



DFKI at CeBIT 2015

Smart Factory - Smart Data - Smart Services

digisign Wins a CeBIT Innovation Award

HANNOVER MESSE 2015

April 13-17



DFKI and *SmartFactory*^{KL} at INDUSTRIE 4.0 Forum



See and experience what is happening that will revolutionize manufacturing in the coming years. We present the advance development of our supplier-independent demonstrator at the HANNOVER MESSE, located in the middle of the INDUSTRIE 4.0 Forum, in Hall 8 at Stand D20.

HANNOVER MESSE 2015

***“Integrated Industry –
Join the Network!”***

Come and marvel at how far the topic INDUSTRIE 4.0 has already progressed.

smartFactory^{KL}

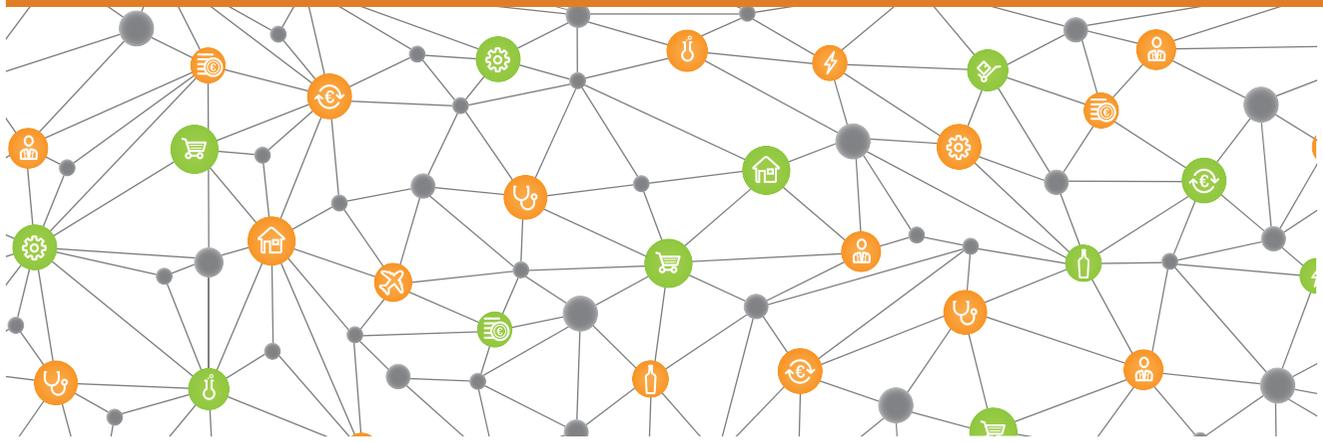
In collaboration with 15 industrial partners, the *SmartFactory*^{KL} technology platform has driven the implementation of INDUSTRIE 4.0 one step further. The existing plant has been expanded with new modules that maximize utility.

Various commercial infrastructure boxes provide input and the unit demonstrates the improved integration of multiple IT systems.



More information on page 26 and online at www.smartfactory-kl.de

Hall 8, Stand D20



Graphics: acatech

Smart Service World Ready to Launch



► The final report of the federal government's Research Alliance has recommended a green light for launch. After completing very thorough preparations, Smart Service World, the second future project to be outlined by the Alliance, is ready. It is a continuation of the first future project, INDUSTRIE 4.0, which has been gradually implemented with great success since 2011.

This initiative represents a digital value added chain that started a paradigm change not only in manufacturing, but also in the service sector and is sure to revolutionize our entire economic system in the coming years. The INDUSTRIE 4.0 smart factories manufacture smart products on which the new smart services can be set up. One driver of this innovation is the intelligent evaluation of production data generated from the application of smart services and the use of smart products. In turn, production in the smart factories based on this data becomes even more efficient with the creation of new or optimized smart products or smart services. The end result is a turbo drive for data-driven digital business models.

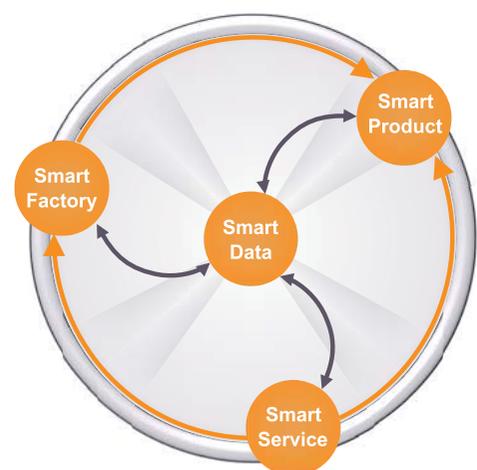
Germany is currently the world leader in the engineering and the top quality production of many complex products. These products must be continuously digitally upgraded through innovative added value functionalities to retain the ability to compete in international markets. Along with storage and computing power, an ever-increasing number of sensors and actuators can be integrated in the products. However, the most important feature is internet access to networks and M2M-communications with machines in the area. Smart products demonstrate some simple characteristics of intelligent behavior: on the basis of the experience stored in their own product memory, they can adapt future behavior. They adapt to both context and user, are capable of self-learning, self-clarification, and are fault tolerant.

In addition, German research has achieved a leading international position in the semantic technologies relevant for innovative smart services, machine learning, and user and product models. This knowledge must now be institutionalized and expanded in the context of future projects.

The business success of smart services depends on new research findings in the areas of user friendliness, intuitive operations, convenient learning, and the design of adaptive user interfaces. Therefore, there must be a greater interest devoted to these areas, traditionally, so often neglected by the German IT industry. We should not freely adopt the technology acceptance research results on other continents because, to a very large extent, these are strictly dependent on culture and that is how it should remain, if possible.

DFKI is recognized worldwide as a pioneer in the area of INDUSTRIE 4.0 – not only for research, but also for its joint implementations with industrial partners. DFKI is represented in all clusters and centers as a core partner in the field of data analysis of large volumes of data (big data/smart data). In the innovative area of smart services, DFKI has earned the pole position, as impressively documented in the recent final report of the working group. DFKI is well-positioned to fulfill its role successfully as an innovation partner for the German economy in the age of comprehensive digitization. ◀

*Prof. Wolfgang Wahlster
CEO & Scientific Director of the
German Research Center for AI*



CeBIT

INNOVATION AWARD 2015

INDUSTRIE 4.0

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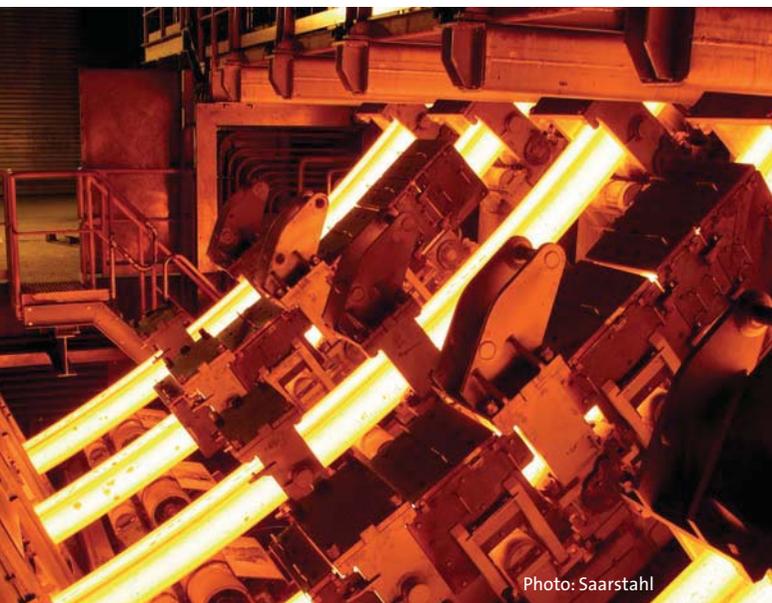
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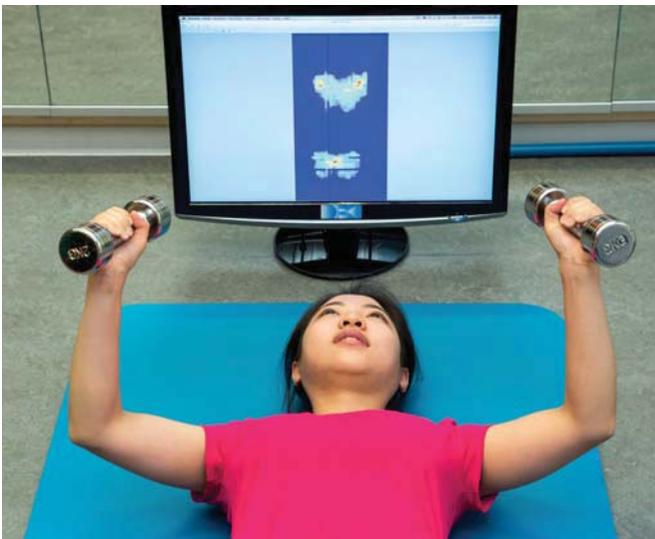
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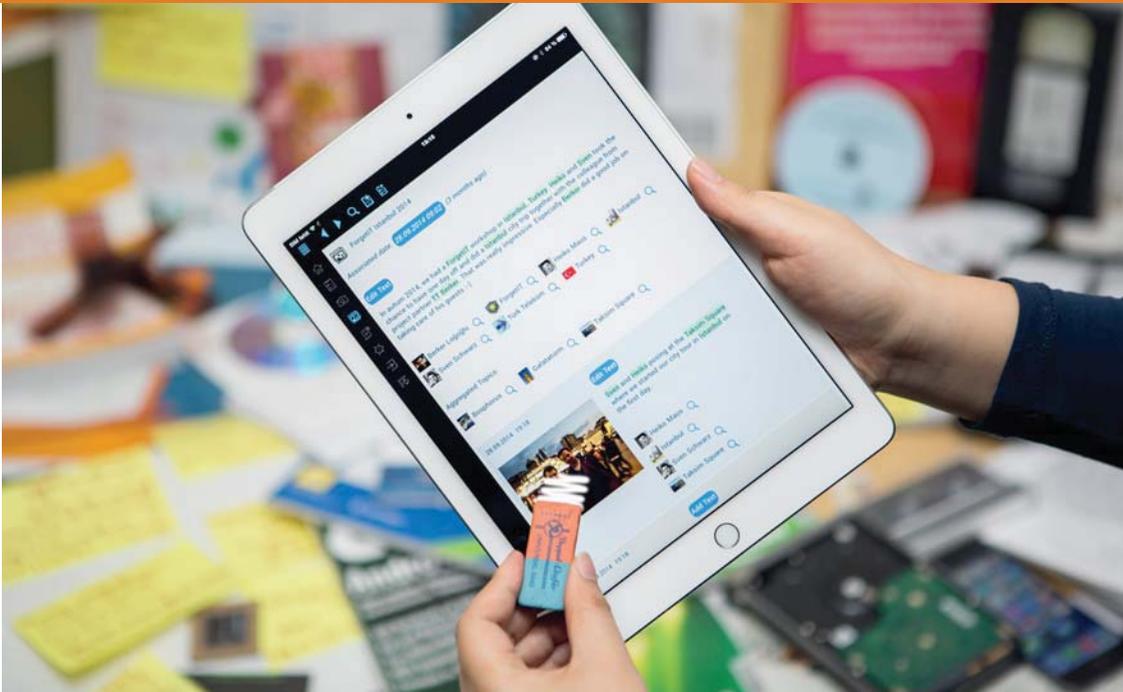
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The personal information model of ForgetIT assists users to manage their digital memories.

ForgetIT – Managed Forgetting and Contextualized Remembering in a Personal Knowledge Space



► Photos, documents, e-mails, tasks, events – on the desktop, on the smartphone, in the cloud. What to preserve, what to forget? ForgetIT is an EU sponsored project that assists users to manage the daily information overload with the aid of a semantic desktop. The semantic desktop creates a personal knowledge space in the file explorer, browser, text editor, e-mail system, in the cloud, or in the photo gallery for annotation, organization, and semantic searches for resources by the user.

Photos and documents may be easily linked with calendar-events, tasks, and e-mails and web pages across applications, for example, through the use of concepts like “Tags.” The concepts are available in all applications and services in the user’s Personal Information Model (PIMO). The PIMO maps a mental model of the user’s contacts, topics, events, projects, and tasks and connects these to resources like photos, videos, documents, e-mails or web pages.

As often happens with information systems, this evolving knowledge space risks becoming too complex and confusing: even information still in use may no longer be relevant tomorrow. It is crucial to distinguish the important from the unimportant. What would be nice and what must be protected for the next generation? How much understanding of context should accompany the material in a preservation system? The user who is already unsure of how to cope with backups should be asked to expend as little effort as possible.

“Memory Buoyancy” is the term that reflects the current importance of the information objects. As an object decreases in importance, it also loses “buoyancy.” Linked to specific threshold values – based on the human brain – in the case of decreasing buoyancy, the information can be forgotten, i.e., first

hidden, and then transferred to external storage, summarized, archived, or even recommended for deletion.

The expanding knowledge space enables the combination of the user’s resources and activities by topic with context descriptions made by using the mental models in the Personal Information Model. DFKI’s PIMODiary – a diary that writes itself in ForgetIT – demonstrates the possibility for managed forgetting, condensing of information and contextualized remembering.

ForgetIT is funded for a period of three years under the EU 7th Framework Program for Research. ◀

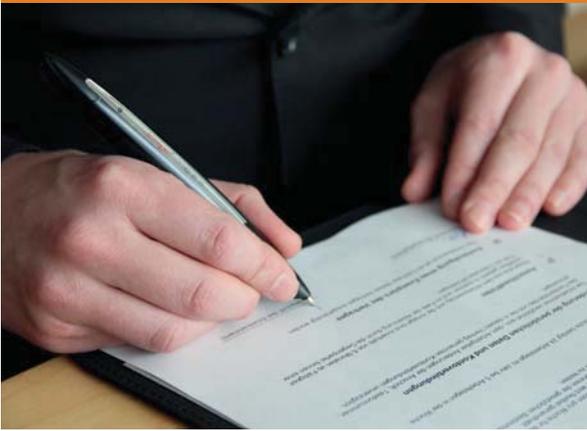
More information
www.forgetit-project.eu

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Signing with the digital pen



Markus Weber and Prof. Andreas Dengel

DFKI Spin-off digipen technologies Wins CeBIT Innovation Award With “digisign” – The Anti-Counterfeit Biometric Signature



► A spin-off company of DFKI based in Kaiserslautern, digipen technologies is among the winners of the CeBIT Innovation Award 2015. The company was recognized for its development of “digisign,” an anti-counterfeit biometric signature technology. The award, endowed with a total of 100,000 euros, will be announced at CeBIT 2015 in Hannover. The winners will present their projects at the joint stand of the Federal Ministry of Education and Research (BMBF).

Computers in the future, using this new technology, will be able to assign a digitized signature to an individual just as surely as the forensic handwriting experts of the past. Digisign was developed by Markus Weber, research and development at digipen and member of the staff at DFKI's department of Intelligent User Interfaces working in collaboration with DFKI researchers in the Knowledge Management department in Kaiserslautern.

To produce the digital signature, the user needs a digital pen equipped with pressure sensors and a camera, and plain paper with no recognizable printed patterns. “When the user signs the document, not only is an image of the signature recorded, but forensic qualities are also recorded such as the pressure exerted, the writing speed, and the line characteristics. A document signed in this way is encrypted and transferred via wireless to the user's smartphone or through a USB port on a computer to the digisign processor, which stores the signature as legally binding and auditable,” explained Andreas Dengel, Site Director at DFKI Kaiserslautern and general manager of digipen technologies. If a forgery is suspected, the stored biometric data can be called on as forensic reference material to determine whether the signature is genuine.

One aspect which helped digisign to convince the jury was the simple operation of the system. “In selecting the winning projects, we place great value on the user friendliness of digital applications because of the unique challenges they pose in information technology,” said jury chairperson Prof. Dr. Gesche Joost, a design researcher at the Berlin University of the Arts.

DFKI's department of knowledge management and digipen technologies have cooperated for many years on the joint development of secure forensic analysis methods, which apply digital pen technology to enable specific capture, secure storage, and reliable handwriting recognition – whether on paper or tablet-PC.

Digipen technologies is another success story in the sustained history of DFKI spin-off companies. Meanwhile, more than 60 companies and approximately 1,700 highly qualified jobs have been created by DFKI. ◀

More information
www.cebitaward.de
www.digipen.de



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Security company employees underway in sustainable and environmentally friendly electric cars.



eFahrung – Inter-fleet Use of Electric Drive Vehicles

How will electric mobility become an economic and reliable addition to the corporate fleets?

► Electric vehicles (EVs) offer great potential for a change to sustainable mobility in the sense of “green” fleets. However, until now, the existing electric drive vehicles could not satisfy the acceptance criteria of efficiency, reliability, and attractiveness. Many companies are lacking the foundation to make an informed decision about e-mobility, which is clearly evident from the small number of companies that operate electric drive vehicles in their fleets.

In the collaborative project eFahrung, DFKI, B2M Software, and researchers at the TU Berlin are working together under the lead management of the [ui!] – the urban institute®. The aim is to develop an economical, reliable, and comprehensive solution to exploit the use of EVs on an inter-fleet basis. Inter-fleet

simply means that multiple companies may access the vehicle. The project aims to provide a platform to be used to collect and document the experiences of intercompany use of e-fleets – while ensuring economic activity at the same time. The eFahrung project is part of the international showcase Berlin-Brandenburg electric mobility program and is sponsored by the federal government.

Visitors to the DFKI booth at CeBIT 2015 can sit in a test e-vehicle and watch a demonstration of the system. This includes an intelligent On Board Unit (iOBU) to record critical driving data from the vehicle, a mobile app for registering and reserving a vehicle, and communications with the driver in addition to a simulation environment for visualizing the potential of e-mobility fleets.

The early focus is on the evaluation and verification of a commercially viable business model based on a collective-style organization of the corporate fleets. Besides the EVs, all the related ecosystem of services like financing, collection and return service, and the assignment of charging stations are also being tested.

The business model should allow operations with EVs to be compared with conventional vehicle fleets. Currently known constraints on e-mobility are detected by means of sensors in the vehicle and balanced by the service offering to ensure that an economic and reliable use of the EVs can be realized.

eFahrung combines empirical research in the area of viable business models with the technological innovations in the area of “fleet monitoring.” The project also studies innovative software technology in the area of inter-fleet planning, optimization, and control in active operations. Additional research is being conducted into methods of how to collect and combine

the urban institute® is a leading software and consulting company for “Smart City” solutions.



Founded with the charter to work closely with the European Innovation Partnership “Smart Cities and Communities,” [ui!] - the urban institute® presently assists cities in Germany and other European countries and Australia in their efforts to implement innovative concepts and solutions to achieve ambitious climate change targets. Climate protection, benefits to citizens, and commercially successful services and solutions are not mutually exclusive terms. Instead they complement each other to form a sustainable association for the future of urban spaces.

www.the-urban-institute.de

vehicle performance data for use in route optimization and demand-driven rescheduling.

The specified driving data is recorded in real time by the intelligent On-Board-Unit (iOBU) from the DFKI Robotics Innovation Center. The unit is able to read important vehicle data over the CAN bus and prepare it for downstream processing. Contact with the environment is achieved via GSM, Bluetooth, or WLAN and may even be extended via USB, RS485, or the existing I/O lines. The data obtained in this way provides test fleet participants with an accurate picture of their E-vehicle use.

A software based solution was designed for inter-fleet use that uses "match-making" to ensure the optimal utilization of the EVs. This, furthermore, can even be integrated with the already existing fleet management systems. The fleet managers themselves are provided with tools for utilization and consumption analyses of their fleet.

A mobile app, developed by B2M Software connects to the cloud-based planning and control platform and assists the driver in making reservations as well as the pick-up and return of the vehicles. Eventually, an intuitive driver access to real time driving data will be possible via the communication with the vehicle's built-in iOBU.

Using another simulation developed at DFKI Berlin, suppliers and customers simulate real or fictional E-vehicle fleets, including specified or random routes and the suitable charging infrastructure. The simulation should supply answers to questions of goal achievement, utilization of the fleet and infrastructure as well as fulfillment of schedules (taking into account charging times and detours to the charging stations). The driving data collected by the on board units can serve as a data source for the simulations.

The aim is to promote the broadest possible introduction of electric mobility in major cities by the example of these working operations of inter-fleet electric vehicles in greater Berlin and other metropolitan regions in 2016.

Participation as a test user is open to interested companies in Berlin and Brandenburg. ◀

More information
<http://efahrung.de>

B2M Software AG

is a software developer in Karlsruhe, Germany with a focus



on mobile apps and systems

for custom solutions within the concept of the "Smart City." The company focus is on (e-)mobility, demographic change, energy, security, and health. B2M supplies practical and smart software-aided feasibility and usability solutions relevant these topics. Whether in the area of consulting, software development, or implementation, B2M supports clients across the entire value chain. The software-based solution Value Mobility from B2M aids people with mobility impairments in the use of public transportation.

www.b2m-software.de

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3cixty – App Platform for “360-Degree” Travel Guide

► Optimal solutions for the tourism branch must satisfy many criteria like being fast, location independent, and providing uncomplicated access while considering constraints like time and money.

If you are planning a trip, for example, to the Milan World Expo 2015, you probably also want to get to know the city of Milan. Therefore, you look for a 3-star hotel with good connections to both the downtown area and the expo grounds. Perhaps it should also be near a good cafe or a fitness studio. The details of the Expo visit need to be planned too: What is the best day during my stay at the Expo to see events related to the topic ‘Feeding the Planet, Energy for Life’ and which pavilions should I focus on that day? What about the evening activities? Is there a theater or a concert in the area? What nearby restaurants have been rated positively by one or more of my friends?

The existing technologies only support optimal multiple criteria answers derived from various online sources to a limited extent. Travelers must visit various web pages and find apps that provide event information, points of interest (POIs) and public transit data and then write down and combine the results.

3cixty aggregates information from multiple sources using semantic technologies and makes them available in a standard format (Resource Description Framework RDF). The query language SPARQL allows sophisticated queries. A graphic user interface enables user-friendly exploration of these integrated knowledge sources. Supplemental services provide customized queries, analyze visitor movements around the city, and support the acquisition of information via crowd sourcing and easily connect to other applications that also use the 3cixty platform.

The showcase app “ExplorMI 360” illustrates the value of the 3cixty services for the city of Milan. Visitors use DFKI’s “parallel exploration” technology via a web-based user interface for tablets and laptops to explore information and plan their visits to the city. The search results of their exploration may be saved in a digital wish list that is accessible from all 3cixty applications. When actually visiting the city, the 3cixty smartphone app provides further assistance with reminders of what is on the wish list and spontaneous access to the knowledge base for additional information.

3cixty is a multiyear collaborative project, financed by the Eu-

ropean Institute of Innovation & Technology (EIT ICT Labs) and comprising 10 partners and 5 SMEs from 6 countries working as a consortium led by DFKI.

The next step on the path to commercialization and the deployment of 3cixty in other cities is the development of a platform for the City of London that incorporates the lessons learned from the Milan pilot project. ◀

More information
www.3cixty.com

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CeBIT Hall 9, Stand F43

SmartF-IT – Cyber-physical Systems Manage the Complexities of Next Generation Multiadaptive Factories



► INDUSTRIE 4.0 brings the Internet of Things into the factory. By integrating the INDUSTRIE 4.0 production technologies with real time information systems they become cyber-physical production systems (CPPS), which will enable future “Smart Factories” to achieve the profitable manufacture of products with many options in low volumes.

The SmartF-IT project is sponsored by the Federal Ministry of Education and Research (BMBF) and focuses on the individual production units and exploits IT processes in order to implement agility and multi-adaptivity as major components of the “Smart Factory.” The aim is to achieve a highly adaptable manufacturing process at all levels of the production system – from planning and control to operation while interacting with processes, products, production resources, and employees. The focus is on versatile, reconfigurable production units for the optimized production of customized products (in the sense of “high-mix, low-volume manufacturing”) – up to lot size 1 – in a hybrid composition of resources and human labor supported by new individualized industrial assistance systems. SmartF-IT studies two typical application areas for the latest technologies: 1) the migration of existing production and 2) the re-planning and subsequent operation of a production line.

A control component for the transport of work pieces is assembled in a example of a multi-lane INDUSTRIE 4.0 production line at the future talk area of the CeBIT. In a variety of different industrial application scenarios, workers, plant operators, and team leaders are assisted in the execution of specific tasks like assembly planning, integrated dynamic detailed planning of the production processes, employee scheduling, fault management, quality assurance and workplace adaptations by specific assistance systems and IT-tools. SmartF-IT plans the flexible use of production resources, which include the automated production assistant APAS, a lightweight robot from Bosch. The INDUSTRIE 4.0 production line shown at CeBIT is a joint development of Bosch Rexroth, the Centre for Mechatronics and Automatisations Systems (ZeMA), and DFKI.

In SmartF-IT, nine partners contribute to the project under the lead management of DFKI. Close cooperation between representatives of the business and

research communities ensures that the intended results and solutions meet the immediate requirements of the industry. The findings will be used to create generic models, methods, and tools that can be used and exploited in areas beyond the individual cases studied, for example, in the national “INDUSTRIE 4.0 platform.” Best practice recommendations stemming from the migration and new planning situations as well as the human centered, cyber-physical system perspective will have a major influence on the further development of cyber-physical production systems in multiadaptive agile factories well beyond the framework of this project. ◀

More information
www.smartf-it-projekt.de
www.plattform-i40.de

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CeBIT Hall 9, Stand F44

Cyber-physical production systems enable highly adaptive manufacturing processes



Photo: ZeMA/DFKI

Smart Interaction With Cyber-physical Systems – MADMACS

► Everyday objects can be networked and made internet capable similar to the components of cyber-physical production systems in the manufacturing industry. They form a cyber-physical environment and communicate via apps, radio signals, or Bluetooth. Often, they function independently through different channels and proprietary data formats.

MADMACS – Multiadaptive Dialog-Management for Cyber-physical environments – is a DFKI project that aims to develop a device and vendor independent, dialog platform that also integrates interaction modalities such as voice recognition or eye tracking. Sponsored by the German Federal Ministry of Education and Research (BMBF) the project should provide mobile users with intuitive and multimodal access to numerous sensors and actuators which interact in multiple ways to adjust the environment to the needs of the user.

Visitors can experience the first demonstrator at CeBIT 2015. According to individual preference, users intuitively control selected environmental systems like lighting or ventilation by head movements, voice, gestures, touchscreen, and proximity sensors in a variety of possible combinations. The SiAM-dp dialog platform developed at DFKI provides integrated system controls and the interaction logistics. Wearables such as data glasses and smart watches are used as both a sensor and an input device when linked to a highly multimodal interaction scenario.

MADMACS supports applications found in the personal living space and in the workplace, where it assists employees in the crafts, commerce, logistics and Industrie 4.0 applications. ◀



Multimodal interaction with environmental systems

More information
<http://madmacs.dfki.de>

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The Newswall – Text Scrolling Adapted to Reading Speed

► Large stationary displays must attract the public viewing audience within a very short loiter time. Being highly visible, such displays permit rapidly changing images with many different messages and can reach a broad distribution. What they do not offer is a target group focus and customized content. Instead, the information display shows, for example, at a train station or airport lounge, mostly news broadcasts where only the video can be seen while most of the time the audio cannot be heard. Only a fraction of the information broadcasted actually reaches the audience.

The DFKI Innovative Retail Laboratory developed Newswall as a system that analyzes the reading speeds and automatically adjusts the display of the text being read. It enables several people to view different content simultaneously and provides an individualized, public information service.

Every reader has control over the text they are reading because not all parts of a text must be displayed at one time. The Newswall detects what line and how fast a text is being read via commercially available eye-tracking glasses. In this way, the information currently being read can be enlarged through so called virtual “viewports” for ease of reading and, it is also possible to define a display area for use by multiple users simultaneously.

The system was conceived as part of a seminar project for a course in media information systems at Saarland University and further developed at DFKI. ◀

More information

www.innovative-retail.de



Eye tracking process used to analyze the reading pattern of the user

CeBIT Hall 9, Stand E13

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The Electronic Product Finder

► “Pardon me, where can I find...?” is a question frequently heard in crowded supermarkets before a holiday, a long weekend, or just before closing time because there is always some ingredient missing that is needed for the evening dinner with family or friends and who can possibly always know exactly where to find the fresh yeast.

The Product Finder from the DFKI Innovative Retail Laboratory (IRL) and GLOBUS SB-Warenhaus Holding, is a stationary kiosk system that enables the customer to independently search for products without a lot of effort. The search can be either for specific words entered in a full text search of the store's product database, by category, or by clicking on a panel display with an overview of the various departments. If the product is stocked in the market, the Product Finder then displays its location on a map.

The first Product Finder was placed in operation in 2011 at the GLOBUS store in Saarbrücken. In September 2014, a new and improved version was tested at three GLOBUS store locations in the Koblenz-Bubenheim area. Randomized use statistics from the first Product Finder figured prominently in the further development of the system in an effort to improve the focus on the needs of the shoppers. A new larger display and familiar input methods give the Item Finder not only an intuitive operating and viewing screen, but enable the op-

erating fields to be moved to the bottom of the screen for better handicapped and child-friendly access. Clicks are recorded anonymously and there is an optional dynamic feedback in order to better account for “user experience” in the continuous improvement of the system. The searches are logged so that the placement of items with a heavy demand can be taken into consideration and the appropriate adjustments made.

Initial figures show a high rate of acceptance for the Product Finder among customers. The highest usage figures were registered, as expected, in the days before Christmas and New Years, but even on regular weekdays, more than 1000 customers took advantage of the simple search method to find a specific product. The Product Finder contributes in large measure to customer satisfaction, especially, at larger stores with more than 120,000 individual items and provides a welcome service to the customers.

Product Finder at the GLOBUS Supermarket in Koblenz-Bubenheim



As a software-based assistance system, the Product Finder will be available in the future for use with a smartphone where it functions as a kind of navigation aid at the supermarket. This enables location independent access and the customer can refresh the display while on the way to the desired item. ◀

More information
www.innovative-retail.de

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CeBIT Hall 9, Stand F43



Collaborate3D – Collaborative planning and simulation of industrial plants

Safe Virtual Technologies for the Industries of Tomorrow

► The Internet is one of the greatest achievements of our time. Now, the Net is facing a revolution. The “Future Internet” envisions a structural and sustainable change: future industrial production will be influenced by the WorldWideWeb which is still the decisive key technology of tomorrow. Intelligent, networked machines will work hand in hand with humans, assisting and coordinating with humans as well as with other machines, while being able to adapt flexibly to new products and production objectives. All of this becomes possible with modern software, state of the art robot systems, appropriate visualization and interaction methods - all integrated over fast and reliable networks.

Agent and Simulated Reality Research Department

DFKI's Agents and Simulated Reality (ASR) Lab headed by Prof. Dr. Philipp Slusallek has been studying and developing safe, virtual technologies for simulation, interaction, and networking for industrial applications for the past 15 years. At CeBIT 2015, the ASR presents a cross-section of the latest research results associated with INDUSTRIE 4.0.

Design of intelligent products

The existing tools used to design products are often too rigid and are nearly impossible to integrate. The ARVIDA project develops new, service-oriented approaches for the real time connection of existing tools using the Internet. The aim of the project which is sponsored by the Federal Ministry of Education and Research (BMBF), is to exploit the parallel use of all tools to design complete, functional, virtual prototypes of the products – so called “digital mock-ups.” The mid-term planning calls for the process to be expanded to the design of production plants.

Intelligent Manufacturing

Networked production plants, machines, and robots adapt within a very short time to changing production targets. The result: cost savings and improved quality in production, which in turn equals a critical competitive advantage. Collaborate3D is another BMBF project in which researchers develop and test innovative approaches and methods for the collaborative configuration and simulation of production plants in cooperation

with the operators. The formal verification of plant functionality not only ensures and improves the manufacturing process itself, but by means of the multiagent technology, it also simulates the workflow of the impacted workers and takes the ergonomic requirements into account. Networked plants of this kind present demanding requirements for secure and efficient communications. Fully in keeping with the INDUSTRIE 4.0 concept, the middleware SINFONI (KIARA) places top priority on the security of the data exchange (“Security by Design”). The middleware enables real time communications among high performance services with a view towards Big Data and next generation hardware architectures.

Intelligent Applications

The idea of “customized mass production” provides many advantages to the customer. Tomorrow's customers design and test their own dream products based on their own ideas: online, simple, and in advance, all by means of a web-based 3D configuration. Home automation can also clearly benefit from these technologies: In addition to optimizing the energy consumption, the open and semantic architecture of the BMWi project GuidedAB enables the easy and flexible display of a great variety of networked sensors and devices setup in the smart home (page 15). These technologies put the tools in the customer's hands to successfully manage the increasing competition and to successfully meet the challenges of the INDUSTRIE 4.0 revolution. ◀

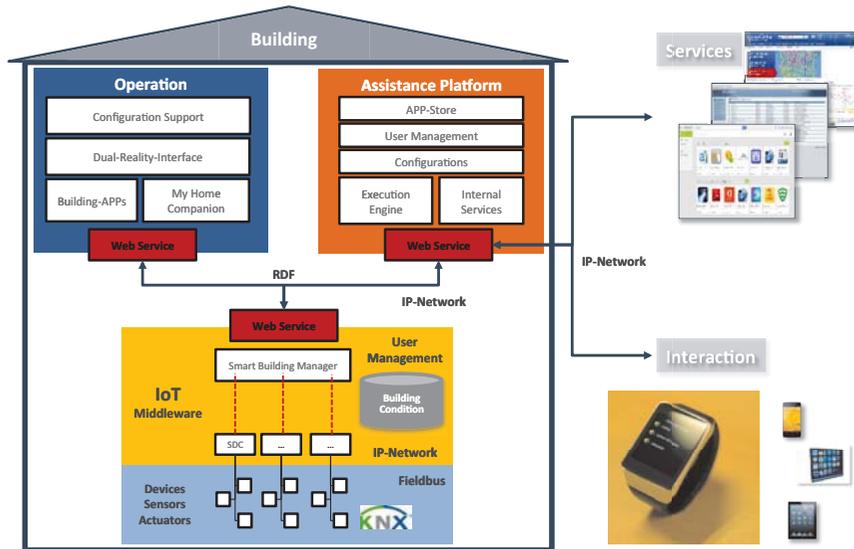
More information

www.dfki.de/web/research/asr

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Reference model for Guided AB architecture

Guided Autonomic Building



Energy efficiency, convenience, and security provided courtesy of a dual-reality services and assistance platform for intuitive building and home networks.

► Germany-wide sales related to the “smart home” are expected to increase from the current 2.3 billion to 19 billion euros by the year 2025. If this forecast is to become reality, the first priority must be on the development of intelligent residential buildings and ensuring that they are of interest to the future mass market. The Guided Autonomic Building (Guided AB) project accepts this challenge and is working on the customization of the smart home – in keeping with the principles of INDUSTRIE 4.0. From a research perspective, the project provides numerous points for advanced study and further development to make the technical operation of building complexes more transparent, safe, and easy, even for non-specialists.

Guided AB is a collaborative project sponsored by the German Federal Ministry for Economic Affairs and Energy (BMWi) under the framework of the technology initiative “Autonomics for INDUSTRIE 4.0”. The project has a three year term. This program combines the innovative potential of modern information and communication technologies with industrial production and accelerates the development of new kinds of products.

In the Guided AB project, researchers team with industry to jointly develop innovative concepts for a flexible building automation and home networking in the context of “intelligent” apartment buildings. The implementation is being tested using application scenarios on a prototype. The systems currently available on the market have limited interfaces and provide the resident very few opportunities for access. Guided AB has created a flexible, easily configurable, and efficient access system. In this case, existing individual solutions may be integrated to the overall system while retaining the ability to perform independently and proactively. By means of a virtual 3D model of a house or apartment, the project focuses on the simple operation and configuration of complex building controls (dual real-

ity interface). In addition, there are sensors and actuators that provide the hardware basis for the Guided AB services. The aim of the project is to develop mobile apps which enable consumers to assign their household appliances and control them by means of learning systems.

DFKI's Agents and Simulated Reality Lab focuses for its part on the design and development of the so called “Dual-Reality-Interface.” An autonomous, networked, and resource efficient apartment building is presented as a cyber-physical system that is controlled and displayed from the intuitive operator console. The challenge now is to integrate the interactive 3D web technologies, modern app concepts, and mobile phones. As a group, such components enable entirely new forms of interaction with intelligent buildings. ◀

More information
www.guided-ab.de
www.autonomik40.de

Supported by:



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ARVIDA – Virtual Technologies in Product Development

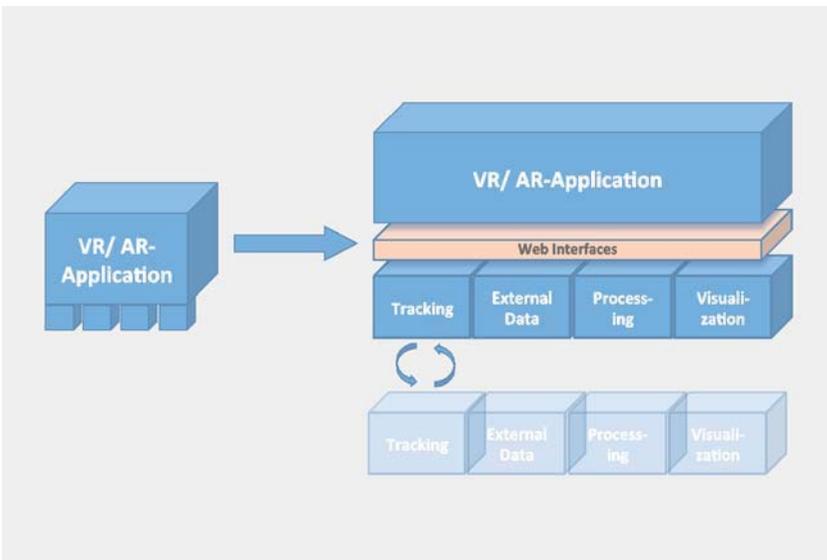


► The collaborative project called ARVIDA is developing an interoperable systems environment for applications based on Virtual Technologies (VT). Sponsored by the Federal Ministry of Education and Research (BMBF), the project includes 22 partners representing industry, research, and SMEs. To create a new basis for modular VT systems ARVIDA is focusing on service-based reference architectures. These VT systems are designed from a flexible combination of services and, in this way, they overcome the disadvantages of a monolithic system environment with mostly proprietary platforms.

The functional requirements of simulated products and their components are steadily increasing. Certain processes and decision steps should be exclusively based on virtual test models, so called “digital mock-ups.” This explains why virtual systems have become an integral part of the IT and process technology landscape, especially, in industrial environments. The term VT includes the VR/AR technologies (Virtual Reality and Augmented Reality) as well as specialized simulation and analysis tools such as virtual human models for ergonomic analyses, physical component simulations, and verification of runtime behavior.

A strategic approach to the exploitation and spread of virtual systems is demanded in light of the heterogeneous IT environments and the great need for flexible, easily configurable platforms for design and production processes in the enterprise.

To achieve this aim, ARVIDA works to the maximum extent with proven principles of web architecture and exploits existing mature web 3D and linked data technologies, for example, a browser-based, 3D review application. The ARVIDA project aims to contribute to the further expansion of virtual technologies in Germany by designing easily configurable, platform independent VT systems that are more open and interoperable in addition to being easily expandable. ◀



Many of today's VT tools are already mature technologies. Realistically, the interaction of several such VT systems is often necessary in virtual product development to cover all of the requirements of a virtual test model. The VT systems currently in use are generally closed systems and there is no inexpensive interoperability between the software tools.

This situation is contrary to the flexible and fast IT support needed for increasingly dynamic design processes and, actually, it is an obstacle to the spread of virtual product development among the small and medium sized enterprises.

The development of suitable solutions in the field of virtual system technologies and, more importantly, their implementation is not yet adequately developed.

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



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Selected Lectures, Presentations and Discussions at future talk CeBIT 2015

Monday, 3/16/2015

Official opening

11:00 - 11:15 a.m. Opening Remarks – future talk and Research & Innovation

Prof. Dr. Johanna Wanka, Federal Minister of Education and Research
Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

Awards Ceremony CeBIT Innovation Award 2015

11:15 - 12:00 a.m. CeBIT Innovation Award 2015 – Award Presentations and Announcement of Winners

Federal Education and Research Minister *Prof. Dr. Johanna Wanka* and Jury **digisign** – anti-counterfeit biometric signature, **FOVEA** – the photo optic app for measuring lumber with a smartphone, **M** – the app for easy encoding of e-Mails

CeBIT d!conomy Core Exhibit

12:15 - 12:30 p.m. SmartF-IT – Competence in Manufacturing and IT for Multi-adaptive Factories: Humans in Focus!

Dr. Anselm Blocher, DFKI / *Dr. Dietmar Dengler*, DFKI
Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

future talk Keynote Panel Discussion

2:00 - 3:00 p.m. Smart Service World: Whoever Defines the Future Standards, is the Winner!

Prof. Dr. Henning Kagermann, President, acatech / *Dr. Andreas Goerdeler*, BMWi / *Prof. Dr. Wolf-Dieter Lukas*, BMBF / *Frank Riemensperger*, Chairman of the Executive Board, Accenture / *Dr. Bernhard Rohleder*, General Manager, BITKOM / *Prof. Dr. Dr. h.c. mult. Wolfgang Wahlster*, Chairman of the Executive Board, DFKI
Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

3:00 - 3:30 p.m. Future Cities of Europe – Innovation Partnership Smart Cities and Communities

Prof. Dr. Lutz Heuser, Chief Technology Officer, [ui!]

Tuesday, 3/17/2015

12:45 - 1:30 p.m. CeBIT Innovation Award 2015 – Innovation at the Boundary between Humans and IT

Winners of the CeBIT Innovation Award 2015 present their innovative ideas.

digisign – anti-counterfeit biometric signature, **FOVEA** – the photo optic app for measuring lumber with a smartphone, **M** – the app for easy encoding of e-Mails

Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

Wednesday, 3/18/2015

CeBIT d!conomy Core Exhibit

1:00 - 1:30 p.m. SmartF-IT – Connected Assembly Technology Solutions

Günter Krenz, Bosch Rexroth

1:30 - 2:30 p.m. INDUSTRIE 4.0 Meets the Web of Things – Business Opportunities and Technical Challenges

Dr. Frank Brode, Harting / *Nils Herzberg*, SAP Senior Vice President, Internet of Things, Industry Cloud / *Dr. Karsten Schweichhart*, Deutsche Telekom AG / *Prof. Dr. Felix Sasaki*, DFKI & W3C / *Prof. Dr. Hartwig Steusloff*, DIN FOCUS.ICT / *Dr. Thomas Usländer*, Fraunhofer IOSB / *Martin Weber*, Akquinet
Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

2:30 - 3:30 p.m. Internet-of-Things Analytics – The Future of IoT Analytics

Lydia Aldejohann, Partner at Intergroup Partners / *David Boundy*, Director Intel CoLLaboratory / *Amr Salem*, Global Managing Director for Smart Cities, Internet of Everything, Cisco / *Dr. Joachim Schaper*, Head of Research, AGT / *Alan Southall*, Senior Vice President of Engineering, Custom Development and Strategic Projects, SAP

Thursday, 3/19/2015

CeBIT d!conomy Core Exhibit

1:00 - 1:30 p.m. INDUSTRIE 4.0 Revolution Reaches the Factories

Dr.-Ing. Matthias Möller, head of technical operations, Werk Homburg; head of production planning, mobile controls, at Bosch Rexroth AG, Homburg

1:30 - 2:00 p.m. Siri in Social Networks – Innovation for the Neighborhood

Dr. Sven Schmeier, Senior Consultant, DFKI / *Clemens Weins*, Cocomore

2:00 - 3:00 p.m. EIT ICT Labs Innovation Slam Meets

Software Campus

Chino, IT / Homey, NL / NNGC, UK / Infozone Ltd, BU / Konux, DE

Testfabrik, DE / 3yourmind, DE

Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

4:00 - 4:30 p.m. ODP Workbench – The Full Package for Proactive Language Dialog Platforms

No diversion to intelligent personal assistance
Jochen Steigner, Chief Sales Officer (CSO), member of the Management Board, SemVox GmbH

Friday, 3/20/2015

12:00 - 12:30 p.m. The New Social Reality – A Machine is Born

Andre Günther, Manager, Minervis GmbH

CeBIT d!conomy Core Exhibit

1:00 - 1:30 p.m. Managing Complexity in Assembly with Cyber-Physical Systems, e.g., SmartF-IT

Leenhard Hörauf, Research Associate, ZeMA – Centre for Mechatronics and Automatisations Systems

2:00 - 3:00 p.m. EIT ICT Labs Innovation Slam Meets Software Campus

Trilogis Srl, IT / ICE Gateway, DE / qKey, NL / Sentryo, FR / Securebeam, AT / 720°, FI

Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

future talk Finale Friday, 3/20/2015

3:00 - 4:00 p.m. Connected Living and Life203

Fabian Marx, Managing Director, Connected Living / *Sven Kielgas*, Entrepreneurial Partner, Serviceplan / *Dr. Joachim Quantz*, Head of Research, ART+COM

Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

future talk Outlook

4:00 - 4:15 p.m. Science Year 2015 – City of the Future

Sustainable Urban Planning: Digital, Environmental, Mutual!
Moderation: *Reinhard Karger*, Corporate Spokesperson, DFKI

More information

www.cebit.de/veranstaltung/future-talk/FOR/60681



Sensor Suit Combats Harmful Postures

► Physically demanding occupations that include highly strenuous movements pose a significant risk of muscular-skeletal injuries that, in particular, become a problem mainly later in life. Visitors to the DFKI booth at CeBIT 2015 can get an idea just how a sensor suit can serve as protection in the workplace against physical strain and injury. Researchers at the DFKI Cyber-Physical Systems Labs have attached a miniature sensor network to a 24-inch tall wooden puppet to demonstrate how the puppet's movements can be detected and measured.

In the context of the collaborative project SIRKA ("Sensor Suit for Individual Feedback on Physical Activity"), a development team at the company Budelmann Elektronik in Munster, Germany is working on a sensor suit that identifies strenuous physical exertion and proposes alternative movements. Integrated miniature sensors measure the movements of the wearer and call immediate attention to adverse movement patterns. Specific application scenarios, for example, include the work activities of shipyard workers (welders and electricians) and emergency medical teams.

Under the framework of its research funding priority "Human Computer Interaction in Demographic Change," the Federal Ministry of Education and Research (BMBF) launched this collaborative project in May 2014 with funding in the amount of 1.1 million euros. The total funding for the two-year project is about 1.88 million euros. Seven partners from the German industrial and research communities are working in close cooperation on the project. In addition to lead manager Budelmann Elektronik, other partners include: Rofa Clothing in Schüttorf, MEYER WERFT in Papenburg, Johanniter Ambulance Service in Berne, DFKI-Bremen, OFFIS - Institute of Information Technology in Oldenburg, and the Osnabrück University of Applied Sciences.

The suit is designed for use in a two-step procedure: First, the diagnostic function produces a detailed record of the movements. Occupational health specialists, physiotherapists, and users then jointly analyze the data to determine a basis for initiating preventive and rehabilitative measures. For example, critical movement patterns can be replaced by others or avoided entirely through the introduction and use of tools or other aids. The collection and analysis of data is performed taking data security into account. In a second step, the suit itself assists in the implementation of the findings. By means of an acoustic warning signal, the suit alerts the wearer about to undertake a dangerous movement. As a result, the trained wearer is aware of the risky behavior and has the possibility to correct it. Furthermore, the cumulative daily loads can be recorded for self-monitoring purposes.

After a successful conclusion of the project, the sensor suit may find application in other occupational fields. Future workers will be protected and will be able to enjoy long and healthy careers thanks to direct intervention and preventive measures. ◀

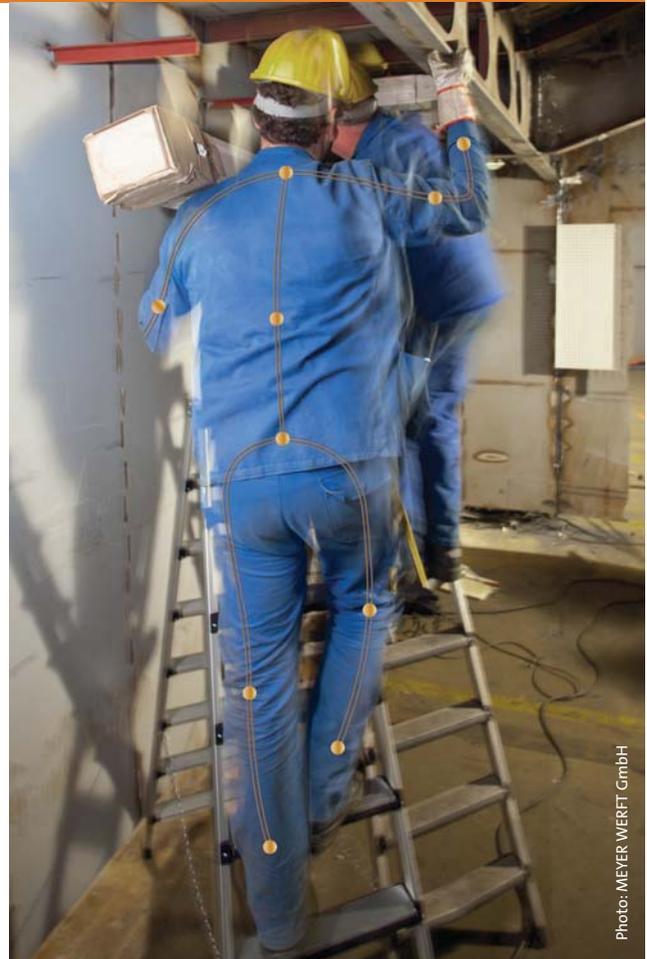


Photo: MEYER WERFT GmbH

Collection and analysis points from the SIRKA sensor suit

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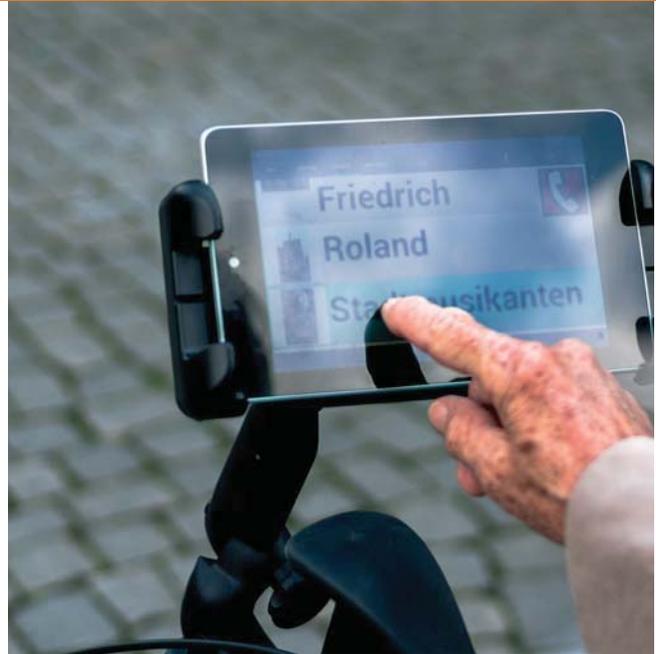
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of Education
and Research



Electronic hand grips signal the proper direction



ASSAM navigation support system mounted on walker

ASSAM – Intelligent Mobility Support

► Mobility platforms such as walkers and wheelchairs assist the elderly to remain mobile despite the everyday presence of equilibrium problems or an unsteady gait. If additional constraints become relevant, for example, vision or hearing impairments or loss of orientation, the usual platforms alone are no longer adequate to ensure safe movement. The research project ASSAM (Assistants for Safe Mobility) develops mobility assistant systems that aid the elderly to compensate for cognitive handicaps and declining capabilities. This research is being conducted by a European consortium consisting of social organizations, suppliers, and research institutes with a focus on modular components for commercially available walkers, wheelchairs, or the innovative new Tricycles. To keep costs manageable, the mobility assistants can be selectively expanded by components that meet the current needs of the user.

Included among the variety of individual components, for example, is the ASSAM Navigation Aid, which attaches to the walker in the form of a tablet-PC. Used in combination with the ASSAM OdoWheel, which easily attaches to the walker in place of the normal rear wheels, the Navigation Aid determines speed and direction and guides the user safely to the chosen destination. Route planning is designed to avoid cobblestone pavements or gravel surfaces as much as possible. There is also an emergency button which can be activated at any time to contact a Red Cross worker.

For individuals with declining vision or hearing impairments, the walker can also be equipped with two electronic hand grips, the iHandleBars. By means of vibration or light signals, if preferred, the respective grip will inform the user of the direction to be taken in order to arrive at the goal. Support can also be obtained on sloping terrains simply by replacing the walker wheels with electric iWheels. These make it easier to walk uphill and brake automatically as the walker makes its way down a slope.

Equipped with laser scanners, the mobility assistant automatically bypasses obstacles or stops, for example, at a curb or stairway. Wheelchairs, especially in mapped interior environments, can be autonomously controlled directly by voice commands.

The collaborative project ASSAM is funded under the EU AAL JP (Ambient Assisted Living Joint Programme) and the German Ministry of Education and Research (BMBF), the Spanish Ministerio de Industria, Turismo y Comercio, and the Dutch Ministry of Health, Welfare and Sport (VWS) for a period of three years. The project launch was on June 1, 2012, bringing together collaborative partners from Germany, Spain, and The Netherlands: DFKI (D), Budelmann Elektronik (D), Die Johanniter (D), neusta mobile solutions (D), Universitat Politècnica de Catalunya – BarcelonaTech (ES), Centre de Vida Independent (ES), Utrecht School of the Arts (NL), Stichting Bartiméus (NL), and Ecobike (ES). ◀

More information
www.assam-project.eu

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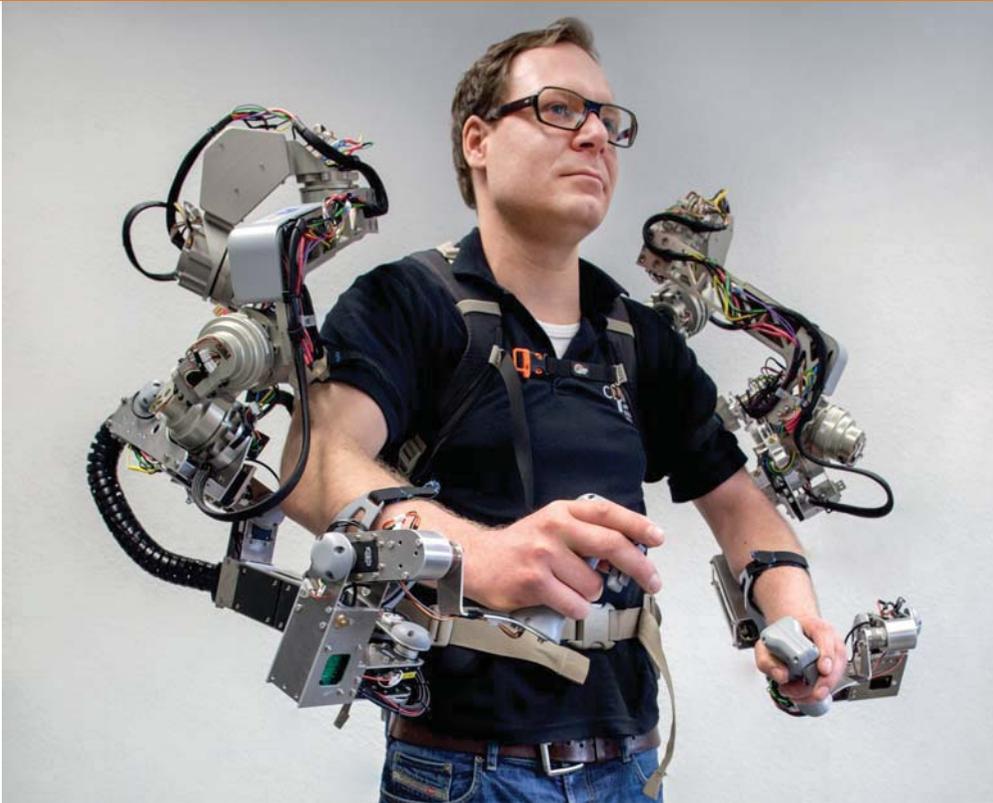


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Motion prediction with pySPACE and reSPACE supports rehabilitation through biosignal analysis.

New Software for Mobile Big Data in Robotics

► The topic of Big Data poses huge challenges for researchers and developers. In robotics, especially, very large amounts of data must be processed in a very short time to breathe life into a robot and allow it to operate autonomously in real time. For this reason, researchers at the Robotics Innovation Center (RIC) are developing the software frameworks reSPACE (Reconfigurable Signal Processing And Classification Environment) and pySPACE (Signal Processing And Classification Environment written in Python) for processing massive data volumes in the field of machine learning and signal processing.

Faced with the spatial constraints of mobile robotic systems and the high power requirement of conventional processors, the robots of the RIC scientists have come to rely on Field Programmable Gate Arrays (FPGAs) which consist of many individual logic components. To exploit their use in robotics, reSPACE was developed. FPGAs enable parallel processing operations and are capable of processing huge amounts of data in short periods of time. reSPACE defines the various application-specific computing operations that are then combined in a building block approach for a data flow accelerator and provided to the FPGA.

Unlike reSPACE, the pySPACE software runs on all conventional CPUs, from distributed high performance computing systems to mobile systems. The open source software is easily configured and enables the parallel execution of complex comparisons as well as the optimization and visualization of more than 200 different processing and evaluation methods. An automatically generated high performance interface provides access from pySPACE to reSPACE and in this way, time critical processing steps can be stored on the FPGA.

The board that houses the FPGA chip was designed at RIC and is only 7 x 10 cm in size, which allows it to be built into the center's own robot systems like Mantis or Sherpa. In addition, plans call for integration in an exoskeleton,

which is being developed under the framework of the research project RECUPERA-Reha for future use in robot-aided rehabilitation of neurologic disorders. The exoskeleton can be controlled using the real time evaluation of EEG data. FPGAs manage the huge data volumes involved within just a few milliseconds. With the aid of reSPACE and pySPACE, researchers are able to predict, for example, when the patient will move an arm. Such information is required to ensure that the exoskeleton supports the arm movement at just the right moment. ◀

More information
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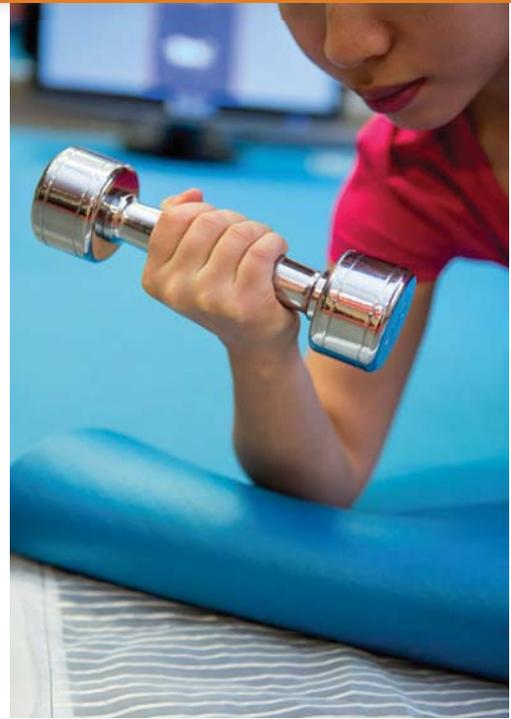
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SmartMat – The Intelligent Sport Mat as Personal Fitness Trainer

► More and more health conscious people are investing a lot of time in fitness programs like yoga, Pilates, or gymnastics. The SmartMat, an intelligent sport mat originated in the DFKI project Simple Skin, assumes the role of a digital trainer to help the user exercise properly. The mat looks like an ordinary exercise mat, but actually has more than 7000 embedded sensor nodes made from a very light and inexpensive fabric. The textile sensor pad can easily be rolled up and transported.

When the user is training on the mat, the system receives a fine grained, two-dimensional pressure profile from the pad. It identifies what body part is in contact with the mat, how much pressure is being applied, and displays this information on a monitor or a smartphone.

SmartMat recognizes dynamic movements like sit-ups, push-ups, oblique crunches, and notes whether the user can find the right balance between strength and technique when performing slower exercises like those of yoga, or whether the movement is smooth or abrupt. The sensor system of the mat is not only able to detect the number of repetitions of an exercise, but can



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also record the intensity, speed, duration, recovery time and even the respiration rate in the relaxation phase. It is so sensitive that it can determine the exact weight of a dumbbell placed on the mat. ◀

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

SmartCity Living Lab – Technologies for the City of the Future

► At DFKI-Kaiserslautern, the SmartCity Living Lab (SCLL) cooperates with partner institutions in researching how the latest technologies can contribute to sustainable development in urban areas.

The DFKI Living Lab combines the competencies of several research areas to explore the possibilities of developing modern, innovative information systems for use in urban areas and to develop the potential of intelligent technology solutions for environmental and social progress. Many interest groups are included, particularly, the citizens as users and idea generators for a future oriented urban development in terms of municipal events and daily city living.

At CeBIT, the SCLL scientists present their lab and their ongoing research in the fields of mobility, civic participation and crowd management. The exhibit includes systems that capture and analyze the behaviors of crowds in real time, assist individuals with parking in the city, and are used by urban planners.

The research at SCLL is based on three pillars: Measurement & Understanding, Interaction & Use, Participation & Shaping. These systems are event oriented (short term) as well as development oriented (long term).

The technological foundation of the SmartCity Living Lab is an open platform for all citizens, institutions, and business in a city, where current data generated from various sensors in the environment and from users is analyzed. It identifies interrelationships, extracts knowledge, and provides the findings as value added services with insightful perspectives back to the users. ◀

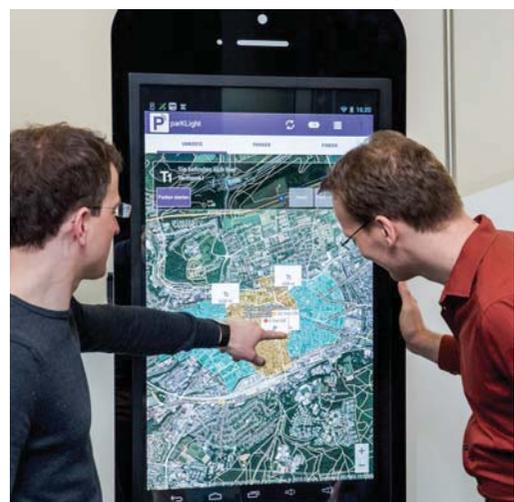
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More information
www.dfki.de/scll

The parkLight app from the SmartCity Living Lab assists drivers to navigate to the next free parking spot.



SPRINTER – Language Technologies for Interactive, Multimedia Language Training

► An online knowledge and exercise platform tailored to the individual needs of the student and interactive services complement the conventional language training programs and provide a new approach to multimedia-based and people-oriented teaching and learning. Online courses provide access to learning materials for an unlimited number of participants, regardless of time and location.

DFKI's language technology team joined forces with LinguaTV, a Berlin-based supplier of video training, to develop intelligent software programs that make the platform more interactive and personal. The SPRINTER research project is part of the "KMU Innovativ" initiative (Innovative SMEs) of the German Federal Ministry of Education and Research (BMBF).

The web based platform from LinguaTV is an interactive and multimedia foreign language training that enables students to learn intensively with the aid of instructional videos, interactive exercises, learning games and to test their language skills in terms of vocabulary, grammar, and pronunciation using a modular e-Learning service.

The language technology solutions from DFKI create dialog-based learning situations and expand the platform to linguistically based automated exercises and linguistic knowledge for quality management in addition to customized pronunciation training, and games that not only enhance effective learning, but raise the motivation levels of the learners.



Photo: LinguaTV

The collaborative project was presented as a sponsored project at the BMBF "KMU-innovativ: ICT – Intelligent Systems Through Cooperation" conference held in Berlin on November 17-18, 2014. ◀



More information
<http://sprinter.dfki.de>

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Innovation Forum Semantic Media Web – Digital Curation

► After intensive support by the DFKI Language Technologies Lab, the Innovation Forum – Semantic Media Web, organized by the Berlin based non-profit organization Xinnovations, was convened in the Senate Hall of Humboldt University, Berlin on October 6, 2014.

The presentations at the event framed the subject "Digital Curation" or, more precisely, digital curating technologies. This term refers to the smart technologies that help companies in the content industry, for example, publishers, media companies, digital agencies, platform suppliers, and software vendors. Specifically, curating involves the use of intelligent language systems and workflows to enable the management of multimedia digital content, or the drastic simplification of the relevant processes. This is especially useful to editors, knowledge workers, developers, and project teams and is achieved through the application of semantic text analysis and text generation processes as well as multilingual technologies.

Following the keynote address "Digital Curation Technologies - Intelligent Software for the Workplace of Tomorrow" by Dr. Georg Rehm and Prof. Felix Sasaki, other presenters from several industrial sectors shared their views and experiences

with digital curating processes. In the closing talk, "Multilingual and Semantic Technologies," Prof. Sasaki and Dr. Rehm explained the technologies and the focus of the research in detail.

Since 2013, the Semantic Media Web event has served the ongoing preparations for a large-scale collaborative project with SMEs based in Berlin. The aim is to develop a platform for digital curating technologies. ◀

More information
www.semantic-media-web.de
www.xinnovations.de

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Intelligent Assistance Systems for INDUSTRIE 4.0 and a Serious Game to Avoid Indebtedness – CeLTech Presents Current Research in the Field of e-Learning

CeLTech

Center for Learning
Technology

Serious Game helps stop young people from going into debt

▶ Young people get into debt because of their cell phones: a study of those in the under 25-year-old group who sought a debt advisor in the year 2013, found that 18% of their liabilities were owed to telecommunication firms. The overall average is only 2.6%.

The Center for Learning Technology together with partners in the Saar-Lor-Lux region develops the innovative “GWVU” project (Cross-border Workshop for Preventing Indebtedness), a broad concept with comprehensive measures for the avoidance of debt situations for young people.

CeLTech, in particular, is responsible for the development of a serious game, which informs and sensitizes the entire region to the problem of indebtedness. Various methodical approaches were taken as to how to prevent young people from falling into the debt trap. Special emphasis was placed on linking methodical-didactic reflection with inspirational game elements. An exciting adventure game incidentally connects various forms of learning: The players learn to manage financial emergencies in a positive way and, in the process, gain knowledge and options for their own monetary situation. This collaborative project is sponsored by the European Regional Development Fund's “Interreg IVa” program.

Try out this learning game online at: <http://games.celtech.de>

Intelligent-adaptive assistance systems for knowledge and skills in support of INDUSTRIE 4.0

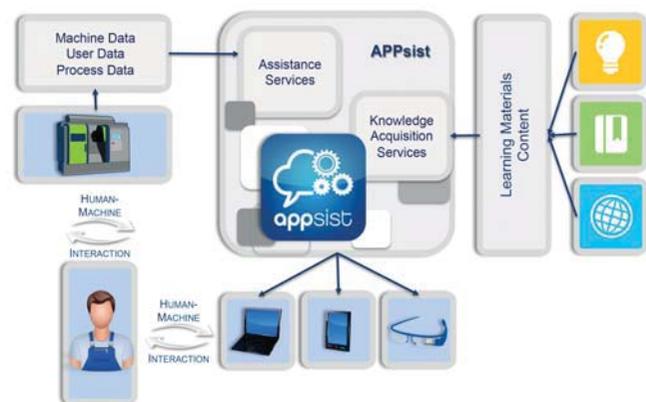
The ever-growing complexity of INDUSTRIE 4.0 manufacturing plants calls for new approaches to transfer expertise about an activity or a process to employees. The collaborative project “APPsist” aims to develop a new generation of mobile, context sensitive, and intelligent-adaptive assistance systems for knowledge and management support in smart manufacturing. Three DFKI research groups are included: CeLTech, Innovative Retail Laboratory (IRL) and the Institute for Information Systems (IW). CeLTech's contribution focuses on qualification of the staff and attempts to compensate for any skills that may be lacking. In addition, they develop AI-based learning assistance systems with the aim of facilitating continuing education

for the staff. This support includes the setup, the initial acceptance, and operation of a manufacturing unit in the production process, as well as the preventive maintenance, maintenance, and troubleshooting.

The continuous expansion of staff expertise is made possible through the acquisition of knowledge and skills in relation to production, product, and process. The aim is to promote the professional development of the staff so that they can gradually start to perform more demanding tasks and serve as a counterbalance to the demographic change and the shortage of skilled workers.

The collaborative project is funded under the initiative “Autonomics for INDUSTRIE 4.0” at the German Federal Ministry for Economic Affairs and Energy (BMWi). ◀

More information
<http://celtech.dfki.de>



Supported by:



Contact

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CeBIT Hall 9, Stand F43



Photo: Saarstahl

iPRODIGT brings BIG DATA and BIG STEEL together

► Every year Saarstahl, with headquarters in Völklingen, Germany produces more than two million tons of high value steel products for use mainly in the automobile industry. Over the course of a year, more than 100 terabytes of quality control data is recorded over a complex sensor network that includes laser, ultrasound, video, vibration, and temperature sensors. This corresponds to the content of more than 30 million telephone books. A new approach to business process optimization is currently being studied that will enable the real time analysis of digitally combined manufacturing and business data.

Saarstahl is participating in “Intelligent Process Prediction based on Big Data Analytics” (iPRODIGT), a research project sponsored by the Federal Ministry of Education and Research (BMBF) to more fully exploit the value adding potential of such data in another step towards implementing INDUSTRIE 4.0.

“The federal state of Saarland, in comparison to other states, has the second highest density of industrial companies while at the same time being a globally recognized computer technology center,” said Annegret Kramp-Karrenbauer, Minister President of Saarland, at a press conference on January 28, 2015. “The fact that the first application-oriented industrial pilot program related to the topic INDUSTRIE 4.0 is now being launched in Saarland logically combines two of the special advantages of our state and creates added value for the region and beyond.”

iPRODIGT is an intelligent approach to the automated improve-

ment of business and production processes and, in addition to the Saarstahl users, consists of an interdisciplinary team of researchers (DFKI, Fraunhofer-Institute for Intelligent Analysis and Information Systems IAIS, industry experts Blue Yonder, Pattern Recognition Company, and Software AG) under the lead management of DFKI.

“iPRODIGT demonstrates how Big Data can be exploited in an enterprise to optimize production processes and accomplish forward looking planning.” In summarizing the advantages of iPRODIGT, Prof. Dr. Wolf-Dieter Lukas, responsible manager for BMBF, said, “Such tools allow us to turn the comprehensive manufacturing data, which was previously unused, into a valuable production resource.”

The aim of iPRODIGT at Saarstahl is to integrate the sensor network that monitors production with the business information systems. Quality fluctuations in the processed steel – the 2.5 million tons produced at the Völklinger plant each year that must be further processed – will then be detected early and will enable the anticipation of necessary changes in the manufacturing or business processes. Such digitally integrated industrial enterprises can forecast the optimal business processes and automatically transfer them to process management. For example, if quality variations can be predicted early enough, product-related test procedures can be omitted and post processing planned while the production is still ongoing. This clearly shows how iPRODIGT supports the optimal utilization of production resources.

“iPRODIGT develops the next generation of production planning software – made in Germany. Such systems capture each event in the current production by means of sensor networks and then compare this to historical data stored in large databases. This permits prediction of future events and the enterprise can react to events before they actually happen,” explained Dr. Dirk Werth from DFKI.

“The digital networking is already an important added value factor for a company like Saarstahl with global operations and customers that demand the highest quality in ever-shorter product cycles. If iPRODIGT lets us optimize future production processes or even achieve cost savings, it is certainly a very

promising approach, said Dr. Karlheinz Blessing, chairperson of the management board at Saarstahl.

The approach developed in iPRODIGT will be implemented, tested, and validated as a technology prototype in the process manufacturing at Saarstahl. This not only underscores the feasibility of the technological approach, but also highlights the potential benefits of INDUSTRIE 4.0. ◀

More information
www.iprodict.de

Control room at the Völklingen steel plant



Photo: Saarstahl



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Federal Ministry
of Education
and Research

Contact

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Seated at the table from l. to r.: Dr. Karlheinz Blessing, Chairperson, Saarstahl AG, Annegret Kramp-Karrenbauer, Minister President of Saarland, Dr. Wolfram Jost, CTO, Software AG, and Prof. Dr. Peter Loos, Director, Institute for Information Systems at DFKI. The project consortium is pictured in the background.



Photo: Saarstahl



INDUSTRIE 4.0 – Network Progress

smartFactory^{KL}

► Again this year, DFKI and the *SmartFactory^{KL}* are presenting the vision of the factory of the future at the world's largest industrial trade fair, the Hannover Messe - HMI. The main exhibit at the INDUSTRIE 4.0 Forum, an initiative of Deutsche Messe in Hall 8, Stand D20, is the one-of-a-kind INDUSTRIE 4.0 demonstrator created by DFKI and its partner network.

At the joint DFKI-*SmartFactory^{KL}* stand, visitors can learn about the continuing development of the INDUSTRIE 4.0 modular manufacturing plant. A consortium of industrial and research partners now numbering 16 members is responsible for the implementation of the unique demonstrator. In addition to their own requirements and innovative approaches, participants in this ambitious project contribute their expertise and research findings from various fields of application and research. Uniform standards facilitate vendor-independent communication between the modules and machines and, using practical examples, the feasibility of this vision of flexible and efficient manufacturing is clearly demonstrated.

INDUSTRIE 4.0 and the *SmartFactory^{KL}*

INDUSTRIE 4.0 is the term used to describe the networking of industrial manufacturing with the Internet of Things and Services. Each individual manufacturing element becomes intelligent and has the capability to communicate after being given a unique identity in the network with its own IP address and computing power. A modular, networked production system is created in which physical objects can be tracked and controlled in real time using information technologies. The *SmartFactory^{KL}* studies and demonstrates this visionary concept in close cooperation with DFKI Kaiserslautern and many industrial partners. The joint technology initiative *SmartFactory^{KL}* currently has 36 partners from industry, research, and teaching using this platform for joint development and to advance the implementation of INDUSTRIE 4.0.

The technology initiative *SmartFactory^{KL}* and DFKI have expanded the demonstration unit with new modules and additional options for the Hannover Messe 2015 (April 13 - 17). The use of "Plug & Produce" – the rapid change and direct operation of individual components during the production process – is clearly illustrated in the application. At the same time, existing modules have been modified and further developed in the context of expanding the overall concept. Requirements and their technical solutions are developed by the partners in collaborative discussions. The joint redesign of the demonstrator is also a research scenario that provides the partners with the opportunity to advance their own research and development and test it on a running object.

In addition, the redesigned unit interprets more important INDUSTRIE 4.0 topics. In the past, a uniform system supplied the comprehensive infrastructure or "backbone" that provided the unit with its network and power. At the trade fair this year, this is provided by different, some commercial, vendor-specific infrastructure boxes that provide individual functions and supply the modules via standard interfaces. Even comprehensive IT systems can be more closely integrated and networked in the current version of the INDUSTRIE 4.0 unit. ◀

More information
www.smartfactory-kl.de

Contact

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3Digify – Make Your Own 3D Scanner!

► 3Digify is a software product that enables the relatively easy and low cost construction of a fully operational 3D scanner simply by integrating a standard camera and a projector with a computer. 3Digify controls the interface and processes the generated data. The construction permits the digital 3D imaging of various objects.

3Digify uses an active 3D scanning method that measures the surface of an object using striped patterns. Unlike passive methods that only compute geometry, size, and color from pictures of the object, this method can achieve significantly greater precision. Comparable scanning methods have been used for years, for example, for measuring and replicating components or for digitally documenting and preserving cultural objects. The aim of 3Digify is to make accurate 3D scanning affordable to everyone and to keep the initial costs as low as possible.

3Digify is purely a software component – the user chooses what hardware will be used. A system with a webcam and a mini-projector is already available for just a few hundred euros. The reconstruction quality of 3Digify is directly proportional to the camera resolution. 3Digify supports all cameras in the Canon EOS series, industrial cameras from Allied Vision Tech-

nologies, and in the very near future, Nikon and Sony models as well as webcams.

3Digify was designed and developed at the Kaiserslautern University of Technology by two PhD students at DFKI's Augmented Reality department. ◀



More information und Anmeldung
www.3digify.com

CeBIT Hall 9, Stand D23

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4th International Symposium on Pervasive Displays in Saarbrücken

► DFKI Saarbrücken is hosting the “PerDis” conference on June 10-12, 2015. This relatively new conference brings together scientists and researchers from various fields to discuss the challenges and opportunities presented by the growing presence of public viewing screens and to test the possibilities of converting these screens from unidirectional information medium to multi-directional communication medium.

The purpose of the conference is to bring together representatives from the industrial, art, and research communities and, based on common interests, to initiate new future-oriented projects. The priority is on the so called public viewing screens and the question of how to make such displays interactive in the future while also being available on private displays, for example, the user's smartphone or tablet.

Several studies from the research, artistic, and commercial areas will be presented in cooperation with HBKsaar (the College of Fine Arts in Saarland). Furthermore, HBKsaar has the possibility to present its own projects in the context of an open stage demo session on the media wall. Visitors will also be able to experience other exhibits in the Visualization Center at DFKI Saarbrücken. In addition to lectures on the potential of these screens in public or semi-public spaces, tutorials about the technologies are also planned. The conference this year is organized by the co-chairs, Prof. Dr. Antonio Krüger and Dr. Sven Gehring, from the DFKI Innovative Retail Lab.

Earlier conferences have been organized at the University of Copenhagen (2014), the University of Minho in Porto, Portugal (2012), and the Google Campus in Mountain View, California (2013). ◀

More information und Anmeldung
www.pervasivedisplays.org/2015

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Research Group wearHEALTH Wins BMBF Competition “Improving Interdisciplinary Skills”

Social Information Systems and Mobile Healthcare Systems

► The Federal Ministry of Education and Research (BMBF) sponsors uniquely talented post doctorate candidates in establishing their own group of young researchers. One of the eight groups selected is wearHEALTH under the management of Dr. Gabriele Bleser from DFKI Kaiserslautern.

During the next five years, the interdisciplinary team will work in the computer science department at TU Kaiserslautern in close cooperation with DFKI's Augmented Reality department to develop reliable technologies and systems for motion analysis studies and the promotion of physical health in the context of mobile health (mHealth). The focus of wearHEALTH is the detailed capture and analysis of biomechanical and anatomical movements, and to give optimized and personalized feedback to the user. The results can be taken into account in a variety of health care applications, for example, in the areas of prevention and rehabilitation.

“Technology must serve the people, not the other way around,” said Germany's Education and Research Minister Prof. Dr. Johanna Wanka at the awards ceremony for the outstanding collaborative research groups on January 15, 2015 in Berlin. Even though assistance systems have helping people for a long time, the future acceptance and usability of new technical systems must be a top priority, according to Wanka. ◀



Minister Prof. Wanka and Dr. Gabriele Bleser

More information
www.wearhealth.de

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Second Software Campus Summit: Participants and Graduates Present Their IT Research at BMBF

► The Federal Ministry of Education and Research (BMBF), as the sponsor of the program, hosted the event in its new facility on Kapelle-Ufer in central Berlin on February 10, 2015. Eight of the 40 participants who presented their research to program partners in Berlin came from DFKI.

Prof. Wolfgang Wahlster with DFKI Software Campus participants Christina di Valentin, Alexander Löffler, Kathrin Eichler, Gerrit Kahl, Jochen Frey, Jens Hauptert, Sabine Janzen (Saarland University), Jana-Rebecca Rehse, and Sebastian Krause



Photo: EIT ICT Labs Germany / news aktuell / Daniel Reinhardt

The IT research projects – ranging from security to health care to gamification – were presented in lectures, demos, and posters. Another key focus of the 2d summit was the expansion of the existing network of academic and industry partners. Besides the award of 14 more diplomas by Dr. Harald Schöning (Software AG) and Prof. Dr. Wolfgang Wahlster (DFKI), the kick-off of the alumni organization provided another highlight.

Each year, up to 100 outstanding master's and PhD candidates are accepted at the Software Campus. They have the chance to realize and manage their own IT ideas. The BMBF finances the IT projects with up to 100,000 euros for a maximum term of two years. The participants have the benefit of a mentor, normally a successful manager at one of the industry partners, to support their personal development. In special training courses, the Software Campus teaches methods and leadership skills as well as social skills. The first class network of industry and research contacts opens new career paths for all participants. ◀

More information
www.softwarecampus.de

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Maastricht University Awards Honorary Doctorate to Professor Wahlster

► Maastricht University presented the honorary doctorate to Wolfgang Wahlster during the university's 39th anniversary celebration or Dies Natalis on January 16, 2015. Nominated by the Faculty of Humanities and Sciences, the University Senate and Council granted Wahlster what is now his third honorary doctorate for his work in the field of artificial intelligence and knowledge based systems.

During the official celebration in St. John's Church (Sint Janskerk), four exceptional individuals were presented honorary

Prof. Wolfgang Wahlster, Prof. Luc Soete, Jimmy Wales, Frans Timmermans, and Prof. Michelle Craske



Photo: Maastricht University

doctorates for their outstanding contributions to education and research. In addition to DFKI CEO Prof. Wolfgang Wahlster, the other awardees included Frans Timmermans, European Commissioner and First Vice-President of the Junker Commission, Jimmy Wales, founder of the online encyclopedia Wikipedia, and Michelle Craske, Professor of Psychology, Psychiatry and Biobehavioral Sciences at the University of California in Los Angeles (UCLA).

Gerhard Weiss, Professor for Computer Science and Artificial Intelligence at Maastricht University, gave the laudation and highlighted the outstanding reputation of Prof. Wahlster in the field of AI research.

Prof. Luc Soete, University President, further emphasized in the appointment letter: "With the establishment of the DFKI, among other things, Wolfgang Wahlster has shown how to successfully integrate research, teaching and applied technology based on knowledge technology and artificial intelligence, which makes him a unique source of inspiration for the Department of Knowledge Engineering at Maastricht University."

In his acceptance remarks, Prof. Wahlster expressed appreciation for having the privilege of being included in such an outstanding group of honorary doctorates in Maastricht. ◀

More information

www.maastrichtuniversity.nl
www.dfki.de/~wahlster

Professor Rolf Drechsler Elevated to IEEE Fellow

► The Institute of Electrical and Electronics Engineers (IEEE), the world's leading association of electronics and computer science professionals has conferred the title "IEEE Fellow" to Prof. Dr. Rolf Drechsler for his outstanding scientific achievements. The DFKI researcher and professor at the University of Bremen earned this title in recognition of his "contributions to the testing and verification of electronic circuits."

The granting of "IEEE Fellow" status signifies a special membership grade in IEEE. This distinction is reserved for select members whose qualifications and accomplishments in any of the fields of the IEEE areas of interest are deemed fitting of this grade elevation. It is the highest possible grade that can be attained within the organization. The exclusivity of being selected for this grade is evident from the fact that the total number selected in any one year does not exceed one-tenth of one percent of the total voting membership of the Institute.

Rolf Drechsler studied mathematics and computer science at Johann Wolfgang Goethe University in Frankfurt, where he also earned a doctorate. In 1999, he habilitated at the University of Freiburg. Previous to accepting the position at the University of Bremen in 2001, he worked at the central technology department at the center for automated development platforms at Siemens, Munich. Drechsler heads the computer architecture working group at the department of Mathematics/Computer



Photo: Lisa Jungmann / Uni Bremen

Prof. Rolf Drechsler

Science at the University of Bremen and, since 2011, also the department of Cyber-Physical Systems at DFKI. This DFKI research focuses on formal methods, cognitive systems, and quality-driven design of embedded systems. ◀

More information

www.ieee.org
www.dfki.de/cps

► DFKI Interview – Markus Weber

Markus Weber is a researcher in the department of Intelligent User Interfaces at DFKI-Saarbrücken and R&D at the DFKI spin-off digipen technologies in Kaiserslautern.

What do you see as the potential application of your research?

The focus of my work is on simple, intuitive user input with digital pens. Handwriting has been known for centuries in our cultures to communicate, to record our thoughts, or to declare our intentions with a signature on a contract. A simple signature on paper with the biometric signature from digisign initiates a digital signature process. This capability closes the gap between the familiar analog world of paper and the modern digital world. The fact that digisign is a winner of this year's Innovation Award at CeBIT shows that there is great interest in this kind of natural interaction.

When did your interest in Artificial Intelligence begin and how have AI processes changed since that time?

After earning my bachelor degree in computer science at the university in Trier, I switched to TU Kaiserslautern for my master's program to learn more about intelligent systems. I started work at DFKI in 2008, where the focus of my research has been on AI-aided, digital pen technologies and gesture-based interaction.

Many AI systems are so common in our everyday lives today that we take them for granted, for example, Apple's Siri, the handwriting recognition feature of Samsung Notes, or Microsoft's Kinect, which enables interaction on the basis of gestures.

What are the greatest challenges and opportunities for AI systems?

The days when we thought of a computer as a box with a keyboard, a mouse, and a monitor are long gone. All the new interactive input methods – natural language, handwriting, gestures – force us to think again about our interaction with the computer. AI systems can help achieve a better understanding of people and their input stimuli.

What do you enjoy doing when you are not working as research scientist?

Because of my "second job" at digipen technologies, I do not have a whole lot of leisure time available. The time that I do have, I prefer to spend with my family. The birth of my son last November changed my life for the positive forever.



Do you see any parallels to your professional work?

Working with artificial intelligence, it is easy to see how impressive and superior nature still is. With our help, a small child quickly masters how to learn about writing, languages, and gestures and how to interpret them.

What are your current projects?

In the context of the Kognit project, we are investigating interaction scenarios to help people with dementia to control their everyday lives. An episodic, visual memory can help people to remember some daily event. The pen is a familiar, intuitive input medium, which through direct digitization of the script creates a bridge to digital communication without overwhelming people.

▶ ITH Conference 2015 – “Innovative Technologies for Commerce”

For the sixth consecutive year, DFKI's Innovative Retail Lab is organizing the annual “Innovative Technologies for Commerce conference (ITH).” The 2-day conference will take place on July 9-10, 2015, in St. Wendel, Saarland. The official sponsor of the event is Anke Rehlinger, Saarland's Minister for Economics, Labor, Energy, and Transportation.

The goal of the conference is to present and discuss selected keynote speeches dealing with the latest research developments and trends in the trade. Once again, in addition to numerous interesting talks presented by members of the industrial, retail, and research communities, the conference represents a major marketplace for innovation. Selected exhibits serve to illustrate the latest developments.

The Innovative Retail Laboratory (IRL) is the application-oriented research lab of DFKI and is located at the GLOBUS SB-Warehouse headquarters in St. Wendel. Established in 2007, in concert with project partner GLOBUS, IRL evaluates innovative uses in realistic application scenarios.

For more information and registration:
www.innovative-retail.de

▶ 80th Birthday Congratulations!

Thomas Leppien (born in Homburg in 1935) was employed until his retirement in the year 1995 at the German Research Foundation (DFG). Leppien was a key supporter of the DFG concept of collaborative research – and the associated research at technical universities in Germany. Without his skillful negotiating style and concern for quality as well as his willingness to accept risks, the special subject area of Artificial Intelligence (SFB 314, 1985-1995) would never have been established – and ultimately, there would be no DFKI today. Mr. Leppien always was a strong supporter of collaborative basic research between universities and industrial programmers, and he played an extremely important role in the meetings leading up to the establishment of DFKI. Because of his excellent relationship with the former Economics Minister of Saarland in the 80s, he was also successful in gaining approval for additional computer science chairs at the university. Mr. Leppien was named an honorary Senator of Saarland University in 1998 - partially, for his decisive role in establishing Saarbrücken's reputation as a computer science center. DFKI extends a hearty congratulation to him on the occasion of his 80th birthday.



Prof. Jörg Siekmann, former head of DFKI's Deduction and Multiagent Systems Department, Thomas Leppien, and Prof. Wolfgang Wahlster in 2013

▶ New Concepts for Intelligent Mobility – DFKI Partners With Volkswagen Data Lab

DFKI will partner with the newly established Volkswagen Data Lab in Munich. The purpose is to cooperate in the development of new IT systems in the areas of Big Data and the Internet of Things. The priority is on developing new data analysis methods as well as networks for customers and their cars in the so called “Smart Environment.” The lessons learned are incorporated into the development of new IT services. The Volkswagen Data Lab partner network also includes, among others, the Ludwig-Maximilian University (LMU) Munich, the University of St. Gallen, leading Big Data firms and promising start-ups.

▶ Minister President Malu Dreyer Visits DFKI



The main focus of a visit to DFKI Kaiserslautern on November 6, 2014 by Malu Dreyer, Minister President of the state of Rhineland-Palatinate, was on the intelligent software technologies in various fields of research – in particular, those relevant to INDUSTRIE 4.0.

The minister president praised the successful efforts and assured the continued support for DFKI, wherever possible. She emphasized the exemplary role performed by DFKI in the successful spin-off of several innovative technology companies. During her visit, the minister president experienced INDUSTRIE 4.0 production scenarios as they ran on the research demonstrator *SmartFactory*^{KL}.

► DFKI takes 2 of 3 Categories at the *KL-gründet* Initiative Awards

Starting a business requires more than just a good idea; it takes, above all, courage. The “*KL-gründet*” initiative honored both at an awards ceremony held at the Fruchthalle in Kaiserslautern on November 4, 2014. At the event attended by more than 250 guests, prizes were awarded in three categories – two of which were awarded to DFKI. The award for “Idea of the Year” went to Dr. Nils Petersen of the Augmented Reality department for the development of “Augmented Reality Handbooks,” now being implemented by a DFKI spin-off company. Andreas Dengel, site director at DFKI Kaiserslautern was honored as the “Start-up Consultant of the Year.”



Prof. Dengel (r.), Dr. Nils Petersen (2d from l.)

„*KL gründet*“ is a joint initiative of government, business, and research in the West Palatinate and aims to identify innovative start-ups and give special recognition to people who promote new business ideas or support the launch of a new enterprise.

► “INDUSTRIE 4.0 – The Internet of Things Has Reached the Factory” – Prof. Wahlster Addresses Darmstadt's Chamber of Commerce and Industry

Following the steam engine, mass production, and even manufacturing automation, the key word “INDUSTRIE 4.0” describes the next revolution in industrial development. On January 22, 2015, Prof. Dr. Wolfgang Wahlster presented a lecture to an audience of 200 guests in a sold-out event at the Darmstadt Chamber of Commerce and Industry (IHK). The topic was the networking of machines and products in the manufacturing and work processes. The event was arranged at the invitation of Brigitte Zypries, State Secretary at the Federal Ministry for Economic Affairs and member of the German parliament.

More information
www.darmstadt.ihk.de



Photo: IHK Darmstadt/Dagmar Mendel

(l. to r.) Holger Frank (IHK), Prof. Wolfgang Wahlster, Brigitte Zypries (Member of the Bundestag), Prof. Hans Jürgen Prömel (TU Darmstadt), Goodarz Mahbobi (axsessio GmbH)

► New Publication About Cyber-Physical Systems (CPS)

In their recent publication “Formal Specification Level: Concepts, Methods, and Algorithms,” Dr. Mathias Soeken and Prof. Dr. Rolf Drechsler from the Cyber-Physical Systems Lab introduced a new level of abstraction in the design process for complex electronic systems, which closes the gap between textual descriptions of embedded systems and their implementation at the electronic system level. This new formal specification level facilitates the semi-automatic compilation of the textual description into a formal model in addition to the execution of verification methods. The discovery not only improves the quality of the design, but enables errors to be detected early in the design process. The book was published in November 2014 by Springer and is now available as a bound edition for 85.59 euros or as an E-Book for 67.82 euros.



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 Group, 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, Nuance Communications Deutschland GmbH, RICOH Company, Ltd., SAP SE, Software AG, University of Kaiserslautern, Bremen University, Saarland University, VSE AG
- ▶ **Equity Holding**
GraphicsMedia.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 as a non-profit public-private partnership. It 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 fifteen research departments and research groups, eight 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 for Economic Affairs and Energy (BMWi), the German Federal States and the German Research Foundation (DFG), 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 of 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, 442 highly qualified researchers, administrators and 359 graduate students from more than 60 countries are contributing to more than 180 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. Dr. h.c. 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. 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:

- ▶ Prof. Dr. Volker Markl: Intelligent Analytics for Massive Data
- ▶ Prof. Dr. Hans Uszkoreit: Language Technology
- ▶ 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, Language Technology, Multimedia Analysis & Data Mining, Semantic Web, Safe and Secure Systems, Virtual Office of the Future

Key Figures

- ▶ **Annual Budget 2013**
€ 38.2 million
- ▶ **Total Assets 2013**
€ 123.2 million
- ▶ **Employees**
442 professional staff, 359 graduate student staff

Scientific Excellence and Transfer

▶ International Scientific Advisory Board

- Bi-annual evaluation of publically funded projects:
- ▶ Prof. Dr. Markus Gross, Eidgenössische Technische Hochschule Zürich (ETH), 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

Advisory Board of the Future Internet Public-Private Partnership Programme of the European Union (FI-PPP), Big Data Value Association, Brazilian Institute of Robotics (BIR), Center of Innovation Program of the Japanese Ministry of Education (COI), Feldafinger Kreis, Management Board of the International Computer Science Institute in Berkeley, Münchner Kreis, National Institute of Informatics (NII, Tokio), Program Committee of the National Aeronautics and Space Research Centre DLR, Research Alliance of the German Federal Government, Steering Committee of the German Informatics Society (GI), and others

▶ Business Committees

Deep Sea Mining Alliance (DSMA), Governance Board of the Intel Visual Computing Institute, and others

▶ Scientific Academies

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

Intelligent Solutions for the Knowledge Society

- ▶ INDUSTRIE 4.0 and Innovative Factory Systems
- ▶ Smart Data – Intelligent Analytics for Massive Data
- ▶ Wearable Computing
- ▶ Knowledge Management and Document Analysis
- ▶ Virtual Worlds and 3D Internet
- ▶ E-Learning and e-Government
- ▶ Development of Provably Correct Software
- ▶ Smart City Technologies and Intelligent Networks
- ▶ Information Extraction from Text Documents
- ▶ Intelligent Web Retrieval and Web Services
- ▶ Multiagent 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
- ▶ Ambient Intelligence und Assisted Living
- ▶ Driver Assistance Systems and Car2X Communications
- ▶ Cyber-physical Systems
- ▶ Multilingual Technologies



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