NEWS

GERMAN RESEARCH CENTER FOR ARTIFICIAL INTELLIGENCE

DFKI at CeBIT 2014

Launch of Smart Data Innovation Lab

Opening of SmartCity Living Lab

Science Year 2014 – The Digital Society

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1/2014

HANNOVER MESSE 2014

April 7-11

DFKI's SmartFactory^{KL} at Forum Industrial IT 2014

"Integrated Industry – NEXT STEPS" is the motto of the world's most important industrial trade show this year as it presents the major issues for the future of the sector by addressing the next steps toward smart, networked, and self-organizing factories in the course of the 4th Industrial Revolution.

INDUSTRIE 4.0 NOW

Standardized, modular, manufacturer independent – INDUSTRIE 4.0 is ready for practical application in a real production scenario.

The SmartFactory^{KL} presents itself as a center of excellence and a technology platform for the implementation of the 4th Industrial Revolution. Under the sponsorship of about a dozen well-known partners in industry, this unique production system has been created to enable this grand vision to become reality.

Come see the future for yourself and experience this unique, modular system!

"Integrated Industry – NEXT STEPS" is the motto of the HANNOVER MESSE 2014

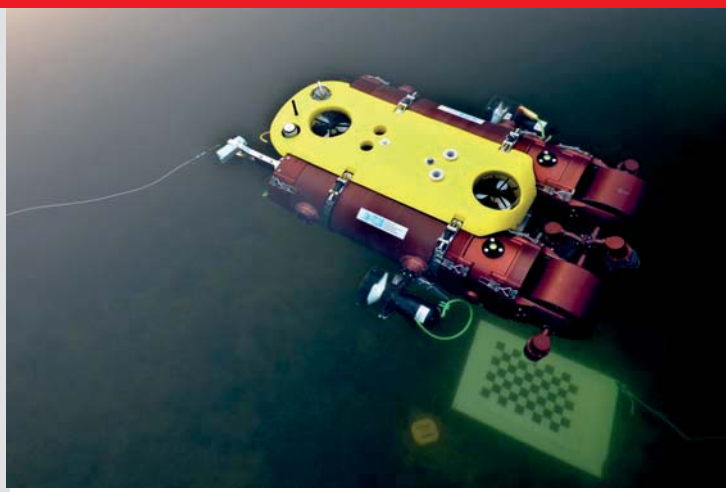
Hall 8, Stand D20

DFKI Robotics Innovation Center at the special InwaterSolutions exhibit

A new special show "InwaterSolutions" presents the competence of the Robotics Innovation Center in the field of maritime systems.

DFKI Bremen develops intelligent, mobile robot systems for underwater operations. InwaterSolutions is dedicated to cross-industry components, systems, and services for underwater technology in Germany.

Hall 6 (Industrial Greentec), Stand K18



InwaterSolutions is dedicated to cross-industry components, systems, and services for underwater technology in Germany.

Science Year 2014 – The Digital Society

Wissenschaftsjahr 2014
DIE DIGITALE GESELLSCHAFT

The "Science Year 2014 – The Digital Society" – an initiative of the Federal Ministry of Education and Research (BMBF) – officially got underway on February 19, 2014 with the kick-off event in the Museum for Communication in Berlin. Federal Education and Research Minister Prof. Dr. Johanna Wanka welcomed participants from research, government, and society and introduced the activities of the Science Year 2014. The roundtable discussion which followed dealt with the question: "How to design the future of the digital society?" Moderated by Jörg Thadeusz, panelists included Dr. Jeanette Hofmann (Alexander von Humboldt Institute for Internet and Society), Prof. Dr. Jörn Müller-Quade (Karlsruhe Institute of Technology), Prof. Dr. Dr. h.c. mult. Wahlster (DFKI), Patrick Bunk (uberMetrics Technologies), Prof. Dr. Gesche Joost (Berlin University of the Arts), Prof. Dr. h.c. mult. Peter Weibel (Center for Art and Media Systems Karlsruhe, ZKM).

From the wristwatch to the automobile, Prof. Wahlster illustrated various aspects of the megatrends INDUSTRIE 4.0 and the Internet of Things. His remarks focused on how our society will change by the year 2020. His statement in the Year of Science press folder: "The Internet of Things will connect all of our everyday digitally enhanced objects from the wristwatch to the heat furnace to the automobile. The auto will morph to a smart phone on wheels, to a sensor node in the Internet of Things. Networked to the home and office, it will communicate with other cars to preclude accidents and still reach the intended destination quickly and efficiently. Intelligent environments that provide customized information and smart services at any time will appear in the workplace and residential surroundings and in public buildings. New wizards and new forms of Human Computer Interaction will provide easy access for all our senses to a digitized world of work and leisure where we can make our daily lives more comfortable."

Concept, important dates, a thematic dossier, a campaign video, and a host of other information about the "Science Year 2014 – The Digital Society" is provided online at:
www.digital-ist.de

l.-r.: Dr. Jeanette Hofmann, Alexander von Humboldt Institute for Internet and Society; Prof. Dr. Dr. h.c. Gerold Wefer, Wissenschaft im Dialog (WiD, Science in Dialog); Prof. Dr. Jörn Müller-Quade, Karlsruhe Institute of Technology; Prof. Dr. Dr. h.c.mult. Wolfgang Wahlster, CEO DFKI; Prof. Dr.-Ing. Reimund Neugebauer, President Fraunhofer Society; Federal Minister Prof. Dr. Johanna Wanka; Prof. Dr.-Ing. Peter Liggesmeyer, President German Informatics Society; Prof. Dr. Gesche Joost, Berlin University of the Arts, and Patrick Bunk, uberMetrics Technologies

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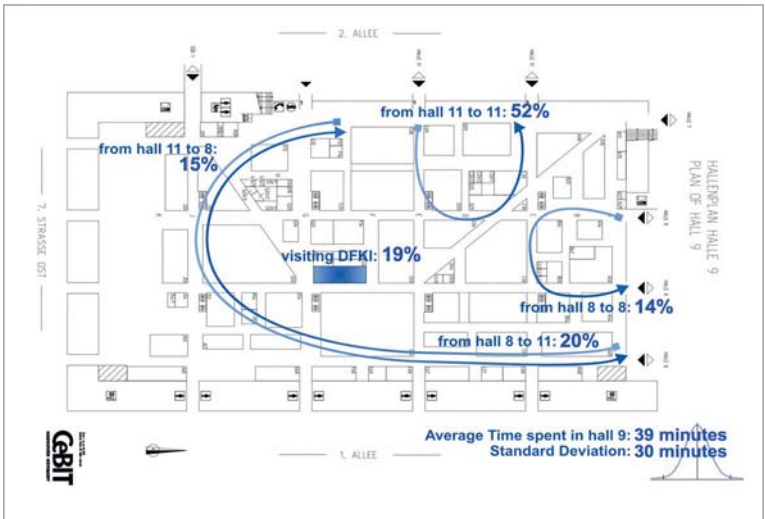

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Photo: SENAI

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DFKI Keynotes, Talks and Panel Discussions at CeBIT 2014

Monday, March 10

11:15 - 12:00 a.m. future talk, Hall 9, Stand F44
Presentation of CeBIT Innovation Award 2014 by Federal Minister of Education and Research (BMBF) Prof. Dr. Johanna Wanka and Members of the Jury

2:00 - 2:30 p.m. future talk, Hall 9, Stand F44
European Institute of Innovation & Technology – EIT ICT Labs: A Unique Pan-European Ecosystem
Prof. Dr. Willem Jonker, CEO, EIT ICT Labs; Paul Jenkins, EIT ICT Labs; Janina Fagerlund, EIT ICT Labs; Kilian Moser, EIT ICT Labs

3:00 - 3:15 p.m. future talk, Hall 9, Stand F44
Science Year – The Digital Society
A Society in Transition – The Impact of the Digital Revolution. *Prof. Dr. Wolf-Dieter Lukas, Ministerialdirektor, BMBF*

3:15 - 4:00 p.m. future talk, Hall 9, Stand F44
100% Digital Economy – INDUSTRIE 4.0, Smart Services, Hybrid Products, and Integrated Business and Value Creation Processes
Dr. Wolfram Jost, CTO, Software AG; Prof. Dr. Peter Liggesmeyer, President, GI; Prof. Dr. Wolf-Dieter Lukas, Ministerialdirektor, BMBF; Prof. Dr. Wolfgang Wahlster, CEO, DFKI; Moderation: Reinhard Karger, DFKI

5:00 - 6:00 p.m. Software AG, Hall 4, C11
The Digital Enterprise – The Moves and Motives of the Digital Leaders. *Panel Discussion, Book Presentation with Prof. Dr. Peter Buxmann, TU Darmstadt; Reinhard Clemens, Deutsche Telekom AG; Dr. Michael Gorritz, Daimler AG; Prof. Dieter Kempf, DATEV eG; Prof. Dr. Wolfgang Wahlster, DFKI; Frank Riemensperger, Accenture; Karl-Heinz Streibich, CEO Software AG; Moderation: Carsten Knop, FAZ*

Tuesday, March 11

12:45 - 1:30 p.m. future talk, Hall 9, Stand F44
Web of Data and Web of Things – Standards Bring Two Worlds Together
Phil Archer, W3C; Alan Bird, W3C; Bernard Gidon, W3C; Achim Hartig, Germany Trade and Invest; Alexander Löser, Beuth University of Applied Sciences in Berlin; Dave Raggett, W3C; Dr. Georg Rehm, W3C Germany-Austria, DFKI; Moderation: Reinhard Karger, DFKI

2:00 - 2:30 p.m. future talk, Hall 9, Stand F44
Software-Cluster, Emergent Software in Action – Changing Trade, Mobility, and Agriculture
Software-Cluster research results; Speakers: 1&1 Internet AG, Software AG, DFKI, John Deere

2:40 - 3:15 p.m. future talk, Hall 9, Stand F44
Networking in the Energy Economy – Risks, Opportunities and Challenges: More Data – More Knowledge
Holger Kirchner, Seeburger AG; Dr. Joachim Schaper, AGT International; Prof. Dr. August-Wilhelm Scheer, Managing Shareholder, Scheer Group; Prof. Dr. Wolfgang Wahlster, CEO, DFKI

3:30 p.m. IT-Planning Board, Joint Stand, Hall 7, Stand B42
Official Launch of "SchwebNET online" – Barrier-free Access to New Identity Card
Annegret Kramp-Karrenbauer, Saarland Minister President; Andreas Storm, Saarland Minister for Social Affairs, Health, Women and Family; Dr. Christoph Igel, Scientific Director, CeLTech

3:40 p.m. IT-Planning Board, Joint Stand, Hall 7, Stand B42
Social INTRANET – An Opportunity for Public Administration?
Panel discussion with Annegret Kramp-Karrenbauer, Saarland Minister President; Prof. Dr. Christoph Igel, Director CeLTech

Wednesday, March 12

10:00 a.m. - 5:00 p.m. future talk, Hall 9, Stand F44
Special Conference: Future Internet PPP – Open Platform for Entrepreneurs in Europe
The Future Internet program (FI-PPP) is an EU-wide effort to create an open platform offering a comprehensive and integrated set of reusable Internet services and the cloud infrastructure to run them on. http://mediafi.org/cebit2014

1:00 - 1:30 p.m. Bitkom Stand, Hall 13, Stand B43, Smart Home Forum
Trends and Challenges for the Smart Home. *Keynote speech with Dr. Jan Alexandersson, DFKI*

Friday, March 14

12:00 - 12:30 p.m. future talk, Hall 9, Stand F44
do it yourself: Start-ups from Software-Cluster Research.
ProcessViews – Making Processes Visible with Data Glasses. *Nils Petersen, DFKI*

12:30 - 1:15 p.m. CeBIT Global Conferences, Hall 8, Power Stage
telegraphen_lunch: "INDUSTRIE 4.0 – The Ideal Solution for the Internet of Things?" *Keynote speech with Reinhard Karger, DFKI*

The Model Chimpanzee – The First Robot with Flexible Spine and Sensitive Feet

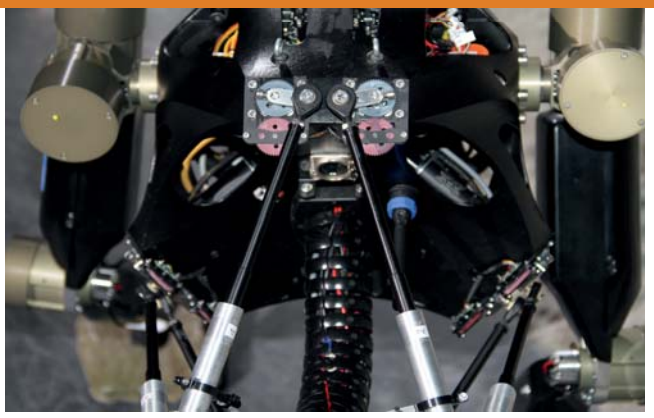
Visitors to the CeBIT will notice the advantages of a flexible spine and built-in sensors in the feet right away at the DFKI stand. That is where "Charlie", the ape-like robot, performs his balancing act on a teeter board and demonstrates how he can intercept and offset abrupt, rocking movements. It is obvious in the four legged and upright walking positions: DFKI has studied biologically inspired movement patterns for a new generation of robots – and taken a leading position in international comparisons.

DFKI scientists together with researchers at the University of Bremen developed the robot in the "iStruct" project (intelligent Structures for Mobile Robots). Humans and chimps serve as the role models. Charlie is able to move safely and flexibly on an uneven surface – for example, when exploring craters on the moon in search of frozen water.

Walking robotic systems provide access to otherwise inaccessible terrain. Their legs and feet can selectively apply forces to certain points and so – without losing their balance – continue to move by optimally distributing the force. This means, for example, that they are able to climb down a steep crater wall. Furthermore, the limbs can be used for sensing and gripping tasks.

The spine and foot soles that adjust to the surface structure have the potential to vastly improve the mobility of the robot in comparison with conventional systems. Charlie has a stability in the four-legged posture that is better-suited, for example, for exploring uneven and unstructured terrain. The two-legged pose provides additional operational possibilities, for example, it frees the upper limbs to perform other tasks or actions.

An interesting topic for future research is to study the transferability of movement patterns from four legs to two legs – or vice versa. Can certain sequences of movement observed in four legged locomotion also serve two legged walking in some direct or modified form? "The answer to this question may provide clues to the evolutionary processes that led to upright locomotion on two legs," says Prof. Dr. Frank Kirchner, Director of the Robotics Innovation Center at DFKI and Head of the Robotics Working Group at the University of Bremen.



Detailed view of the spinal structure

Details: Spine provides agility to the robot

Many robotic movements – especially in the field of biologically inspired motion machines – appear cumbersome and stiff despite good individual joint control. This is generally because of the rigid construction, which is mounted in the middle and serves as the body of the robot. As a consequence, the respective power units are suspended in the extremities. "That simplifies construction and reduces the complexity of the robot, but it restricts the freedom of movement and reduces the possibility of directing the flow of force in the robot from the hind legs to a forward locomotion. In contrast, the flexible iStruct spine permits movement in six spatial directions," explains project leader and DFKI researcher Daniel Kühn.

Lower leg with active ankle joint and sensitive soles

The feet serve as the contacts between the robot and the surface. This essential subsystem provides for the effective locomotion of the robot, as it ensures good traction and a solid stance. To achieve this, the lower leg was designed with an active ankle joint and adaptive foot sensors.

More information
www.dfki.de/robotics

"Charlie" in upright position

Supported by:
Federal Ministry for Economic Affairs and Energy

CeBIT Hall 9, Stand F43

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Crowd Sensing – Automatic Recognition of Crowds and Direction of Movement

When is the number of visitors the highest at a public festival or a trade fair? Where are most of the visitors at that time? Which exits are most heavily used? What display receives the most attention?

DFKI's Embedded Intelligence research department pursues new basic technologies for interior positioning and innovative approaches for sensor fusion, to include so called "crowd sensing," which has led to the development of a method for large area, collaborative data acquisition.

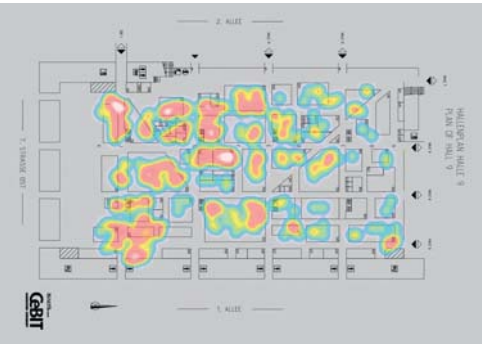
The automatic recognition of visitor density and the direction of movement is relevant for many applications. The range of possible use includes "crowd control" and emergency services, an information source for urban planning, and visitor analyses for events and trade shows. There are even end user applications that provide entertainment recommendations.

The Crowd Sensing System presented at CeBIT 2014 by DFKI anonymously records, evaluates, and displays the visitor flow in Hall 9. Compliance with data protection directives, of course, goes without saying.

The system uses WiFi and Bluetooth scanners positioned throughout a room or an outdoor area. These sensors passively recognize the regular signals sent from mobile phones, to the extent they are activated. The system analyzes the data and estimates the number of people that are present in the different areas of the room. There is no installation of a special smart phone application required.

A live display of the activity in certain areas of interest within the hall is shown as a heatmap on a monitor wall at the DFKI stand, where visitors can listen to a detailed explanation. In order to judge the quality of the system, the results are compared to camera recordings of the hall.

In addition to estimating the size of the crowd, the system also captures the exposure time in a certain area or the overall area as well as the transit time between the separate areas. Furthermore, the direction of movement between the areas is revealed. Visitor patterns can be recorded and analyzed: visitors who showed interest in company X, also visit the booths of companies Y and Z. The Crowd Sensing System can also identify route preferences and the information can be used for optimal positioning of objects.



Heat map of visitor fluctuation in Hall 9 at CeBIT 2013

More information
www.dfki.de/web/research/ei

Density of people over the course of a crowd density measurement

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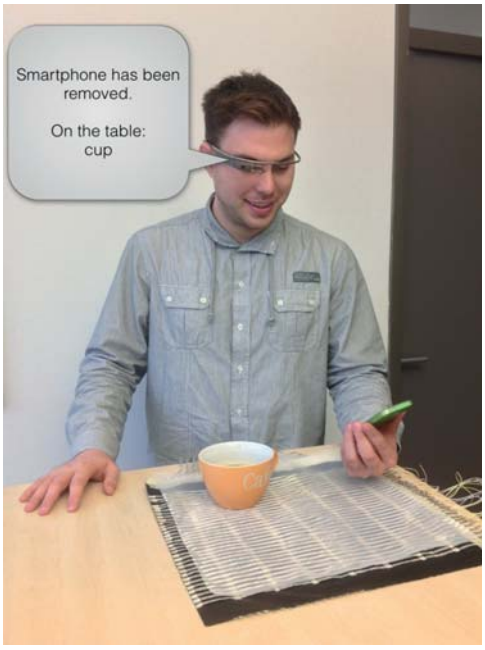
CeBIT Hall 9, Stand F43

Smart Table Cloth

In some science fiction scenarios, humans no longer use computers: artificial intelligence reacts like a living organism adapting to each separate need of the person. Some authors envision floors, walls, or tables that react to surface pressures and know what the user is doing, they "feel" it like an organic skin. Today, these technologies have developed well beyond pure imagination. Touch screens are everywhere, most markedly on iPads and smart phones. The current models, however, are designed to allow the user to touch a point on the surface of a computer screen, but do not differentiate detailed information, such as the form or the force applied to the point.

In contrast, the sensor pad of the “Smart Table Cloth” measures the distribution of the force acting on the surface. When pressure is applied, the electrical resistance of the conductive material changes relative to the applied force. Thanks to lightweight, convenient, and flexible technical fabrics, the technol-

ogy can be used, for example, under a table cloth. The millimeter thick, flexible fabric identifies up to eight objects based on their shape and weight. Integrated pressure sensors identify not only the object, but also register changes in weight. The information is displayed on a Google Glass (optical head-mounted display) directly into the field of the view of the user. Furthermore, the technology is easily incorporated into other fabrics, for example, in clothing or the materials used in furniture production. The collected data can be recorded and analyzed to detect movement patterns or to draw conclusions about nutritional habits.



Fabrics with integrated sensors can identify objects based on form and weight.

The Smart Table Cloth complements the nutritional schedule and supports personal food plans. It helps to shed light, for example, on how much butter a family of four consumes at the evening meal or whether they have had enough to drink. Diabetics can receive an indication of the expected blood sugar levels after eating certain foods.

More information
www.dfki.de/web/research/ei

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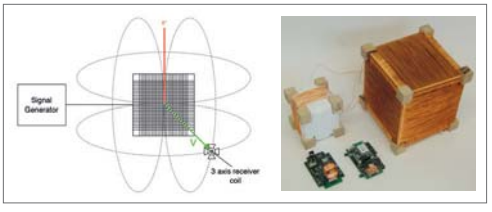
CeBIT Hall 9, Stand F43

Magnetic Field Sensors – For Positioning in Enclosed Areas

DFKI's department of Embedded Intelligence is developing interior positioning methods with centimeter-level accuracy that are deployed to optimize presentation and sales showrooms or to improve safety at major events.

For example, these methods provide an understanding of which presentation areas are most attractive in a sales showroom, what object in an art exhibition allures the most attention, or what stand at the trade show has above average traffic.

The Magnetic Sensor system functions on the basis of oscillating magnetic fields and mobile receivers that enable three-dimensional position-finding to an accuracy of 30 centimeters inside a building. The system can identify the exact location and orientation, for example, of a device or a sensor worn on the body. As developed by DFKI, the system consists of stationary emitters that cover an area of approximately 60m2 and enable the user to exactly locate receiver units throughout the building in 3-D. The position and orientation of the receiver is determined 30 times per second using magnetic force field data measured by the mobile receiver units in combination with speed, gyroscopic, and compass information. The system has an accuracy of 30 cm. Metallic objects exert only a local influence on the magnet fields while walls, furniture, and people located within the magnetic fields have no effect whatsoever on the measurements as the lines of force simply pass through such objects.
This new technology is sponsored under the CoCoReC project by Federal Ministry of Education and Research (BMBF) and the German Aerospace Center (DLR).



The mobile receiver unit measures the force of the fields generated by three transmitter coils standing above to one another. The corresponding lines of force limit the possible locations of the receiver to the intersection of the fields.

More information
www.dfki.de/web/research/ei

CeBIT Hall 9, Stand F43

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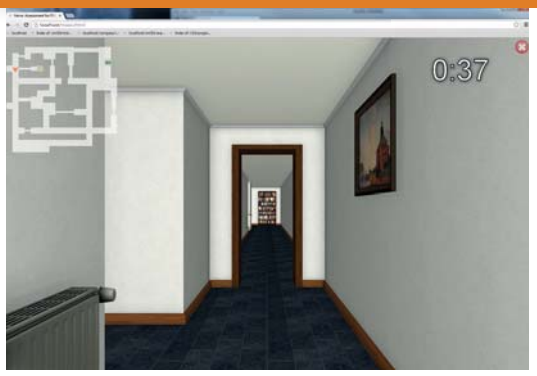

Simulated residential environment with narrow door passage

Three-dimensional patient explanation of magnetic resonance imaging

VERVE – Virtual Worlds in the Therapy of Neurological Disorders

How virtual worlds can improve the quality of life for patients with Parkinson's or Alzheimer's disease or people with anxiety disorders is the focus of Project VERVE (Personalized Virtual Reality Scenarios for Groups at Risk of Social Exclusion), under development by an interdisciplinary team of European researchers.

DFKI developed, in collaboration with neuroscientists at Trinity College in Dublin, a specific training environment that uses virtual 3D scenes to help these patient groups to once again move about safely in real environments. The project team works closely not only with these patient groups, but also with the caregivers, families, therapists, and relevant funding organizations.

Neurological diseases like Parkinson's or Alzheimer's, diverse fears of everyday situations, or afflictions of old age combined with motoric impairments often lead to the withdrawal of the victims from their social surroundings.

The virtual 3D environment deliberately confronts these patients with situations that trigger the anxiety or "freezing" states (blocked movement) and gradually trains the strategies to help counteract them. In this way, patients learn to better manage the attacks, to reduce the frequencies, and to once again move about safely in public. The VERVE consortium models customized and populated Virtual Reality (VR) environments, 3D web graphics, and Serious Games by applying state-of-the-art research techniques.

For example, the use of XML3D technology means that the patient training session can be completed at home – not only in conjunction with a stationary hospital stay. The 3D Internet technology is developed at DFKI in joint research with the Intel Visual Computing Institute at Saarland University. A game was created on the basis of XML3D for patients to balance on a "Wii Balance Board" and "walk" through a virtual labyrinth that contains many different elements to provoke the freezing reactions. The playful nature of the exercises is designed to encourage the patients to continue the training beyond the prescribed schedule. The use of XML3D facilitates supervision by the attending physician and customization of the difficulty level of the training courses.

XML3D – Technology for the 3D Internet

XML3D enables the creation of three-dimensional web sites and permits viewing on nearly every web browser on almost all PC's and mobile phones. As a minimal and seamless extension of the previous HTML standard, the technology need not be learned from scratch. It is a natural progression to use it in games and product presentations. However, there are many other new and interesting application areas: interactive visualization of data sets, collaborative enterprise resource planning and supervision in the context of INDUSTRIE 4.0, training scenarios for emergency response teams, and construction site logistics are just a few of the many topics being studied at DFKI in the context of various industrial and research projects.

The technology is also attractive to the health care sector because the introduction and use of XML3D is so cost effective. Using the technical know-how from DFKI, Saarland University Hospital Homburg/Saar has already developed a three-dimensional patient training aid for magnetic resonance imaging (MRI) in XML3D.

More information
http://verveconsortium.eu
http://xml3d.org

FUNDED BY

VERVE is funded under the EU 7th Framework Program for Research.

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CeBIT Hall 9, Stand F43

Real Time Monitoring, Analysis, and 3D Visualization of Emotions and Vital Data for Gaming, City Planning, and Tourism

Human Analytics Apps TrackMe and GeoVisualizer

EASY IMP

Under the keyword "Quantified Self," health conscious researchers worldwide are capturing data about their own bodies. The technological prerequisite is the "wearable," a minicomputer worn on the body to capture, store, and evaluate data. Miniaturized sensors worn on the body, now available for everyday individual use, can record vital data relevant to health care as well as having inertial motion sensors that measure the speed of the movements.

Wearables are easily personalized and provide every smartphone user the opportunity to record vital data like breathing, heart frequency, bio-electrical characteristics and skin temperature. In this way, the wearer can follow and document their individual physical development. The current trend is called "human analytics" and the aim is to capture and display physical data in real time as well as to provide for the interactive analysis of the data. Until now, there have been few efforts to link such vital data with information about the environment and to create an appropriate intuitive visualization of it.

The TrackMe and GeoVisualizer apps from DFKI's Augmented Vision department combine these two aims. At CeBIT 2014, the department will demonstrate how vital parameters, emotions, activities, and individual physical data like gender or age can be linked to information about the immediate surroundings. This combination results in a location-based indication of the individual state, a kind of emotional map, which shows the personal "feel good" factor for the location.

From a smartband worn on the wrist or a chest strap, TrackMe captures and analyzes the vital parameters from various sensors in real time and puts it in relation to the current location of the user and the ambient data. Besides the vital parameters like heartbeat, skin temperature, or bio-electrical response, the software records and evaluates environmental data such as noise level, humidity, and temperature. The data is provided by external sensors as well as from the internal sensor systems of the smartphone. The app, developed for the Android operating system, records data even when it is not connected to the Internet and continues to evaluate information, for example, about the activity and emotional state of the user with respect to the immediate surroundings. This enables the creation of an emotional plan of the city.

The user retains sovereignty over the data. The system uploads the locally stored data to the server only with the express consent of the user and stores it there in an anonymized format, where it is accessible for research purposes to anyone.

To visualize the recorded sensor data, researchers have developed a 3D visualization environment. The GeoVisualizer is based on a 3D component developed under the EU project SUDPLAN, which creates a three dimensional presentation in a global context that enables an interactive and visual analysis of the most diverse data. The application is based on NASA's so called World Wind SDK – an open source alternative to Google Earth. The 3D visualization software developed at DFKI can also be used independently with many other applications in geographic information systems, for example, for spatially related market analyses, tourism, environmental studies, or energy distribution.

The current research findings are being further developed under the framework of the EU sponsored project EASY-IMP.

More information
www.geovisualizer.de
www.sudplan.eu
www.easy-imp.eu
www.dfki.de/av

FUNDED BY

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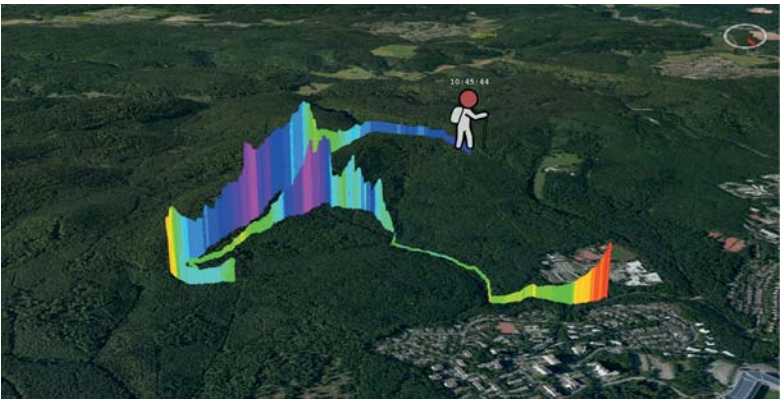
CeBIT Hall 9, Stand F43

Emotions on one of the favorite walking trails in the Pfälzer Wald: The combination of skin temperature (color) and skin conductivity (height of the the curve) serves as a visual indication of emotional reactions. A higher curve and brighter red color represent a more stressful situation.



Visualization of data from mobile, locational sensors at the Berlin Zoo

RefMod-Miner – Big Data in Business Process Management

Cyber-physical manufacturing systems equipped with sensor systems support automated production processes with many variants in low quantities. This support entails large volumes of highly complex data – Big Data, which provides detailed information about actual business and production processes. When structured, analyzed, and consolidated, Big Data can provide a solid basis for process enhancements and the further development of the manufacturing executions systems (MES).

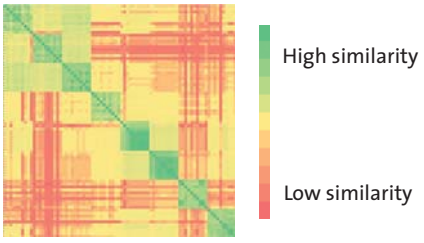
The process libraries at smart factories can easily attain a volume of anywhere from a thousand to ten thousand individual models. Even with established modeling and business process management tools, management is still a cost and resource intensive endeavor. Companies find it increasingly difficult to take all possible side effects into account and react flexibly to process changes.

The Institute for Information Systems (IWi) at DFKI developed a prototype software tool called RefMod-Miner (Reference Model Miner), to compare various process models. The prototype comprises current approaches and technologies from business information systems research for the detailed analysis of model and entity data, which enables the automatic alignment in different application scenarios, for example, process mining, compliance tests, and process model upgrades.

RefMod-Miner supports the company in the analysis of process variants. Through the identification of different process variants, it can recognize duplicates of model fragments and generate inductive reference models. The similarities between the process models are visualized using a matrix. The figure below shows the degree of similarity between 80 different models. Potential groupings within the process libraries are readily identified by the color-coding of similarity values, with each element of the matrix indicating the similarity to the model named in the column or line heading.

The process for the automatic generation of process matchings received the "Outstanding Matcher Award 2013" at the Business Process Management Conference (BPM) in Peking.

More information
http://www.dfki.de/web/research/iwi



Similarity matrix shown as a heat map

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ARGUMENTUM – Search Engine for Argumentation

Lawyers spend much of their time searching through books, news magazines, and commentaries for text passages relevant to the issue under review. They scour manuals, professional journals, and the Internet for justifications or case precedents to support their own thesis or weaken the opposition's arguments. Online legal databases already provide a great deal of help. However, as a rule, the help provided is only for simple full text searches, which often return an incomprehensible and unorganized number of hits. The search for the appropriate arguments is still a lot like searching for the proverbial needle in the haystack.

The ARGUMENTUM project at the Institute for Information Systems (IWi) at DFKI, in cooperation with the Institute of Law and Informatics (IfRI) and the Chair for Theoretical Philosophy - both located at Saarland University - as well as the European Academy of Law and Computing (EEAR), have developed an innovative search engine that is designed to supply appropriate arguments for specific legal questions at the “push of a button.” The result is that both practical and legal work efforts are simpler and faster. The available online decisions of the Federal Constitutional Court were used as a basis in the development of the prototype.

ARGUMENTUM was launched in June 2012 and is sponsored for a period of three years by the Federal Ministry of Education and Research (BMBF) under program ID 01UG1237C.

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Federal Ministry of Education and Research

More information
www.dfki.de/iwi
http://argumentum.eear.eu

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MENTORbike – Safe Outdoor Training for Chronically ill and Heart Patients

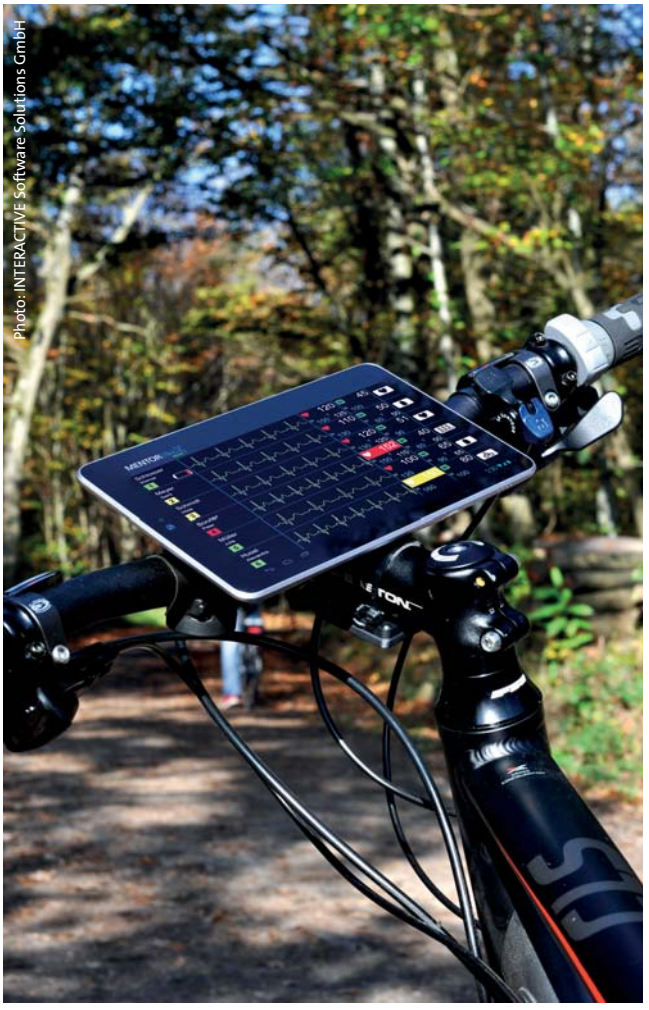
Beyond the usual stationary treatments for controlled stress training, an outdoor system now enables chronically ill patients to self-determine their training units without exceeding individual performance limits. In contrast to a conventional ergometric training bike, MENTORbike provides the option to train in the open air while taking into account the vital parameters and individual fitness level of the user.

The MENTORbike presented at CeBIT 2014 demonstrates how to link the support function of a pedelec (pedal electric cycle) to the pulse frequency and enable the dynamic adjustment of the pedaling resistance. If the pulse becomes too fast or the pedaling effort of the cyclist too demanding, the motor power of the pedelec is increased. The user is given proactive motorized support before reaching the point of over exertion, preventing a situation where the risk outweighs the benefits of physical activity.

Conventional systems are not designed to include vital parameters like an electrocardiogram (ECG) when monitoring and controlling individual mobile training. MENTORbike is the first system that controls individual physical activity based on physiological and physical data like heart rate, expended effort, and geographic location. User-specific recommendations before and after training support and motivate the user.

A common smart phone and a body area network are required for the MENTORbike system to link the pedelec to a smart online-portal that records and processes the captured data like GPS, motor, and ECG signals. The portal facilitates the administration of patient data, supports therapists and trainers in the preparation of training plans, and even provides route recommendations. When finishing a training unit, the trainer app uploads the data to an online portal where it can be retrieved at any time for analysis and evaluation.

The MENTORbike Trainer App enables support to a group of outdoor cyclists and provides a whole new range of perspectives for training and therapy. Never before has individual, near real time, adjustment been possible in a training situation. Now, users can train outdoors within individually specified preventive or therapeutic limits for use and stress control. Even if the users have different levels of fitness, they can train as a group thanks to the individual controls. MENTORbike makes it easy for the fit grandson to ride side by side with a grandfather with a heart condition. Their different physical conditions are optimally factored in by the system.



Monitoring participants with the MENTORbike trainer app

The system demonstrated at CeBIT is a preliminary study for a rehab product developed by DFKI in collaboration with project partners BitifEye Digital Test Solutions, Benchmark Drives, INTERACTIVE Software Solutions, Center for Physical Health at the German Sport University Cologne. A market ready product is planned for the cycling season 2015. The system is presently undergoing clinical tests at a rehabilitation facility for heart patients.

More information
www.mentorbike.de

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Design pattern of the augmented print application

INTeRACT 4AP – App Links Digital Content with Print Media

Print media is currently facing the challenge of competition from online digital media in terms of timeliness and pricing. In addition to their traditional print business, publishers are now attempting to gain a foothold with products and services in the area of digital communications. Ideally, the print and digital businesses are linked in such a way that the value of conventional print media will be increased through integration and its business model can remain viable.

To this end, publishers are developing so called "augmented print" applications that link printed content with digital content via a smartphone. So far, this type of application has mainly been used in the "advertising & commercial" business. There, for example, a video clip of a sports car driving along the California coast complements the static content of a printed advertisement, or a coffee table shown in a printed furniture catalog is placed in any available color in your own virtual living room.

"Until now, developing an augmented print app and embedding it in the value creation process required a major financial and organizational effort," says Dr. Dirk Werth, Head of Business Integration Technologies at DFKI. He adds, "In the INTeRACT 4AP project, we have conceived a reference model that leads the development of such apps away from the costly individual solutions to more cost effective industrial production methods and, in parallel, it is adaptable to the individual requirements of any newspaper publisher."

DFKI and Scheer Management demonstrate the feasibility of this approach in a prototype, developed and evaluated in cooperation with the publishing company "Saarländisches Wochenblatt GmbH". In principle, the underlying reference model promises a cost effective market entry as it can address digital offers to all publishing and media houses as the target group. In particular, by connecting the print and digital businesses, it enables medium sized publishing houses to keep pace with the larger publishing groups.

Besides linking digital content with physical media, another innovative highlight is the possibility to display enriched content in correlation with the current context and even the individual preferences of the user. It is now possible to refine the print content on the basis of the personal preferences of the individual user. The result has a much greater relevance and utility, for example, readers now receive customized and context related videos, audio files, or related articles about a specific topic. Rather than providing the same information for all readers as in the past, augmented print enables an individual reading experience.

The Federal Ministry of Education and Research (BMBF) sponsors the project under the framework of the SME Innovation Offensive ICT (Project ID: 01IS13010B).

More information
http://interact4ap.de

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Swoozy Future TV – The Intelligent Semantic TV of Tomorrow

What is that actor's name?" "Where was that scene filmed?" "Is there by any chance a DVD for this program?" TV viewers occasionally want to know more than the program itself offers - although, not wanting to devote their attention to an online search using some other medium that causes them to miss a critical scene.

Swoozy is an interactive TV system that enables the viewer to search for information related to the program being viewed directly from the TV screen. Using simple hand gestures, not only can TV functions be controlled and programs switched, now an online search can be initiated too. The hits, derived from knowledge content and media found in the Internet and the Semantic Web (Web 3.0) are displayed in the form of videos or facts pertaining to the on-screen personality.

Keyboard entries are passé – synchronized with the current program, semi-transparent icons are displayed for selection via a direct "Grab 'n Drop" gesture. These so called "Grabbables" may contain terms such as the names of actors or buildings. The selectable terms in the lower portion of the screen change as the images in the program change. The gesture recognition is achieved with a depth ranging camera, motion controls (Gyration Air Mouse) or finger-tracking (LeapMotion), which let the user search without needing any other tools.

The content is generated by its own backend solution, the Swoozy Cloud. Swoozy extracts and harmonizes information from the heterogeneous web services and interfaces (APIs) based on semantic analyses and comparison methods. In this way, information is supplied that can then be uniformly interpreted, classified, and evaluated.

It is even possible with the mobile Swoozy app (Android/iOS) for several users to interact in parallel with a program, on multiple devices, and to start separate semantic search queries.

"Grabbables" in the lower portion of the screen can be sent to search with just a simple hand gesture. The results from the Swoozy cloud are displayed on the right side of the screen.

Gestures control the transfer of search results from a tablet to the TV set.

If you want to share some of the more interesting results with the entire family, a simple "sling-it" gesture is enough – videos or photos are transferred from the mobile devices to the TV set.

The innovative interaction and expanded internet search goes far beyond the options present in the current connected TVs. Swoozy can also be used in other media intensive areas, for example, for live streaming in e-Learning, as a video conference system, or for an interactive presentation of a company portfolio in Business-TV.

Furthermore, thanks to the generic character of the system, it is well suited for use in data intensive domains like Industrie 4.0. The analysis and control options available in a networked, intelligent production system can be exploited through intuitive interactions via consoles equipped with Swoozy technology.

Matthieu Deru, a doctorate candidate at Saarland University received the special "Young Innovator Prize" in the CeBIT Innovation Award 2013 competition for his intelligent TV system Swoozy. As a researcher at DFKI-Saarbrücken, he is continuing his research and is presenting the advanced developments at the Swoozy Entertainment Area located at the DFKI Stand.

More information
www.swoozy.de

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Digital Forensics – Prevention and Detection through Pattern Recognition

We often hear about concealed identities, money laundering, manipulation of documents, illegal photo and video data with criminal content, attacks on computer systems, or data theft – all challenges presented by today's so called cyber criminals. DFKI's department of Knowledge Management studies Digital Forensics and the latest methods of detection, analysis, and evaluation of criminal content in very large data sets as well as advanced processes to protect against fraudulent activities in digital media and channels.

Biometric methods for entering, archiving, and verification
In many areas, the handwritten signature is fundamental for the legal effect of important documents. This makes it a potential target for forgery attempts. DFKI researchers have been working with secure forensic analysis methods for many years. These methods involve the use of digital pen technology that enables the specific detection, secure archiving, and reliable recognition of handwriting, whether on paper or a tablet PC.

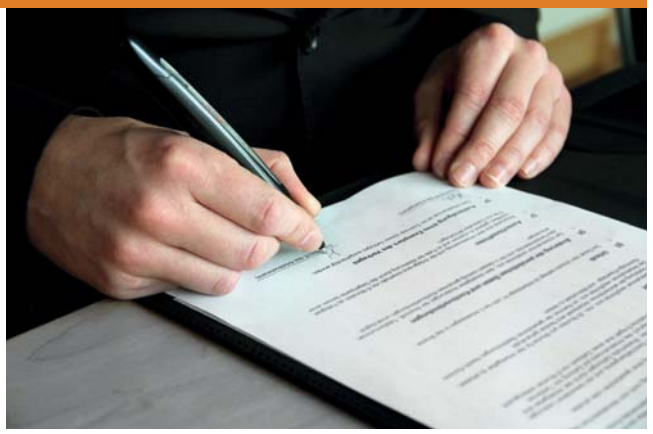
To protect legal transactions from manipulation, the system converts the signature to a computer readable PDF/A, encodes the corresponding biometric characteristics, and stores it in a legally binding and auditable metadata format. Furthermore, the integrity of the associated document is assured by advanced electronic signature.

The biometric and typical individual characteristics of a signature are appropriate for direct automated recognition when the stored reference metadata and the identity of the signatory are used to verify the authenticity of a signature.

Image recognition and video analysis for unmasking criminal content
It is increasingly easy to manipulate digital images and videos with the technological methods and tools available today. Consequently, there is also a growing interest in reliable methods for automatic authentication checks. Computer forensic methods are used, for example, to examine digitized documents or accident scene photos for authenticity. DFKI develops photo forensics that can provide evidence solely from an analysis of stored documents, digital photos, or film material.

When controlling the documents in the inbox, for example, the intrinsic properties of the scanned document image (layout, print properties, CPS codes, etc.) are determined in order to automatically identify atypical features and filter out manipulated documents in real time.

When extensive image and film materials are confiscated on a large scale, manual checks are often unmanageable and may, for some content, be stressful on the investigator. The scalable processes developed at DFKI automatically examine all available image sources and, besides the analysis of image and audio data, also integrate the detection of known locations, objects, and individuals. This method enables a much faster evaluation of the seized storage media.



Successful research in the area of digital pen technologies resulted in the founding of DFKI spin-off *digipen Technologies*.

Network security through anomaly detection
Forgery and fraud detection, fault diagnosis, and network security aspects are the typical applications for identifying anomalies. The aim is to find elements or parts of large data sets that are different or atypical and stand out from the norm.

The detection methods at DFKI are especially well-suited for the analysis of very large data streams, for example, from telecommunications and electricity suppliers, financial service providers, and data infrastructure management. In contrast to the available commercial, largely rules-based systems, DFKI programs have proven themselves in practice and are based on a combination of learning algorithms with specific filtering rules to enable a detailed analysis of the attack. In this way, new and completely unknown network anomalies can be detected. The key to preventing any attempted intrusions or DDoS (Distributed Denial of Service) attacks from being successful lies in early detection and a defensive response, even before knowing what such an attack looks like.

More information
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New Scientific Director for Multilingual Technologies at DFKI in Saarbrücken

Multilingual systems help to neutralize language barriers. They facilitate cross-border dialog, interpersonal understanding, and socio-political discourse. Prof. Josef van Genabith brings prominence to the DFKI activities in the field of machine translation and strengthens the team in Saarbrücken. Prof. van Genabith assumed his new responsibilities as scientific director at DFKI in February 2014.

The technological victory over language barriers can enrich the cultural heritage of a nation, facilitate multinational communication in everyday life or in the workplace, and create the basis for successful business models, innovative applications, and new industries. The need is increasing and the scientific-technological developments of recent years are very promising. DFKI is fortunate to have the distinguished European researcher Prof. Dr. Josef van Genabith join the team as scientific director. Prof. van Genabith has also accepted a position as professor of translation technology at Saarland University beginning in March 2014.

Prof. van Genabith's research focus is on language technologies for machine translation. His approach is a very pragmatic one: He combines machine learning with knowledge-based systems, statistic with symbolic methods, and closely integrates machine translation with the professional world of human translators. The aim is to develop scalable systems that can also handle the digital and multilingual processing of uncommon language pairs and supply the appropriate business models.

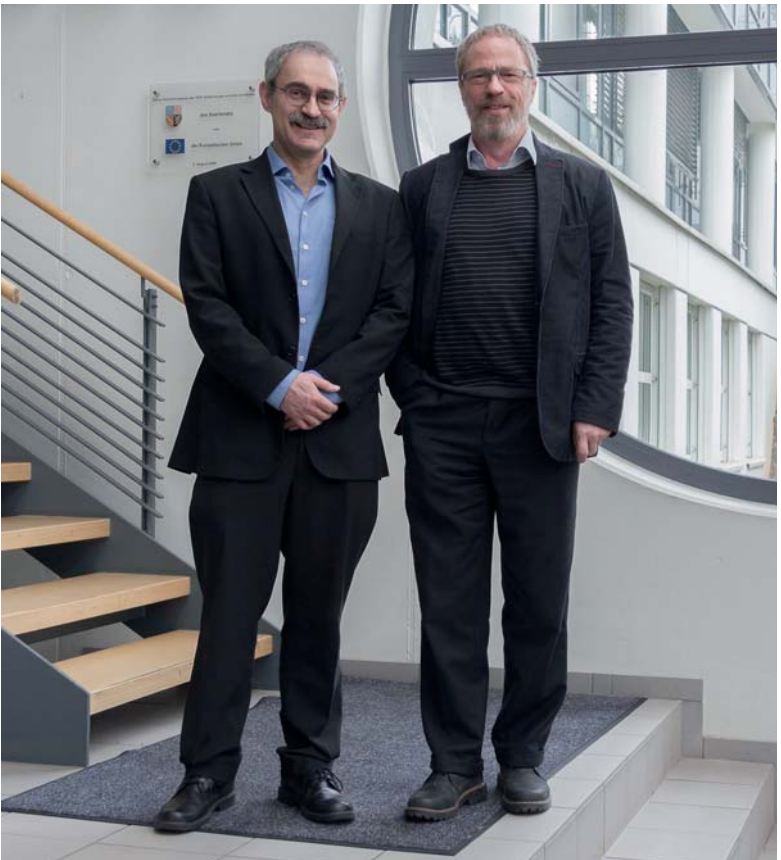
The application scenarios are relevant for everyday life and contemporary situations. Multilingual communication is increasingly becoming an everyday experience in our international employment and business landscape, but also in the leisure and life experience at modern, multi-cultural and multi-national companies: projects extend beyond national borders and involve colleagues on several continents, international travel and vacations have long become commonplace, the most successful cities and metropolitan areas on the planet are international, the information flow is global – and multilingual smart services can offer the appropriate tools for each scenario.

The contemporary international, mobile living and working society constantly involves contact with various languages and no one can really learn all of them. Multilingual systems are designed to simplify administrative processes and to facilitate daily life and orientation. They should assist apartment hunters to get settled in new language surroundings, travelers to operate the systems in the rental car, and the motorist to understand multilingual message dialogs and provide translingual information access.

Prof. van Genabith served as the director of the National Centre for Language Technology (NCLT) and as the first director of the Centre for Next Generation Localisation (CNGL) in Dublin, Ireland. His major research focus is on machine translation and computer linguistics. After studying electrical engineering in Aachen, he went on to earn a doctorate in theoretical linguistics at the University of Essex. Before moving to Ireland in the mid-90's, he worked in the field of formal semantics in Stuttgart.

Prof. van Genabith will lead the new research area of Multilingual Technologies at DFKI and, together with Prof. Dr. Hans Uszkoreit, co-head the department of Language Technologies. His contribution will expand the research activities at DFKI into automatic translation and investigate new topics in the rapidly growing field of application.

Prof. Josef van Genabith, Prof. Hans Uszkoreit



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B/S/H/ GROHE Maggi

"Kochbot" in Intelligent Kitchen

Better, Safer, and More Efficient Cooking Thanks to Language Technologies and Home Automation Systems

"I want to make something with tomatoes, minced meat and carrots today!" "I have an urge for cherry pie." "I need a recipe from France." The on-call "Kochbot" finds the appropriate recipe and reads it aloud, monitors the cooking time, and controls the kitchen appliances. No more burned food. Say goodbye to stained, sticky, and wet pages of cook books, smart phones, tablets. The intelligent Kochbot app runs on any smart phone or tablet equipped with the Android operating system.

Kochbot stores more than 30,000 recipes from "Ulrike's online recipe collection" and analyzes them semantically to find the appropriate one - depending on whatever is in the fridge! The app uses its ontological knowledge about the cooking domain, which allows it to classify spaghetti as a noodle.

Following the recipe search, Kochbot helps with the preparation: You can listen to step-by-step instructions without ever having to touch the unit with greasy fingers. In response to a voice query, Kochbot gladly repeats the quantities of the individual ingredients or the detailed preparation notes for the pastry.

Even if the quantities in the recipe are abbreviated or entered, for example, as "1 TS" or "1 tblesp," Kochbot correctly reads aloud: "One tablespoon." If the meal is a success, you can store the recipe as a favorite in your personal cook book. If you are at a loss of ideas as to what to cook, just shake the smart phone or tablet to receive a random recipe.

Colorful Pepper Soup à la CeBIT

Ingredients:

For each 1/2 green, yellow, and red bell peppers
1-2 tablespoons of tomato paste
1 liter water
1 package of Maggi alphabet soup
Pepper

What to do:

Clean, wash and dice green, yellow, and red pepper halves
Sauté tomato paste in a pot (without fat)
Add the peppers
Pour in 1 liter water
Add the contents of the Maggi alphabet soup
Add pepper for taste
Cook for 7 minutes over low heat, stirring occasionally.

At CeBIT 2014, Kochbot is integrated with an intelligent kitchen: during the cooking process, the Kochbot app controls the full surface induction stove top, the ventilation hood, and the kitchen faucet by means of Universal Remote Console technology (OpenURC). OpenURC enables a universal, homogeneous interface for the operations of the oven, stove, refrigerator, digital TV, or computer over a single, individually configurable control unit.

In the CeBIT kitchen, the Kochbot app activates the full surface induction stove top and the ventilation hood for the respective step, setting them at the appropriate power settings and turns them off when finished. When roasting meat or frying fish, the fan in the hood vent needs to set at a higher speed than when simmering in a saucepan with a closed lid. It is similar for the power settings on the stove top. The OpenURC controls obtain the necessary information directly from the Kochbot's semantically analyzed recipe.

Kochbot tells the water mixing and dosing unit the required amount of water and, combined with the non-touch activation of the electronic kitchen faucet, can supply, for example, exactly 200 ml. The aggravating hassle with the measuring cups is a thing of the past. In the future, a networked kitchen scale or baking thermometer will be integrated in the cooking process in a similar manner.

The Kochbot app and intelligent kitchen form a practical combination for people who need assistance to interact with the kitchen, for example, the visually impaired or those with limited mobility.

More information

www.kochbot.de
www.ulrikesrezeptesammlung.de
www.bsh-group.de
www.consistec.de
www.grohe.de
www.maggi.de
www.openurc.org
http://aal.dfki.de

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EyePICA – Smart Indoor Environments with Precise Position Finding and Point Cloud Analysis

Researchers combine technologies for environmental modeling with analytical components in the EyePICA project at the Automotive Group of DFKI's Intelligent User Interfaces department.

Recently, they performed a laser scan of the entire DFKI stand at CeBIT in order to generate an exact replica in the form of a three-dimensional point cloud. Another technical highlight are the sensors used to locate mobile devices like smart phones or even iPods. As soon as the system identifies a visitor approaching the exhibit, it automatically sends context sensitive information about the object located just ahead. Besides text, this information can contain photos, videos, or supplemental links.

EyePICA data glasses

EyePICA can also be modified and extended for other application scenarios. Data from the built-in eye-tracker in data glasses can be evaluated and combined with the data from the analysis component – which leads to even more precise interaction with the object under scrutiny.

The technology for the 3-D modeling of environments has already been successfully tested in the SiAM project (Situation-Adaptive Multimodal Interaction for Innovative Mobility Concept) for the interactions between passengers and their surroundings. The scanning technology and expertise used in EyePICA is supplied by DFKI spin-off white|c.

More information

http://automotive.dfki.de
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Technologies for the Cities of the Future – DFKI SmartCity Living Lab Opens in Kaiserslautern

The development of urban habitats is one of the great challenges of the future. In Europe, two thirds of the population already lives in cities or metropolitan areas. Next to climate protection and sustainable resource management, a topic of ever increasing importance is how to adapt to the demographic trends and changing social and societal concerns. The goal is to design an attractive habitat, while at the same time ensuring and improving the competitiveness of the local economy.

Given the omnipresence of modern communication technologies in all areas of life, data and information have become a key resource in our information society. In these times of social media and the growing demand for information and participation, the reliable use and analysis of data to improve the quality of life is just as important as building the infrastructures and encouraging civic participation.

DFKI-Kaiserslautern, in future joint projects with partner institutions, plans more intensive research into the practical and systematic application of advanced technologies in urban spaces in order to contribute to sustainable urban development in a variety of areas.

l. - r.: Prof. Wolfgang Wahlster; Heike Raab, Ministry of Interior, Sport, and Infrastructure State of Rhineland-Palatinate; Dieter Bertram, Deutsche Bank; Prof. Andreas Dengel; Takumi Toyama, DFKI; Uli Quaas, “Land of Ideas” Initiative

"At the newly established SmartCity Living Lab, we combine the competencies from several different areas of research at DFKI to study the potential uses of innovative, state-of-the-art information technologies in urban surroundings and the use of smart technologies to develop potential areas of ecologic and social improvement," said Prof. Dr. Paul Lukowicz, Head of the SmartCity Living Lab.

On February 5, 2014, the SmartCity Living Lab was officially opened at DFKI-Kaiserslautern, with presentations and system demonstrations of selected projects in addition to the many invited guests from government, research, and business.

Prof. Paul Lukowicz

In her remarks, Heike Raab, State Secretary in the Ministry of Interior, Sport, and Infrastructure (ISIM) Rhineland-Palatinate, conveyed the best wishes of Minister President Malu Dreyer and acknowledged the innovative strength of DFKI: "In addition to formal exhibits, high-tech and IT solutions require illustrative examples and hands-on opportunities for civic cooperation to identify with the changes. DFKI has set the standard in these areas in Rhineland-Palatinate for many years."

One of the projects developed at the department of Knowledge Management, the virtual city guide "Talking Places," was awarded by the "Germany - Land of Ideas" initiative in the opening competition as a future-oriented concept for cities and communities. The system, based on data glasses, captures the wearer's viewing direction and the corresponding object of interest and supplies the appropriate information. Prof. Dr. Andreas Dengel, when accepting the award on behalf of DFKI Kaiserslautern said: "Location-based data are an expanding and increasingly important source of information. Given their high density, especially, in urban areas, this data holds the promise of many useful applications in the future. Data glasses will become one of the important tools for implementation. We are very proud to accept this award and the recognition of our ambitious research effort in this field."

Prof. Andreas Dengel

Numerous projects already deployed

DFKI has been implementing national and international projects in the context of Smart City with various partners over a number of years. Recently, for example, as part of a civic-participation project with the City of Kaiserslautern to optimize parking in the city, the smart phone application "ParKLight" was developed in collaboration with Fraunhofer IESE (Fraunhofer Institute for Experimental Software Engineering). Drivers can use it to navigate to available parking garages, or to specific tariff zones, or to purchase or extend parking time online. The app displays the parking time and cost, and senses on its own when the car has left the parking space. Local businesses can also use the app to attract customers with free parking cards.

Other research activities focus on the analysis of crowd movements from a safety and security aspect. Stationary WLAN and Bluetooth scanners register the automatic connection queries from the smart phones to record and analyze the formation and behavior of crowds in real time. This function enables the detection and analysis of complex behavioral patterns of crown flows and facilitates observations about the utilization of city districts, town squares, individual businesses, and public offices. Another approach based on a smart phone crowd sensing and management app has already been deployed at major events worldwide, such as the Olympic Games 2012 in London or the Royal Coronation Ceremony for the Dutch king 2013 in Amsterdam. This app monitors the flow of visitors during the event, enabling early detection of risk situations and immediate messaging to the visitor.

DFKI is also studying the topic “Urban Sensing” in collaboration with TU Kaiserslautern’s special focus subject “Computer-aided planning and design methods (CPE)”. The research involves the use of mobile sensors to capture human emotions in an urban context. A so called “Emo-Map” displays how residents perceive their urban space and what moods are connected with certain places. Such data has already been collected in Kaiserslautern and, in collaboration with the University of Alexandria, in Egypt as well.

Another important field of research investigates the uses of location-based data and information (geo-content). RADAR, a social-media platform developed at DFKI, enables easy administration of such data and makes it available for use on mobile phones by many of the common augmented reality browsers and operating systems. The system has proven itself several times as an interactive information platform at urban events and also serves as the official multi-media tour guide. On a tour of the city, for example, the smart phone highlights and navigates to nearby attractions and, once there, supplies photos, text, 3-D models, videos, or audio tracks which can also be added by the users. DFKI researchers are currently working on systems that make location-based information and social media data useful for improving the interaction between businesses and local customers.

DFKI's SmartCity Living Lab structure supplies the optimal conditions for realistic, application-oriented, cutting edge research. Additional projects with the city, the university, and other partners are in planning.

More information
www.dfki.de/web/living-labs-de/SmartCity-Living-Lab

Germany
Land of Ideas
Selected Landmark 2013/14

Takumi Toyama, DFKI

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W3C provides a vendor-neutral forum for establishing web standards

The Web of Data and the Web of Things – W3C Panel Discussion at CeBIT 2014

The slogan of CeBIT 2014, "Datability" is the basic idea underlying the Web of Data and the Web of Things. Without the interoperability in the generation, processing, and exchange of data, Big Data would be unthinkable. So too, the Web of Things would be unimaginable if all the networked devices and objects in the Web of Data were unable to communicate with one another and make use of the information available worldwide. Standardization is a basic principle for innovative and sustainable "Datability." As an international standards organization and major facilitator, the World Wide Web Consortium (W3C) brings the key minds behind the Web of Data and the Web of Things together for a panel discussion at CeBIT 2014.

Phil Archer is the head of the W3C Data Activity established in 2013. The building blocks (data formats, query languages, etc.) have already been completed for the most part with the basic technologies of Linked Data, so now what is needed are specific applications for a variety of domains. Data from the public domain (key word: eGovernment) plays a major role. Among his other responsibilities, Dave Raggett also heads a W3C working group that focuses on the Web of Things. In the context of standardization, bringing analog things and the digital Web together means mastering extremely heterogeneous technological areas with the aid of Web technologies. Finally, the interfaces have to be created for each physical object that are as easy for the web developers to use as a web browser.

Alan Bird and Bernard Gidon from the W3C Business Development Team will also be available for discussions at CeBIT. They are building new business areas and represent a link between cutting edge research from Germany and the global market for digital innovations. In the framework of individual discussions, interested businesses and organizations can obtain information about W3C activities and opportunities to collaborate with and within W3C.

DFKI is also a W3C member and is predestined to tie the discussions about the standardization process to specific research activities. Dr. Georg Rehm, Head of the W3C German/Austrian Office based at DFKI, says: "The standardized technologies for intelligent processing of Big Data co-developed at DFKI are helping to put the German economy at the forefront of the innovative Web technology development."

W3C is participating in the future talk round table discussion "Web of Data and Web of Things – Standards Bring Two Worlds Together," at CeBIT on Tuesday, March 11, 2014 in Hall 9, F44. In addition to the W3C staff already named, the panel includes Dr. Alexander Löser from the Beuth University of Applied Sciences in Berlin, Achim Hartig, Director Service Industries from Germany Trade and Invest (GTAI), and Dr. Georg Rehm, Head of the W3C German/Austrian Office. Interested parties are cordially invited to participate in the round table discussion. Furthermore, W3C offers individual appointments with the panelists. Interested organizations can arrange a meeting time online at: www.w3c.de/2013/12/meet-w3c-at-cebit-2014.

More information
www.w3c.de
www.w3.org

About the World Wide Web Consortium (W3C)

W3C is an international community where member organizations, a full time staff, and the public work together to develop web standards.

The aim of W3C is to further technological advances in the World Wide Web and lead the web to its full potential. W3C develops and standardizes protocols and guidelines to ensure the long term growth of the Web.

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CeBIT Halle 9, Stand F43

Smart Applications for Cloud & Retail

EIT ICT Labs at CeBIT 2014

The European Innovation Network EIT ICT Labs presents projects from education, research, and business at CeBIT 2014. Five exhibits featuring current research and the latest initiatives are ready for close-up viewing and hands-on testing. The main focus is on innovation in the areas Future Cloud and Smart Retail. In addition, students from EIT ICT Labs Master School and Software Campus are also on hand to report on their own experiences.

About EIT ICT Labs

EIT ICT Labs is a Knowledge & Innovation Community (KIC), sponsored by the European Institute for Innovation and Technology (EIT). Our mission is to establish Europe as a global leader in ICT innovation. The EIT ICT Labs Co-Location Centers (so-called nodes) in Helsinki, Trento, Stockholm, Eindhoven, Paris, Berlin, and London play a major role in the implementation of our strategy to put the priority on excellence in education, research, and innovation.

CeBIT Hall 9, Stand E44

Big announcement of the EIT ICT Labs Idea Challenge

This year, the kick-off of the latest EIT ICT Labs Initiative "EIT ICT Labs Idea Challenge" adds a special highlight. The Challenge involves a series of eight Europe-wide competitions - one for each area of innovation at EIT ICT Labs. The Challenge is also featured on Tuesday, March 11, at 4:00 p.m. at CeBIT's future talk (Hall 9, Stand F44) and, subsequently, at the EIT ICT Labs stand.

Smart Kiosk – Exhibits for the retail segment

Visitors to the Smart Kiosk will find new types of services and business models. Two high tech start-ups demonstrate how to optimally analyze customer behavior. Proxible, focuses on the Internet of Things, personalized, context-adaptive interaction with smart environments and RetailerIN, develops an innovative analysis system for retailers.

In the Future Cloud

Companies can learn more about the cloud source software of the future: an open source platform for the analysis of long data series in parallel computing environments, or a motion-based eGames platform that supports therapeutic treatment and learning activities for children with severe motor and intellectual disabilities, or a cloud solution that provides individual storage and backup security as well as sharing services for consumers and SMEs.

Training at the EIT ICT Labs

EIT ICT Labs Master School offers a two-year training program for young scientists, which focuses on innovation and entrepreneurship in addition to one of seven technical subjects.

Software Campus trains the IT managers of tomorrow and promises excellent career perspectives in Germany for young IT experts. It offers a completely new concept that combines cutting-edge research and management practice.

Conference Program of EIT ICT Labs at CeBIT

future talk, Hall 9, F44

A Unique Pan-European Ecosystem
Monday, March 10 (2:00 - 2:30 p.m.)

Eight International Idea Challenges
Tuesday, March 11 (4:00 - 4:30 p.m.)

Software Campus
Participants in the Software Campus present their research
Thursday, March 13 (10:00 - 10:30 a.m. and 12:00 - 12:30 p.m.)
Friday, March 14 (4:30 - 5:00 p.m.)

Global Conferences, Hall 8 Open Stage

Smart Cities/Smart Infrastructures
Monday, March 10 (2:30 - 2:55 p.m.)

Varaani Cloud Hub
Thursday, March 13 (12:00 - 12:25 p.m.)

Apiomat
Thursday, March 13 (3:00 - 3:25 p.m.)

Kinexon – Game-changing Technologies
Friday, March 14 (11:30 - 11:55 a.m.)

Global Conferences, Hall 8 Pecha Kucha

Plugsurfing
Friday, March 14 (11:44 - 11:51 a.m.)

Jury member Prof. Gesche Jost, Federal Education and Research Minister Prof. Dr. Johanna Wanka, and Software Campus participant Alexander Löffler (DFKI), winner of the CeBIT Innovation Award 2013

FUNDED BY

More information
www.eitictlabs.eu/cebit
www.masterschool.eitictlabs.eu
http://www.softwarecampus.de/en

GRASPY – Object Recognition and Gripping with NAO

The cute little NAO, barely 60 cm tall, is produced by the French manufacturer Aldebaran Robotics and is anything but a toy. It is, instead, considered to be a robot research platform, developed primarily for scientific experiments. Since 2007, NAO has been the robot used on the teams in the RoboCup - Standard Platform League, an international robot soccer competition.

GRASPY is a joint research project of DFKI and Aldebaran Robotics with the aim of developing the programs that give NAO the ability to accept an object offered by a human and, as requested, to give it back. A stereo camera system developed by the manufacturer enables NAO to recognize an object that is within his grasping range, perhaps, a pen or the handle of a plastic cup. DFKI researchers implemented visual object recognition as well as the design and execution of the grasping movements for the small robot. All calculations run on an embedded PC in NAO.

GRASPY-NAO receiving a plastic cup

The system works with gray scale images and is largely independent of lighting conditions. When the object it recognized, the motion generator selects one of the hands to do the grasping, plans the path of the hand to a safe gripping position and executes the action. In view of the fact that the object is to be accepted from an outstretched human hand, NAO must continuously recalculate a new plan and be capable of reacting to the possibility of a moving target. A performance control system decides when the object is to be gripped, returned, or released. This involves an assessment of the recognized user inputs (voice or touch) and the object's current location.

GRASPY is funded as an experiment under the framework of the EU ECHORD project (European Clearing House for Open Robotics Development), where the aim is to strengthen the cooperation between research institutes and industrial enterprises with a focus on robotics.

More information
www.echord.info/wikis/website/graspy
www.dfki.de/cps

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CeBIT Hall 9, Stand F43

SPECifIC – Safety in the Design of Cyber-physical Systems

Whether in your home, your car, a mobile phone, or an airplane: Embedded systems control many devices and are constantly increasing in complexity. This is accompanied by an increasing need for quality and safety in these systems. In the SPECifIC project, researchers at DFKI-Bremen are developing an innovative design process that improves the quality and safety of embedded systems and advances new technologies and methods. Furthermore, the work of the DFKI researchers is of special interest in the area of circuit design: the new design process, including the software tools, can greatly reduce the time and cost of chip development in the future. It enables the control of safety and functionality early in the design phase.

A practical demonstration of the design process at CeBIT 2014 is based on the development of an access control system. Visitors can see each phase of the development right up to viewing the product in action: They can alter the design to see how it will directly affect the development of the access control system.

At the core of the new design process is a formal specification level, which facilitates abstract description of a system and, in the future, will enable embedded systems to check for correctness and consistency before they are implemented. In this way, faults are discovered at the root and can be corrected – unlike in the past – before becoming part of the electronic circuit.

The main source document is a natural language specification, which ensures mutual understanding among all participants – from the programmers to the project leader to the customer. This specification is then promoted to increasingly detailed models in a multi-level transformation process. Safety is critical in these transformations, which means their analysis is of central importance.

Besides the additional formal specification level, designs feature the use of natural language processing methods and comprehensive functional change management, which makes the design process more flexible and facilitates the integration of intellectual property.

Assisted compilation of the specification

The initial formal model is automatically generated while writing the specification. A dialog between humans and computer clarifies any outstanding points in the specification. This process alerts the programmer to any imprecise or ambiguous sections in the specification.

Early Verification

The model that results from the compilation of the specification is immediately subjected to the first automatic check for process correctness. This check provides for early detection and correction of faults in the design process. This process saves time and money, which can be decisive in light of today's product lead times (time-to-market).

SPECifIC design process brings new quality to the development of embedded systems. A practical demonstration at CeBIT is based on the development of an access control system.

Change Tracking

In the interests of non-functional requirements such as execution time and energy consumption, it is not unusual for the model to undergo manual changes in later phases. The SPECifIC project develops an intelligent tracking of these changes and makes them transparent through previous phases all the way to the initial specification.

More information
www.dfki.de/cps

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CeBIT Hall 9, Stand F43

Multimodal Agricultural Production – Integrating Information for the Harvest

Photo: John Deere

Modern harvesting processes are labor and resource intensive, extremely time critical, and require detailed planning. They are comparable to industrial production processes. Unforeseeable events like the loss of a machine, bad weather, or traffic delays along the transport route from field to silo can bog down this process, which effects quality and lowers profits. Although it is possible to provide cloud based process data such as telemetric data for the machinery and process related events in real time, changes to the harvesting process are still manually executed by the responsible agricultural contracting firms. The appropriate information reaches the drivers of the harvesting fleet at some later time, usually via a mobile phone.

The "Multimodal Agricultural Production" technology demonstrator presents a networking and automated coordination system between the contracting firm and the many tractor and forage harvester drivers and their machines during the harvesting process for the not too distant future.

Designed for the modern agricultural contracting firm, the demonstrator contains a resource and context management and planning component for the calculation of changes to the harvesting plan based on reported events and the availability of process data. Such events, for example, are called up from external traffic and weather services, generated by the farm machinery itself, or reported by a machine operator.

The continuous analysis of process data and events facilitates fast and reliable calculation of optimal changes and their implementation through the simultaneous communication of user-friendly instructions to all players during the process. This minimizes logistic delays and optimizes the added value stream.

An app developed by the project team at DFKI's department of Intelligent User Interfaces provides the multimodal communications interface. The app provides information about relevant events and changes that affect the respective machine. The details about a new order can be queried and input in dialog. Furthermore, the app provides access to the instructions and verification system, for example, to retrieve the necessary operating manual or to archive completed activities as required by statutory law. Implemented on a special secure mobile phone, the application strictly separates private from commercial use and safeguards all stored and communicated information.

The communications platform was developed in the collaborative project SINNODIUM (Software Innovation for Digital Enterprises) in the "Software Cluster" in close cooperation with project partners John Deere, SAP AG, Eyeled, and Sirrix.

More information
http://www.software-cluster.org/en/research/projects/joint-projects/sinnodium

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Fast MRO – Quick Help in the Field

Augmented Vision for the Maintenance, Repair, and Overhaul of Agricultural Machines

For some time now, modern farm machines have been evolving into rolling control rooms equipped with GPS, touch screens, and sensor systems that capture the harvested volumes or adjust the working speed to the crop density of the field. The manufacturers of agricultural machines have also continued to develop the aesthetics of their products: enclosed driver cabins with panorama windows and frameless doors for an unhindered, 360 degree view and all-around covering of the entire tractor engine ensure a sleek appearance. This protects the maintenance intensive, external machine parts like hydraulic connections, seals, control or mounting elements from dirt and contamination, but their function is no longer obvious. Especially during the more infrequent maintenance jobs, individual elements are easily overlooked as a review of technical information is often time consuming.

DFKI is presenting a comprehensive augmented vision maintenance information system at the Software Cluster stand in Hall 9, E40 at CeBIT. The system accurately

and graphically explains the technical details of routine maintenance jobs like refilling the lubricant levels, replacing worn parts, or fixing minor defects.

Integrated in a John Deere tractor, Fast MRO supports the exchange of defective expendables such as bulbs or wheel nuts or, the maintenance of lubricated parts like ball bearings. The system supplies information about the positioning of machine elements, maintenance intervals, and separate components in use and guides the repair specialist step by step through the various instructions.

The farmer points the camera of a tablet or some other end device at the defective element to obtain a display of the relevant technical information. Looking at a defective headlamp reveals what lamp is needed for the replacement or shows the maximum allowable wattage. Focus the camera at the grease fitting for the bearings, Fast MRO gives the user the maintenance interval and the exact, possibly hidden location of the other lubrication points. If the front or rear wheels have been targeted, the system provides the recommended tire pressure, the size of the wheel nuts, and the proper torque.

Fast MRO even supports switching out the tractor's tilling equipment by guiding the user through the individual steps required to connect the hydraulic hoses and electrical system connections. Just to complete the procedure, the system recommends a check of the splash covers on the rear wheels.

More information
www.dfki.de/av

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ADIGE – Adaption and Control of Service-based Business Processes

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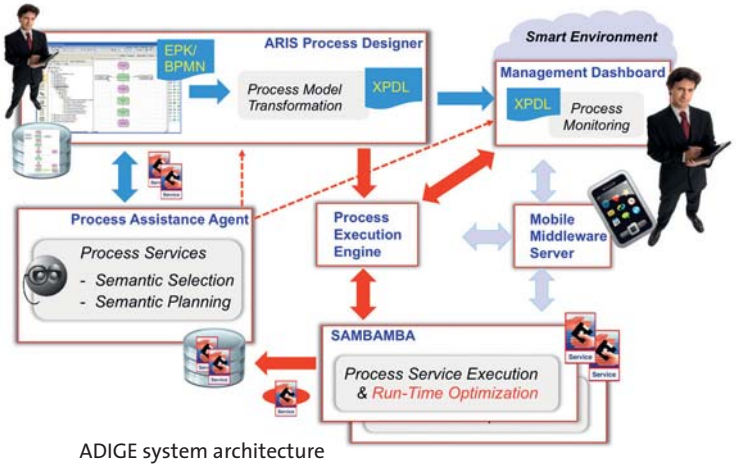
Thanks to modern software and cloud computing, there is a growing market for the suppliers of software components, products, and services.

In the future, largely, without any manual steps, business processes will adapt to account for the dynamically changing number of providers, especially, for the reordering of goods in the retail market. Emergent software permits the integration of such adaptive business processes so even the small and medium sized providers will participate quite profitably.

Software Cluster partners DFKI, Innovative Retail Laboratory (IRL), Software AG, and Saarland University developed the technology demonstrator ADIGE (Adaption and Control of Service-based Business Processes) to highlight the potentials of emergent software. Adaptable processes linked to semantic methods and assistance agents form the basis of the automated selection and composition of the service. Besides the adaption of business processes at the time of design and support for process modeling, another priority of ADIGE is the enabling of adaptions during operations.



ADIGE system architecture

This involves the capture and processing of sensor data, for example, from RFID equipped goods in a salesroom or in the warehouse, as a virtual three dimensional graphic display of a supermarket. As the sensors recognize the removal of goods from the shelf, the virtual product also disappears from the respective shelf in the 3-D model. The Management Dashboard (a central processing unit) can then initiate the reorder process much earlier. This gives the managers of such supermarkets, a simple possibility to control the environment and issue instructions, if necessary.

Manual steps like the definitive selection of a supplier, can also be performed in a mobile environment with ADIGE. Context is used so that the task to be completed can be sent either to a stationary computer or a mobile phone for processing, depending on where the employee is located at the moment. Emergent systems help to accelerate the execution speed of the service programs in use.

More information
www.innovative-retail.de

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Software-Cluster
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Business Model Wizard – Bringing Innovation Successfully to Market

business model wizard
find and optimize the substance of your business

Companies like Google and Apple have impressively demonstrated that every innovation needs an appropriate business model if it is to compete successfully in the market and ensure its long-term survival.

The Business Model Wizard is a prototype for the integrated and standardized description of business models for the software industry. The system supports start-ups or established software firms in the design, analysis, optimization, and controlling of their value creation architecture.

Via a link at the process level, the Business Model Wizard integrates current information from the business processes and recommends modifications to the underlying model, as required. The system addresses, for example, the strategic focus, the revenue model, product creation and distribution.

Current and relevant information like net profit or sales figures for a specific business model can be included using interfaces to external sources in the web. Market data (industry sales figures, performance forecasts, competitive analyses) is used to identify economic trends and included for dynamic consideration in the business model. Also, semantic knowledge networks that can be searched interactively at any time through the user friendly display are used. Similarly, models already existing on the market can be used as references to evaluate your own business planning.
A transformation mechanism enables the transfer of the business model to executable processes (top-down). The linking of key indicators like the number of processed customer inquiries or the average processing time enables the continuous monitoring of critical thresholds (bottom-up).

Participating organizations
Conweaver, DFKI, Fraunhofer Institute for Computer Graphics Research (IGD), SAP AG, Software AG, TU Darmstadt

More information
www.dfki.de/web/research/iwi

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INDUSTRIE 4.0 – Vertical Integration of Production Processes (VI-P)

Thanks to implementation of Industrie 4.0, Internet of Things is finding its way into production. Consequently, the various manufacturing departments are converted to intelligent, self-guided infrastructures. In collaboration with partners in the Software Cluster, DFKI investigates how the flexibility of the structures of a networked production environment can be improved within all levels of automation and across each level's boundaries. Research involves the vertical integration of automation and information technology, the orchestration of services for the production systems, and the required control, coordination, and QoS enabled communication systems.

At CeBIT, a model Industrie 4.0 manufacturing process, the filling of a product, will be demonstrated in a prototypical production system set up by Software Cluster partner proALPHA Software. Visitors are invited to enter their own individually selected configuration in a mobile HMI interface device and send it to a smart, RFID-equipped container.

During processing, the various process and quality data is continuously aggregated at the field level and sent to the ERP system. At the end of the manufacturing process, all information concerning the manufacturing steps and the future area of application is transferred into the digital product memory.
Here, different control architectures and networks, traditionally separated from one another in the system, are bridged by developing a cross-system services concept for production systems and the corresponding communications systems which are also accessible for other participants.

More information
www.software-cluster.org/en/research/projects/joint-projects/sinnodium

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proALPHA - Stand
CeBIT Hall 5, Stand E18

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Intelligent Learning Environments and Mobile Learning – Innovative Solutions from the New CeLTech Offices in Berlin

Three presentations by the Centre for e-Learning Technology (CeLTech) at CeBIT 2014 focus on smart, tutorial learning systems: teaching children about road safety, adaptive AI software tools for clinical training in the medical field, and an app that assists athletes to prepare for competition. Since January 2014, CeLTech has occupied new offices at the DFKI Project Office Building in Berlin, where research is carried out on innovative technologies for education and training.

SafeChild – 3-D learning environment simulates road traffic
Children can practice safety at home on the game console with the SafeChild multimodal, immersive learning environment. In place of expensive, specialized software and hardware, SafeChild employs devices from the entertainment electronics sector as interactive interfaces, which substantially reduces the costs and facilitates a wider distribution. In a realistic simulation of urban traffic, the child experiences authentic and recurring situations, with the specific tasks being selected and adapted through an intelligent-tutorial teaching/learning system based on the individual skills and learning objectives of the child. The project is sponsored by the Federal Ministry of Education and Research (BMBF) in the Software Campus, a training program for promising young researchers with management potential.

ActiveMed – Interactive exam preparation for physicians
The aim of this BMBF collaborative project is to reinforce practical and clinical skills through systematic, technology-aided instruction for physicians and to improve the professionalism of the teaching. ActiveMed is based on the intelligent-adaptive learning system ActiveMath, and is initially developed for use with a mobile phone. Great emphasis is placed on the quality of the content: theoretical knowledge is linked to the learning objects like texts, films, and photos. The examination content is usually based on a multiple choice question format. All content can be evaluated by the users of the system and automatically recommended to other users. The national surgical learning objectives catalog has been integrated to provide a quick overview of the content included in the system. Beyond its practical use as a navigation aid, the learning objectives catalog is also useful when searching for teaching materials. Students can prepare for examinations by completing the checklists and, based on the results, have the system prepare the appropriate learning materials.

Theoretical expert knowledge is linked with learning objects such as texts, films and images.

IAT – A mobile learning app for one-on-one sports
A systematic analysis of the opponent's patterns of behavior is essential in preparing for a competition in sports like judo, boxing or wrestling. This app gives athletes the chance to review videos and exchange ideas as they prepare to face opposing techniques and fighting strategies.

In collaboration with the Institute of Applied Training Technologies (IAT) in Leipzig, CeLTech developed a mobile application for competitive kinds of sports that allows the detailed study of opposing behaviors and fighter profiles. Consequently, both offensive and defensive tactics can be adjusted accordingly. Judokas, boxers and wrestlers can use the application's interactive database online and offline to help prepare for competitions – immediately before the start, and from any location.

More information
www.celtech.de

3D learning enviroment simulates road traffic

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Centre for e-Learning Technology

CeBIT Hall 9, Stand F43

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automotiveHMI – IAA presents Research Results for the Standardization of Infotainment Specifications in the Automobile Industry

Well-known names in the German automobile industry like Audi, Daimler, Porsche, and Volkswagen as well as the suppliers Bosch, comlet, and Elektrobit have worked together for three years on the development of an exchange format for a new standard for the specification of automobile infotainment systems.

The research project automotiveHMI started in January 2011 with a total funding volume of nearly 7.4 million euros from the Federal Ministry of Economics and Technology.

The results were presented in the fall of last year at the International Automobile Show in Frankfurt am Main. Among the presentations was an infotainment system generated by the automotiveHMI exchange format using middleware interfaces, that interacted with the hardware platform of a VW Golf 7.

The exchange format adapts the different process and tool environments at the various companies and provides a technology-neutral interface between the tools used. An infotainment specification produced in this format can be imported for the usual human work environment and, as it is machine readable, it also enables automatic consistency checks, the derivation of test cases, as well as the rapid and early generation of feasible prototypes. The innovations of the exchange format lead to improved efficiencies and form the basis for cost saving technologies such as model-based testing of infotainment systems.

The specification of the exchange format is provided as open source online at the project's web site.

More information
www.automotiveHMI.org

automotiveHMI exchange format for the infotainment system in the VW Golf 7

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PeerEnergyCloud – Neighbors Trading Energy

In interregional smart grids, suppliers are connected to the operators of the distribution systems by high and very-high voltage power lines. The Smart Micro regional distribution network operated by the Saarlouis public utility is part of the PeerEnergyCloud project and consists of approximately 100 homes and multiple photo-voltaic units.

The first test users are already connected. Households can negotiate through a public exchange market with their electricity producing neighbors about the times of power consumption. This means the load compensation is optimized and the use of the infrastructure is digitally priced.

The market is implemented on a cloud platform in the Internet that uses both private and public resources. The services offered there are very reasonable and scalable based on requirements because of the dynamic characteristics of the cloud.

Visitors to the special Trusted Cloud exhibit of the Federal Ministry of Economics and Energy (BMWi) can learn more about how, on the basis of forecasts of the available energy quantity by means of a multi-agent system, the neighborly energy trading on the public market place works.

The aim of the Federal Ministry of Economics and Energy's "Trusted Cloud" technology program is to promote the development and evaluation of innovative, secure, and legally compliant cloud computing solutions.

More information
www.peerenergycloud.de

Supported by:
Federal Ministry for Economic Affairs and Energy

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CeBIT Hall 9, Stand E24

ePools – Market Place for the Creation and Operation of Energy Pools

The decentralized production of electricity is on the rise. However, no new market for the end customer and the many small power suppliers has yet formed - energy requirements are still being met and transacted by the major suppliers.

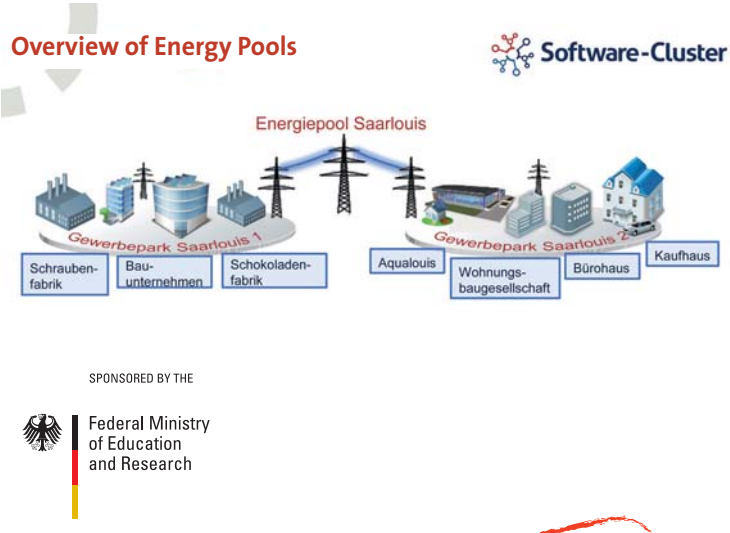
The aim of the ePools project is to expand the traditional processes of the energy industry with pooled energy. Supplier and consumer will have access to smart tools so they can organize themselves in a variety of composite structures.

The result is better support for efficient energy management and substantial cost savings. On this basis, energy traders (aggregators) are given an opportunity to introduce innovative business models to the market. Similarly, civic or industrial interest groups can operate independently in the energy market. The ePools software enables a flexible design of the pools according to optimized energy aspects as well as the creation of new business models for regional markets in compliance with legal standards.

Learn more about the wizards that create energy pools at CeBIT 2014.

The scenario emerged from the Software Cluster's InDiNet (Innovative Services in the Future Internet) sub-project.

More information
www.software-cluster.com/en/research/projects/joint-projects/indinet



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Federal Ministry of Education and Research

CeBIT Hall 9, Stand D40

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Shaping an Intelligent Energy Transition – VSE Teams with DFKI

"Two together are stronger than one alone!" This motto has brought DFKI and VSE together in the belief that the challenges of the energy transition can only be mastered, according to VSE director Tim Hartmann, when research and energy suppliers work together efficiently for a common purpose.

"Companies must seek new paths in the face of the energy transition. The need for a closer exchange between the business and research communities is of growing importance in many areas. For many years, the cooperation has been very positive between DFKI and the companies and partners of the VSE Group. DFKI know-how enables us to pursue new solutions for the increasingly complex organization and the optimization of the energy systems," said Tim Hartmann, member of the management board at VSE. "This official investment by VSE in DFKI emphasizes the long-term nature of the cooperation. Both companies are convinced that the benefits of this venture will extend well beyond the Saarland."

The new partners have already started work on a specific project. VSE and DFKI are developing an intelligent forecasting system to support direct marketing in compliance with the German Renewable Energy Act (EEG). As DFKI-CEO Prof. Wolfgang Wahlster explained: "DFKI and VSE are two strong partners dedicated to advancing the goals of the energy transition and capable of technically implementing the smart grid vision. The partners study innovative possibilities to optimize weather dependent and difficult to predict consumption of alternative energies. Minimizing these uncertainties is only possible if the forecasting becomes more accurate. The energy production can then be calculated and the energy transition made more achievable."

The aim of the joint project EEG_FORECAST is to identify methods to support forecasting the supply of alternative energies and to implement them in IT-based systems. In the initial project phase, DFKI is analyzing the hit rates of current forecasting methods and is developing a software tool to integrate and clearly visualize the data sources. Existing processes and methods for predicting supply should be optimized for the attainment of the best possible integration of the alternative energies into the energy supply system and for an even better contribution towards mastering the challenges of the energy transition.

More information
www.vse.de

Smart Data Innovation Lab kick-off event

Smart Data Innovation Lab – Turning Big Data into Smart Data

According to the principles of INDUSTRIE 4.0, sophisticated cyber-physical manufacturing systems are equipped with thousands of sensors connected to the Internet of Things. Such smart factories supply petabytes of data each year from tools and production machines, Big Data, which must be compiled to Smart Data in order to identify optimization potential and benefit from a competitive advantage. The Smart Data Innovation Lab (SDIL), a recently launched research platform, will help to realize these opportunities. The first projects are related to the strategic areas of research: INDUSTRIE 4.0, the energy transition, smart cities, and personalized medicine.

Leading representatives from industry, research, and government signaled the launch of the Smart Data Innovation Lab (SDIL) on January 8, 2014 at the Karlsruhe Institute of Technology (KIT). Major requirements for top research in the area of Big Data have been met with the establishment of this high performance infrastructure and availability of data from industrial processes. The cooperation of all participants ensures the latest research findings can be efficiently shared with industry and contribute to a decisive competitive advantage for European businesses.

"Digital data is growing rapidly in our society. We need new tools in order to manage it and make it is available as a source of knowledge," said Prof. Johanna Wanka, Federal Minister of Education and Research and co-chairperson of the National IT Gipfel (IT Summit) working group "Research and Education for the Digital Future." Consequently, the Smart Data Innovation Lab and the research data made available there are an optimal addition to further the goals of research in this area.

"Smart Data is used for predictive maintenance and to attain optimum efficiencies and reach the optimum operating point. It can save up to 30% in material, energy, costs, and labor and is good for the environment," explained Prof. Dr. Wolfgang Wahlster, CEO of DFKI, at the round table discussion with Jim Hagemann Snabe, Co-CEO SAP AG, Karl-Heinz Streibich, CEO Software AG, Dr. Wolfgang Heuring, Siemens AG, and Prof. Wilfried Juling, KIT. "In most cases, the added value is only obtained when the evaluation takes place in real time, so the results of the Smart Data analysis can be input directly into the process control – so called Smart Data analytics in the loop. Not only have we developed such systems in collaboration with 20 industrial companies, in the world's first Smart Factory for INDUSTRIE 4.0 at DFKI, but we also are now testing the methods in appropriately equipped manufacturing plants, for example, in the fields of bottling beer, drug packaging, or in the production of valves," said Wahlster.

Practical insights about the promise of Smart Data for the management of mega events were presented by Prof. Dr. Paul Lukowicz, Head of DFKI's Embedded Intelligence department. His research team develops Crowd Management and Crowd Sensing systems for publiĺc spaces that enable the preparation of real time heat maps showing the density of visitors and visitor movement, which provides improved efficiency and much more effective emergency and disaster management systems.

The SDIL is operated at KIT and represents a collaboration between industry and research. Besides the operators, the other founding partners are: Bayer, Bosch, Microsoft Deutschland, SAP, Siemens, and Software AG in addition to the German Research Center for Artificial Intelligence (DFKI), Fraunhofer-Gesellschaft, and the Jülich Research Center. Today, SDIL is supported by more than 20 other companies and institutes.

More information
www.sdil.de

Brazilian Robotics Institute Modeled on DFKI

The National Service for Industrial Training SENAI (Serviço Nacional de Aprendizagem Industrial) celebrated the establishment of the "Brazilian Institute of Robotics" (BIR) on October 31, 2013 in Salvador da Bahia, Brazil. The aim is to teach the fundamentals of robotic systems and conduct research on future industrial applications. The Institute is modeled after the DFKI. Professor Frank Kirchner, Director of the DFKI Robotics Innovation Center (RIC), has accepted responsibilities as Scientific Director for the scientific-technical orientation of BIR and now serves in an advisory capacity from Germany.

The two institutes enjoy a close cooperation in academic and research areas. The cooperation includes the exchange of young research scholars and scientists between the two institutes. "In this way we can support the so called 'teaching of research' and do it in solidarity with an economic understanding and in an international context," said Kirchner at the grand opening in Salvador. Prof Kirchner was there at the invitation of SENAI and José de Freitas Mascarenhas, President of Industrial Association FIEB, in the state of Bahia. The planning of the first collaborative projects with Brazilian companies in the area of underwater robotics has already begun.

The administrative organization of the new institute is similar to that at DFKI; the infrastructure of the test facilities is oriented specifically on the Bremen RIC. Funding for the BIR is provided by the "Center for Integrated Manufacturing and Technology" (SENAI CIMATEC), which was founded in 2002 in Salvador, Bahia and has become one of the leading Brazilian hubs for the implementation of scientific-technical findings in industrial applications.

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Quick Assists When on the Move

Mobia (Mobility for the Elderly) represents an excellent idea for the City of Tomorrow – A mobility concept that supports barrier-free transport

Germany Land of Ideas
Selected Landmark 2013/14

Project Mobia was selected as one of the 100 prize winning ideas in the nationwide innovation competition "Selected Places in the Land of Ideas" 2013/14. In the "Society" category, the project addresses the topic "Ideas for the City" and responds to the issue of how seniors or people with disabilities can be assisted when using public bus and rail transport systems.

It is not easy for the elderly to use public transport. Ticket machines are complicated to use, schedules are hard to read, and, from a wheelchair or with a walker, getting in and out of a bus or train is nearly impossible without help. To improve this situation, Saarbahn transportation company launched the "Mobia" project in Saarbrücken: special guides come to assist when barriers seem insurmountable. They can be called easily via a new smart phone app. The guides themselves then use the system to coordinate their efforts.

The Mobia project is sponsored by the Federal Ministry of Education and Research (BMBF) for a period of three years. It is now in its second year and is currently in the crucial testing phase.

Project partners: DFKI-Saarbrücken, B2M Software based in Karlsruhe, the Institute for Social Research and Industry (iso) in Saarbrücken, Center for Vocational Education and Training Saar (ZBB), and Saarbahn Public Transport.

More information
www.mobia-saar.de

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Federal Ministry of Education and Research

Dr. Jan Alexandersson, DFKI; Karin Riga, ZBB; Manfred Backes, Saarbahn; Martin Zewe, Deutsche Bank; Peter Poths, B2M Software; Prof. Dr. Daniel Bieber, iso-Institute

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DFKI Interview – Nils Petersen

Nils Petersen works at DFKI's Augmented Vision department, where he, under the direction of Prof. Dr. Didier Stricker, investigates the links between Augmented Reality (AR) and AI technologies. His work in the area of Cognitive Augmented Reality extends the classic AR concept to the user context.

What is the application potential of your research?
The systems that I help to develop enable the automated generation of so called Augmented Reality manuals. This involves digital assistance systems that guide the user through the task, step by step, with the aid of data glasses. It provides rapid support for manual maintenance and assembly work in a manufacturing environment. The detailed record of the activity makes it possible to correct execution errors in real time, which significantly reduces the time required for training and qualification. In principle, the system can even be used to improve motor skills.

When did your interest in Artificial Intelligence begin and how have AI processes changed since that time?
During the first time I was particularly working on capturing hand movements on video. About three years ago, I had an idea to combine hand tracking with a machine learning approach. The result was a learning tracking method that always delivers better results the longer it is in use. Over time, AI methods have advanced rapidly in the areas I study.

What are the greatest challenges and opportunities for AI systems today?
As the concept of Augmented Reality developed, it encompassed only the spatial relationships between virtual overlays and the real environment. In principle, AR technologies have been used synonymously with real time camera tracking and this is partially true today. However, at the other end of this spectrum are the assistance systems like "Google Now" or "Siri" that select information mainly by context (while considering the approximate location). In my opinion, these approaches will meet somewhere in the middle and come to shape the field we now call Cognitive Augmented Reality.

What do you enjoy doing when you are not working as a research scientist?
I like to play squash and also to go snowboarding as often as possible to restore some range of motion to my office chair battered body.

Are there parallels with your professional activities?
It's funny, I often catch myself analyzing my hand position, when playing squash for example, thinking to myself, "how could I manage that in an algorithm?" My gaze was permanently fixed on my hands, especially in the earliest days of my research in hand tracking.

What are your current projects?
In addition to continuing the professional work on AR assistance systems, it is now all about bringing this technology to market in specific practical applications for use in industry. There are already discussions and projects with several commercial partners.

Secure Computer Chips – Researchers Receive Award for New Test Procedure

Dr. Stephan Eggersglüß, Dr. Robert Wille, and Prof. Dr. Rolf Drechsler received the Best Paper Award 2013 at the International Conference on Computer-Aided Design (ICCAD) last November in San Jose, California.

The scientists, who work at DFKI and the University of Bremen, introduced a new method of production testing for digital circuits. The procedure generates tests for computer chips that enable test quantities to be reduced while still retaining quality, thereby reducing the overall test costs. Unlike common industrial practices in the past, the new method is based on formal rather than structural methods.

"We are pleased that one of the world's most prestigious conferences selected our work," said Rolf Drechsler, Head of Cyber-Physical Systems department at DFKI-Bremen, at the 4-day conference when accepting the award on behalf of the "Bremen Trio."

More information
www.iccad.com

Prof. Wahlster Elected as Speaker of the OFFIS Advisory Board

At the constituting meeting of the new Advisory Board in October 2013, Prof. Wahlster was elected by a unanimous vote as Speaker for the "Oldenburger Institut für Informatik" (OFFIS).

Like DFKI, OFFIS is another medium-sized organization in the German scientific research community. Established in 1991, the Institute currently employs a staff of approximately 280 in numerous computer science projects – almost always with direct relevance for practical application. The Advisory Board advises OFFIS in questions of scientific and economic importance, provides suggestions for priorities and specific goals, promotes contacts with other institutions in the field of ICT, and provides opinions on projects.

More information
www.offis.de/en

New Members Appointed to DFKI Supervisory Board

The 74th General Meeting of DFKI shareholders was held at the new DFKI facility in Bremen on January 31, 2014. Dr. Müller-Wiesner and Dr. Janik resigned as members of the Supervisory Board subsequent to the expiration of the Airbus and Microsoft delegation rights. Following a vote, new delegation rights were assigned for a term of three years to CLAAS and Empolis Information Management. CLAAS has appointed Dr. Hans-Peter Grothaus and Empolis Information Management has appointed Dr. Stefan Wess to the DFKI Supervisory Board.

l.-r.: Dr. Hans-Peter Grothaus, CLAAS KGaA mbH; Prof. Wahlster; Dr. Stefan Wess, Empolis Information Management GmbH

New BMBF Project “Ambi-Wise” Launched in January 2014

Industrial manufacturing specialists often rely on the know-how of their colleagues and sometimes they acquire their own experience which is, in turn, informative and valuable to others.

“Ambi-Wise” is a collaborative project to develop and integrate mobile, context sensitive user interfaces with the aim of promoting a participatory culture of exchange within the company. Each employee has a personal, mobile application that can interface to a social network.

DFKI's Intelligent Factory Systems department provides technological components in the field of innovative Human Computer Interaction, which help employees to enter into exchanges with colleagues or to store their own experience in the knowledge system.

The joint venture is sponsored for a period of three years by the Federal Ministry of Education and Research (BMBF) and is implemented in partnership with: SemanticEdge (SME), Infoman (SME), Schaeffler and Daimler as end-user as well as the Beuth University of Applied Sciences and the Institute for Technology and Labor (ITA).

Generation Pop and DaaS – World Heritage Site Presents New Technologies

The research and application project from the field of digital visualization "Display as a Service" (DaaS), which received the recently established CeBIT Innovation Award in 2013, was again featured in the headlines in January 2014.

This technology of the future provides real time, wireless control of a random set of visual displays by means of intelligent software. The system made a grand appearance at the "Generation Pop" exhibit at the Völklinger Hütte World Heritage Site.

The exhibit is open until June 15, 2014.

More information
www.voelklinger-huette.org/de/generation-pop

Runner-up Award – “Silver Medal” at International Conference

The 9th IEEE International Conference on Collaborative Computing: Networking, Applications, and Worksharing co-organized by EAI (European Alliance for Innovation) was recently held in Austin, Texas. The team of Prof. Slusallek, scientific director at DFKI's Agents and Simulated Reality (ASR) once again earned the respect of the scientific community as their innovative research paper "A Collaborative Virtual Workspace for Configuration and Evaluation" was chosen as the runner-up in the “Best Paper” competition award.

More information
www.collaboratecom.org

DFKI Service Offering

As an internationally renowned Center of Excellence for innovative software systems based on Artificial Intelligence (AI) methods, DFKI is offering the following services with more than 25 years of experience in basic and applied R&D:

- Technology transfer of the award-winning research results of DFKI
- Innovation coaching and start-up consulting in the Public-Private-Partnership sector
- Individual design, development and implementation of innovative application solutions
- Market studies, expert surveys, feasibility analysis and empirical user studies
- Component development with AI-functionality, enhancing the performance of complex software systems
- Scientific advice on the selection and implementation of complex software solutions
- Customization, implementation, deployment and maintenance of our AI-solutions
- Scientific evaluation and benchmarking of software solutions
- Application-oriented basic research
- Independent assessment of IT-security and privacy
- Technology workshops, training and practice
- Scientific monitoring of data collections and their evaluation
- Business engineering: Process analysis and development
- Innovation coaching and turnaround management
- Strategic and technical due diligence consulting for companies in the ICT sector
- Technical and organizational support for the standardization in the IT sector (Including W3C, ISO)
- Design, construction and operation of Living Labs

Kaiserslautern Site

Saarbrücken Site

Bremen Site

Project Office Berlin

German Research Center for Artificial Intelligence

Company Profile

Established
1988

Legal Form
Non-profit organization
(public-private partnership)

Executive Board
- Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster, CEO
- Dr. Walter Olthoff, CFO

Supervisory Board
- Prof. Dr. h.c. Hans-Albert Aukes, Chairman
- Dr. Susanne Reichrath, Representative of Saarland's Minister President for Higher Education, Science and Technology, Vice Chairwoman

Locations
Kaiserslautern (registered office), Saarbrücken, Bremen, Berlin (project office). Further operating sites in Osnabrück and St. Wendel

Shareholders
Airbus, BMW Group Forschung und Technik GmbH, CLAAS KGaA mbH, Daimler AG, Deutsche Messe AG, Deutsche Post AG, Deutsche Telekom AG, Empolis Information Management GmbH, Fraunhofer Gesellschaft e.V., Harting KGaA, Intel Corporation, John Deere GmbH & Co. KG, KIBG GmbH, Microsoft Deutschland GmbH, RICOH Company, Ltd., SAP AG, Software AG, University of Kaiserslautern, Bremen University, Saarland University, VSE AG

Equity Holding
Center for the Evaluation of Languages and Technologies Srl (CELCT), Trento - Graphics-Media.net GmbH, Kaiserslautern - Ground Truth Robotics GmbH, Bremen - SemVox GmbH, Saarbrücken - Yocoy Technologies GmbH, Berlin

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Intelligent Solutions for the Knowledge Society

The German Research Center for Artificial Intelligence (DFKI) was founded in 1988 and has research facilities in Kaiserslautern, Saarbrücken and Bremen, a project office in Berlin and branch offices in Osnabrück and St. Wendel. In the field of innovative commercial software technology using Artificial Intelligence, DFKI is the leading research center in Germany.

Based on application oriented basic research, DFKI develops product functions, prototypes and patentable solutions in the field of information and communication technology. Research and development projects are conducted in fourteen research departments, ten competence centers and six living labs. Funding is received from government agencies like the European Union, the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Economic Affairs and Energy (BMWi) and the German Federal States as well as from cooperation with industrial partners. Twice a year, a committee of internationally renowned experts (Scientific Advisory Board) audits the progress and results of state-funded projects. In addition, BMBF evaluates DFKI every five years. The most recent assessment was again very successfully concluded in 2010.

Apart from the state governments of Rhineland-Palatinate, Saarland and Bremen, numerous renowned German and international high-tech companies from a wide range industrial sectors are represented on the DFKI supervisory board. The DFKI model of a non-profit public-private partnership (ppp) is nationally and internationally considered a blueprint for corporate structure in the field of top-level research.

DFKI is actively involved in numerous organizations representing and continuously advancing Germany as an excellent location for cutting-edge research and technology. Far beyond the country's borders DFKI enjoys an excellent reputation for its academic training of young scientists. At present, 424 highly qualified researchers and 300 graduate students from more than 60 countries are contributing to more than 270 DFKI research projects. DFKI serves as a stepping stone to leading positions in industry and successful careers as founders of spin-off companies. Over the years, more than 60 staff members have been appointed professors at universities in Germany and abroad.

Research & Development

Scientific Directors and Research Departments

Kaiserslautern Site
- Prof. Dr. Prof. h.c. Andreas Dengel: Knowledge Management
- Prof. Dr. Paul Lukowicz: Embedded Intelligence
- Prof. Dr.-Ing. Hans Schotten: Intelligent Networks
- Prof. Dr. Didier Stricker: Augmented Vision
- Prof. Dr.-Ing. Detlef Zühlke: Innovative Factory Systems

Saarbrücken Site
- Prof. Dr. Josef van Genabith: Multilingual Technologies
- Prof. Dr. Antonio Krüger: Innovative Retail Laboratory, St. Wendel
- Prof. Dr. Peter Loos: Institute for Information Systems
- Prof. Dr. Philipp Slusallek: Agents and Simulated Reality
- Prof. Dr. Hans Uszkoreit: Language Technology
- Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster: Intelligent User Interfaces

Bremen Site
- Prof. Dr. Rolf Drechsler: Cyber-Physical Systems
- Prof. Dr. Frank Kirchner: Robotics Innovation Center
- Prof. Dr. Joachim Hertzberg: Robotics Innovation Center, Branch Office Osnabrück

Project Office Berlin
- Projects and cooperation in the German capital region

Living Labs

Testing, evaluation, and demonstration of innovative technologies in comprehensive application scenarios

Advanced Driver Assistance Systems Living Lab, Bremen Ambient Assisted Living Lab, Innovative Retail Lab, Robotics Exploration Lab, Smart City Living Lab, Smart Factory

Competence Centers

Coordination of research activities in particular areas

Ambient Assisted Living, Case-Based Reasoning, Computational Culture, e-Learning, Human-Centered Visualization, Language Technology, Multimedia Analysis & Data Mining, Safe and Secure Systems, Semantic Web, Virtual Office of the Future

Key Figures

Annual Budget 2012

€ 36.0 million

Total Assets 2012

€ 113.6 million

Employees

424 professional staff, 300 graduate student staff

As of February 19, 2014

Scientific Excellence and Transfer

International Scientific Advisory Board

Bi-annual evaluation of publically funded projects
- Prof. Dr. Horst Bunke, University of Bern, Switzerland, Chairman

Leading-Edge Research

DFKI is the only German institute for computer science to participate in each of the three leading-edge research clusters
- Cluster of Excellence "Multimodal Computing and Interaction" funded by the German Research Foundation (DFG)
- Leading-Edge Cluster "Software Innovations for the Digital Enterprise" funded by BMBF
- European Institute of Innovation and Technology - Information and Communication Technology Labs (EIT ICT Labs)

Networks of Excellence

At present, DFKI is a coordinator or core partner in four European Networks of Excellence

Promoting Young Talent

DFKI is a founding member and core partner of the Academy Cube and the Software Campus to promote managerial talent in the IT industry

Academic Chairs

More than 60 former staff members have been appointed professors at universities in Germany and abroad

Spin-offs

Over 60 spin-off companies have created approximately 1,700 highly skilled jobs

Committees and Academies

DFKI is represented by its scientific directors on numerous committees and academies

Scientific and Government Committees

Research Alliance of the German Federal Government, Feldafinger Kreis, Münchner Kreis, Advisory Board of the Future Internet Public-Private Partnership Programme of the European Union (FI-PPP), Coordinator of the European Alliance Multilingual Europe Technology Alliance (META-NET), Management Board of the International Computer Science Institute in Berkeley, Chair of the German Informatics Society (GI), National Institute of Informatics (NII, Tokio), and others

Business Committees

International SAP Research Advisory Board, Governance Board Intel Visual Computing Institute, Advisory Board NEC Computers and Communication Innovation Research Lab, and others

Scientific Academies

Royal Swedish Academy of Sciences, German National Academy of Sciences Leopoldina, Berlin-Brandenburg Academy of Sciences, Academy of Sciences and Literature, National Academy of Science and Engineering, European Academy of Sciences, and others

Intelligent Solutions for the Knowledge Society

- Knowledge Management and Document Analysis
- Virtual Worlds and 3-D Internet
- E-Learning and e-Government
- Development of Provably Correct Software
- INDUSTRIE 4.0 and Innovative Factory Systems
- Smart City Technologies and Intelligent Networks
- Information Extraction from Text Documents
- Intelligent Web Retrieval and Web Services
- Multi-agent Systems and Agent Technology
- Multimodal User Interfaces and Language Understanding
- Visual Computing and Augmented Vision
- Mobile Robotic Systems
- Shopping Assistance and Intelligent Logistics
- Semantic Product Memories
- Safe and Secure Cognitive Systems and Intelligent Security Solutions
- Semantic Web and Web 3.0
- Ambient Intelligence and Assisted Living
- Driver Assistance Systems and Car2X Communications
- Cyber-physical Systems
- Multilingual Technologies
- Wearable Computing

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