventional webcam. Laboratory studies with special hardware and staff that have been associated with a large expenditure so far can now be carried out online in an easy and quick way. The target group desired can be addressed via the internet. Upon the user’s approval, his or her behavior can be recorded under authentic conditions while sitting at the desk or on the sofa. The user interface is designed such that neither test persons nor analysts have to install special software or plugins – a normal web browser opens the way into the virtual eye tracking laboratory. Studies can be planned, performed, and evaluated in the online suite. Diagrams and gaze plots indicating the direction of view are available for representation, statistical calculations are possible. Machine learning approaches are used to constantly improve the self-learning system. The first area of application of the system is market research. Other developments for interaction, diagnosis, and assistance are feasible.

Skilled Machines – Bimodal Sensor for Industry Robots:

Intelligent robots are capable of perceiving their environment in a contact-free manner and reacting accordingly. They can safely interact with surrounding objects and specifically and reliably execute complex tasks, such as gripping of unknown objects.

The sensors developed by KIT can be used to backfit established camera systems, thus allowing for a new type of interaction of machines with their surroundings or a workpiece. One of these sensors is the capacitive tactile proximity sensor. Through electric capacitive coupling, it can detect and localize objects in a contact-free manner. In case of a mechanical contact, it can measure the compressive force of the grip. At the stand, a demonstrator will illustrate the role of

such sensors in e.g. teleoperation. Sensor data are represented by a haptic display. The user can follow the perception of the robot live.

AUREUS: Intelligent Data Visualization for Industry 4.0:

Virtual and augmented-reality (VR/AR) applications are to capture industry, logistics, the healthcare sector, trade, and many other branches in the near future. With a 3D printer being used as an example, CeBIT visitors will be shown how data of production facilities can be illustrated in real time with the help of augmented reality: A tablet will show wind intensity and wind direction measured by the sensors of the miniaturized production facility. Such sensor information is of high relevance to production systems or processes that are highly sensitive to the surroundings. Injection molding, for instance, is sensitive to draft and fluctuations of ambient temperature.

Visitors are invited to vary these parameters via rotary knobs and to influence the molding quality in this way. For this intelligent data visualization with augmented reality for Industry 4.0, the data of various sensors are read out with model-driven software development approaches, semantically enriched by context information, such as standards data records or a data history, transformed, and displayed on mobile end devices. Measurement and intelligent visualization enable workers to easily interpret disturbing impacts of airflow and indications of their sources and derive appropriate countermeasures.

Symposium “Robotics in the 21st Century“:

Renowned German experts will speak about trends and latest developments in robotics **at a scientific symposium on Wednesday, March 22, 1 to 3 pm, at the Convention Center (CC), hall 3A.**

The experts will be: Prof. Tamim Asfour (Karlsruhe Institute of Technology), Prof. Oliver Brock (Technische Universität Berlin), Prof. Wolfram Burgard (University of Freiburg), Prof. Jessica Burgner-Kahrs (Universität Hannover), Prof. Rüdiger Dillmann (Karlsruhe Institute of Technology), Prof. Sami Haddadin (Universität Hannover), Prof. Katja Mombaur (Heidelberg University), Prof. Oskar von Stryk (TU Darmstadt), Prof. Britta Wrede (Bielefeld University), Prof. Florentin Wörgötter (University of Göttingen).

Symposium Program:

11 to 11.30 am	Visit of the stand of KIT (hall 6, stand A30)
11.30 to 12 am	Introduction, welcome, and demonstration (hall 6, Future Talk Conference Forum) Prof. Thomas Hirth, Vice President for Innovation and International Affairs, KIT
12 am to 1 pm	Snacks and exchange of ideas (Convention Center (CC), hall 3A)
1 to 3 pm	Scientific symposium "Robotik im 21. Jahrhundert" (robotics in the 21st century) (Convention Center (CC), hall 3A)

For more information on KIT's appearance at CeBIT, click:

<https://www.pkm.kit.edu/cebit2017.php> (in German only)

About FZI Research Center for Information Technology

The FZI Research Center for Information Technology at the Karlsruhe Institute of Technology is a non-profit institution for applied research into information technology and technology transfer. Its task is to provide businesses and public institutions with the latest research findings in information technology. It also qualifies young scientists for their career in academics or business as well as self-employment. Led by professors from various departments, research teams at FZI interdisciplinarily develop and prototype concepts, software, hardware, and systems solutions for their clients. The FZI House of Living Labs offers a unique research environment for applied research. Every FZI department operates under a quality management system certified according to DIN EN ISO 9001:2008. The FZI main office is located in Karlsruhe.

FZI has a branch office in Berlin.

Karlsruhe Institute of Technology (KIT) pools its three core tasks of research, higher education, and innovation in a mission. With

about 9,300 employees and 25,000 students, KIT is one of the big institutions of research and higher education in natural sciences and engineering in Europe.

KIT – The Research University in the Helmholtz Association

Since 2010, the KIT has been certified as a family-friendly university.

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