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The world economic crisis has created new challenges for companies and research institutions. What it has made clear is that organizations with poor innovation capabilities are especially vulnerable. However, the crisis can also be seen as an opportunity that innovative firms and institutions can manage and even exploit.

When companies are in a strong position on their market and are doing good business — especially when they have been doing good business for a long time — they can be blinded to innovation in their field. The same is true for universities. Just like companies, successful, well-reputed institutions can fail to see changes in the disciplines where they do their research. This kind of arrogance can lead a company to collapse; in the case of research institutions it can lead to a decline in scientific quality. One of the most important ways of curing this “blindness” is through tight collaboration between science and business, as in the C-LAB model. The Internet provides us with a good example. For a long time, businesses saw it as nothing more than an academic toy. Only later did industry realize its enormous commercial potential. But when they did they began to look at the net in ways that were inconceivable for academia.

C-LAB has been developing its know-how on the commercial exploitation of Internet technology for more than twelve years. For instance, C-LAB has made a fundamental contribution to the Paderborn-based OWL Innovation Center Consortium (InnoZent OWL Verein) which from the moment it opened on January 1, 1999, has emphasized the importance of the Internet for business.

Unfortunately many companies do not recognize that disruptive technologies and innovative business models can offer them new opportunities, and fail to bring them into their business. Vice versa, many universities do not realize the potential market significance of academic
C-LAB hat in Paderborn maßgeblich mitgewirkt, den Verein InnoZent OWL zu gründen, der bereits im Rahmen der Eröffnungsveranstaltung am 19.01.1999 diese zukünftige, nicht mehr nur akademische Dimension des Internets klar prognostiziert hat.

Leider gilt für viele Unternehmen, dass sie das Entstehen neuer Chancen durch disruptive Technologien und innovative Geschäftsmodelle nicht rechtzeitig erkennen und für sich nutzen. Umgekehrt erkennen Hochschulen häufig nicht, wie akademische Erkenntnisse eine Bedeutung für den Markt erlangen.

Eine enge Kooperation von Hochschule und Industrie, wie sie im Falle von C-LAB seit Jahrzehnten erprobt und bewährt ist, kann auf beiden Seiten eine derartige Betriebsblindheit vermeiden und ist bei geschickter Anwendung auch gar nicht teuer. Und sie erzeugt eine beruhigende Kenntnis der im eigenen Umfeld entstehenden neuen Herausforderungen und in der Regel auch ausreichend Zeit, sich darauf einzustellen.

Für C-LAB als Innovationswerkstatt der Universität Paderborn und der Siemens AG, letztere vertreten durch den Bereich Siemens IT Solutions and Services, ist das Aufspüren von neuen Technologien und Geschäftsmodellen, die wissenschaftliche Erforschung und Aufbereitung, der Aufbau entsprechender Kompetenzen sowie das Abprüfen der Marktrelevanz das tägliche Brot. In enger Zusammenarbeit mit Wissenschaftlern der Universität Paderborn und der Siemens AG wird ein „Innovationsradar“ kontinuierlich ergänzt und abgesucht. Die Sichtweite beträgt dabei ca. 3 bis 5 Jahre und ermöglicht das rechtzeitige Erkennen von eventuellen „Eisbergen“

, aber auch kommenden „Oasen“ für das eigene Geschäft und die eigene Forschungslandschaft.

Der Begriff des „Innovationsrads“ ist in mehrfacher Hinsicht die richtige Metapher. Bei korrekter Nutzung werden die Themen rechtzeitig erkannt, können bezüglich Entfernung, sprich Zeit, positioniert und somit entsprechende Aktivitäten richtig priorisiert und die Umsetzung entsprechend geplant werden.

Aktuell wird immer deutlicher, dass in fast allen Bereichen und Branchen neue Lebensqualitäten, Wertschöpfungspotenziale, Produktivitätsssteigerungen, Prozessverbesserungen etc. häufig nur durch den Einsatz innovativer Informations- und Kommunikationstechnologien (IKT) stets qualitativ verbessert werden können. Zu nennen ist beispielsweise das Auto in klassischer Ausprägung, ins-

know-how. The kind of tight university-business cooperation that C-LAB has practiced for decades makes both sides aware of the potential of innovation, and does not need to be expensive, if it is efficiently implemented. One of its key advantages is that it gives the partners confidence that they understand the emerging challenges in their respective areas of business, letting them gain time to develop their response.

C-LAB is a joint innovation workshop for Paderborn University and Siemens AG, currently under the wing of Siemens IT Solutions and Services. In this role, our everyday business is to scout for new technologies and business models, to test them, to prepare them for market implementation, to build the skills needed to apply them, and to investigate their relevance to market needs. Working with a 3–5 year time horizon, scientists from Paderborn University and Siemens AG act as an “Innovation Early Warning System”, picking out “icebergs” looming on the horizon or possible oases where they can do new business. The concept of an Early Warning System is a good metaphor. If we are effective, we can recognize key issues at an early stage, take timely corrective measures, prioritize our activities and plan the necessary implementation work.

It is becoming ever more evident that in nearly all branches of the economy, the only way to make a substantial contribution to quality of life, value creation and productivity, is through new Information and Communications Technology (ICT). There are many examples. One is the car industry – in the classical sense of the word – and the new infrastructure and maintenance requirements that come with electric cars. Another is the creation of emergency systems to help manage rescue operations and assistance after major accidents. Yet another is the design of seamless, real-time connections between machines and information systems in essential business processes – an area in which robots will increasingly replace humans not only in physical and also in simple intellectual tasks. Another key task for product management is to monitor trends towards so-called “commoditization”, when it becomes possible for competitors from all over the world to build and offer similar products. When this occurs, competition shifts away from the functionality of the product and the way it is used, and focuses almost exclusively on price. Yet even in these cases, it is still possible to defend a valuable

Des Weiteren ist im Produktgeschäft ein Trend zu so genannten Commodities zu beobachten, das heißt, dass Produkte ähnlicher funktionaler Ausprägung überall auf der Welt produziert und angeboten werden. Dabei verschiebt sich der Wettbewerb entscheidende Faktor weg von der eigentlichen Funktion und dem damit verbundenen Nutzen fast ausschließlich hin zum Preis. Um auch in solchen Fällen sein wertvolles Produkt vor einer Kannibalisierung durch Wettbewerber zu schützen, bietet es sich an, die Produkte um wertschöpfende zusätzliche Dienste anzureichern, die nicht so einfach zu substituieren sind. Dieses sogenannte hybride Leistungsangebot, also eine Mischung von Produkt- und Dienstleistungs geschäft, erlaubt eine wesentlich stärkere Position im Wettbewerb. Die zusätzlich anzubietenden Dienstleistungen sind aber wiederum in vielen Fällen nur mittels innovativer IKT möglich, u. a. insbesondere dann, wenn die Kunden und Lieferanten stärker eingebunden werden sollen. Hier sind z. B. neue Technologien wie Web 2.0 aktuell verfügbar und bieten viele neue Funktionen für geschäftliche Chancen.


Es gilt also, dass nur der permanente Wandel und die Anpassung an neue Technologien, Märkte, Kundenwünsche und gesellschaftliche Randbedingungen das Beste-

Charles Darwin hat bekanntlich schon in den Jahren um 1860 publiziert, dass nur die Anpassung an neue Lebensverhältnisse das Überleben der Arten sichert – und nicht die pure Größe oder die Tatsache, in der Vergangenheit erfolgreich gewesen zu sein.

Dies scheint nicht nur für biologische Systeme zu gelten, sondern ein universelles Prinzip zu sein, ein Prinzip, das auch auf kommerzielle wie akademische Organisationen anwendbar ist.

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**AUSGEWÄHLTE PROJEKTE**

**SOFORTTRETTUNG BEI GROSS-UNFÄLLEN**

**HERAUSFORDERUNG**


Bei der Bewältigung von Großunfällen mit vielen potenziell Verletzten, z. B. in Flughäfen, Bahnanlagen, Stadien etc., könnte so durch bessere Koordination der verschiedenen Rettungskräfte die effiziente Versorgung der Unfallopfer wesentlich verbessert und die psychische Belastung der Rettungskräfte reduziert werden.

**SELECTED PROJECTS**

**RAPID HELP DURING MASS CASUALTY INCIDENTS**

**THE CHALLENGE**

One of the implications of advances in technology and society is that despite better safety, the number of people involved in individual accidents and disasters is increasing. Accidents and disasters involving large numbers of people are known as Mass Casualty Incidents or MCIs.

During an MCI, emergency personnel begin by classifying the injured in terms of the severity of the injuries they have sustained, forming a first idea of the treatment they will need. This is known as *triage*. In current practice, information on patients’ medical situation is noted on so-called Casualty Record Cards. Often the data is incomplete – in many cases even the information on the number of people injured and the severity of their condition is only an estimate. In major incidents, the lack of in-
te reduziert werden. Im Vordergrund steht dabei die als Triagierung bezeichnete Anfangsphase, bei der prioritär die schwerverletzten Personen gefunden und in Krankenhäuser transportiert werden sollen. Die Leitstellen könnten weiterhin durch die möglichst schnelle Beschaffung von umfassenden (Bild-)Informationen über die Lage am Katastrophenort bei ihren Entscheidungen wesentlich unterstützt werden.

SZENARIENORIENTIERTE FORSCHUNG IN SOGRO

C-LAB hat hierzu das vom BMBF geförderte Forschungsprojekt SOGRO (Sofortrettung bei Großunfall mit Massenanfall von Verletzten) initiiert. Als Anwendungs- partner konnten das DRK Frankfurt (als Konsortialführer) und der Frankfurter Flughafen gewonnen werden, die mit Anforderungen und Erprobung im Rahmen von Übungen die Praxistauglichkeit der Lösungen sicherstellen. Weitere Partner sind die Universitäten Stuttgart (Flugzeugbau) und Freiburg (Begleitforschung) sowie Andres Industries, die für die PDA-Hardware verantwortlich sind.

SOGRO setzt bei der Verkürzung der ersten, tendenziell chaotischen Phase bis zum Beginn des Abtransports der Verletzten in Krankenhäuser mit diesen Globalzielen an:
• Optimierung der medizinischen Erstversorgung der Unfallopfer
• Erfassen und Aufbereiten umfassender Lage- und Einsatzinformationen für die Leitstellen
• Optimiertes Vorgehensmodell für Rettungskräfte bei Großunfällen
• Vorbereitung eines einschlägigen Marktes


Im Folgenden werden die sich ergänzenden Beiträge der beiden C-LAB-Partner dargestellt. SIS C-LAB erstellt in diesem Projekt die IT-Architektur mit Lösungen zur Triagierung (Sichtung und Einteilung der Verletzten in Dringlichkeitskategorien) und zur Leitstellenanbindung. Die Universität Paderborn befasst sich in diesem Projekt

formation makes it difficult for hospitals and emergency teams to keep up with the situation on the ground and to plan their activities.

Making basic information available to managers, emergency services and hospitals nearly immediately after an incident can significantly improve the care provided to patients. In incidents in which there may be many casualties (e.g. incidents in airports, on the railways, in sports stadiums etc.) better coordination can also improve the psychological burden on emergency personnel. Here the initial triage is critical. The priority is to find the severely injured and transport them rapidly to hospital. In this phase, it is important to support decision-making by emergency managers with complete information (and pictures) of the incident location.

SCENARIO-ORIENTED RESEARCH IN SOGRO

To respond to this challenge, C-LAB has launched the BMBF-funded SOGRO research project. The German acronym (Sofortrettung bei Großunfall mit Massenanfall von Verletzten) means Rapid Assistance for Mass Casualty Incidents. The application partners are DRK Frankfurt (the Consortium Coordinator) and Frankfurt Airport. DRK and the Airport will help to define requirements for the project and will conduct exercises to test how the solutions provided fit with the requirements of practical emergency management. The other partners are the aircraft construction department of Stuttgart University, Andres Industries, which will be responsible for the PDA hardware, and Freiburg University which will provide supporting research on legal, social and economic issues.

The main goal of SOGRO is to shorten the initial, often chaotic phase, before the injured are transported to hospital. The overall aims are to:
• Optimize the first care provided to casualties
• Collect and aggregate comprehensive information on the emergency site and the mission and provide it to the control room
• Optimize operational procedures for emergency personnel during major incidents
• Prepare the market for the solutions developed in the project.

To this end, SOGRO is making an on-going effort to involve end-users (emergency agencies, the fire services,
emergency services, hospitals) as project partners. The project plans several small and larger scale exercises to test the systems used to transmit information on treatment requirements and to validate the planned solutions.

In what follows we will describe the complementary contributions of the two C-LAB partners in the project. The SIS group is contributing the IT architecture and is offering solutions to support triage (initial examination of the injured, sorting by severity of injury) and control room communications. University of Paderborn’s role is to collect and pre-process situation data from flying drones, equipped with cameras operating in different spectra.

RFID-BASED TRIAGE AND EMERGENCY MANAGEMENT COMMUNICATIONS

SIS C-LAB’s goal is to speed up the triage process, making it possible to start treatment of the injured as early as possible. During triage, emergency personnel classify the injured into three categories (red, yellow and green), producing a standardized diagnosis and, where appropriate, providing initial medication. In current practice, the information is handwritten onto triage tags, physically attached to patients, and manually transmitted to coordinators. C-LAB’s basic aim is to make this process faster and easier, using RFID tagged wristbands. Emergency personnel are equipped with robust (PDA-based) hand-held computers that can read and write the labels. The colors of the wristbands show the triage category of the patient (e.g. the color red shows that the patient requires urgent treatment). The hand-held computers are equipped with special software, designed for use in emergency situations. Appropriate support is provided for information input and for interpreting output. This includes automatically generated information such as information on location, and personal identification information. The PDA is used to collect information about the
tisch erfassbare Informationen wie Ort, Zeit und/oder Identifikationsmerkmale ergänzt. Mit dem PDA wird der Zustand des Patienten erfasst, dazu gehören auch alle am Patienten vorgenommenen Behandlungen und das Transportmittel zum Krankenhaus. Alle Daten werden einerseits auf den RFID-Chip geschrieben und sind somit am Patienten verfügbar, andererseits übermittelt der SOGRO-PDA die Daten per Funk (GSM, UMTS, WLAN ...) an die Einsatzleitung, die dadurch nahezu in Echtzeit einen Überblick über das Triagierungsresultat erhält. Zwar sind auch bei der Funkabdeckung Lücken möglich; die Software ist jedoch so ausgelegt, dass die Daten automatisch gesendet werden, sobald eine Verbindung verfügbar ist.

Die vollständige SOGRO-Lösung unterstützt folgende Schritte:

• **Sichtung (Triage):** Der elementare Zustand wird in drei Kategorien erfasst und an das Datenzentrum übermittelt: sehr schwer verletzt (rot), verletzt (gelb), allenfalls leicht verletzt (grün).

• **Medikation:** Die bei Sofortmaßnahmen am Unfallort gegebenen Blutersatzmittel, Schmerzmittel etc. können erfasst und auf dem Armband gespeichert sowie durch den PDA vor weiteren Medikationen angezeigt werden.

• **Transport:** Vom Unfallort in ein Krankenhaus transportierte Patienten werden durch Auslesen des Arm- bands notiert. Die an das Datenzentrum übermittelten Daten enthalten Transportmittel und Ziel-Krankenhaus.

• **Krankenhaus:** Bei der Aufnahme können die Medikationsdaten gelesen werden, um Überdosierungen zu vermeiden. Weiterhin wird ein Datensatz zur Information an die Zentrale übermittelt, dass der Patient im Krankenhaus eingetroffen ist.

Über das Datenzentrum ist also sowohl für die Einsatzleitung vor Ort als auch für die Leitstelle jederzeit ersichtlich,

• wie viele Patienten gesichtet sind und wie hoch der derzeitige Bedarf an die Krankenhäuser ist,

• wie viele Patienten bereits vom Unfallort auf dem Weg in ein Krankenhaus sind,

• wie viele Patienten in Krankenhäusern angekommen sind.

status of the patient, including information on treatment provided or on the transportation used to take the patient to hospital. This data is written to the RFID chip, directly attached to the patient and simultaneously transmitted to the control room via GSM, UMTS or WLAN. In this way emergency managers can obtain a real-time overview of triage results. Given the risk of gaps in network coverage, the software ensures that the data is transmitted automatically as soon as a connection becomes available.

The complete SOGRO solution supports four stages in emergency management:

• **Triage:** Patients are divided into three categories (red – very severely injured; yellow – injured; green – only lightly injured) and the information transmitted to the data center.

• **Medication:** information on emergency medication (blood surrogates, painkillers etc) is collected on the PDA and recorded on the wristband, where it can be read out by personnel providing follow-up treatment.

• **Transport:** while initiating transport to a hospital, emergency personnel read out relevant data from the wristband and transmit it to the data center. The information provided includes information on the vehicle transporting the patient and the destination hospital.

• **Hospital:** On admission, medical staff can read out the medication data to avoid the risk of overdosing. A record is sent to the data center, recording the admission.
EINSATZ IN ERSTEN ÜBUNGEN


BEZUG ZUM SIEMENS-PORTEFOLIO

Zusammen mit dem Vertical PS CNS und PTM wurden die ersten beiden Phasen des vom BMBF geförderten

CONTRIBUTING TO SIEMENS’ COMMERCIAL OFFERING

Siemens IT Solutions & Services (SIS) positioned the first two phases of SOGRO as a portfolio development project on RFID-based Triage. In this way, the solution developed by the project contributed to SIS’ offering for Emergency Management.

In this and the next business year, the other topics handled by the project (e.g. communications for emergency managers) will also become portfolio development projects. In this way C-LAB will ensure effective transfer of research results and help to future-proof the SIS portfolio.
Forschungsprojekts in den SPLM-Prozess als Portfolioentwicklungsprojekt **RFID-based Triage** eingebracht. Die Lösung dient dazu, das Portfolioelement **Emergency Management** der SIS weiterzuentwickeln.

Auch die weiteren Themen des Forschungsprojekts (z. B. Leitstellenanbindung) werden in diesem und den kommenden Geschäftsjahren auf Portfolioentwicklungsprojekte abgebildet. So wird der Transfer der Forschungsergebnisse sichergestellt und gleichzeitig für die Zukunftssicherung des SIS-Portfolios gesorgt.

**INTELLIGENTE LAGEINFORMATIONSGEWINNUNG**


Häufig werden mit Kameras bestückte Flugdrohnen ausschließlich als intelligente Kameraträger verwendet, die zwar autonom Wegpunkte abfliegen können, jedoch die Bilder lediglich aufzeichnen oder zu einer Basisstation senden. Im Gegensatz dazu wird vom C-LAB ein System entwickelt, welches bereits an Bord der Flugdrohne eine Analyse der erfassten Bilddaten vornimmt. Hierbei kommen zwei Kameras zum Einsatz, wobei eine Kamera im sichtbaren Spektrum arbeitet und die andere im Infra-

**INTELLIGENT COLLECTION OF SITUATION DATA**

A key issue in emergency missions is effective allocation of available personnel. In this setting, it is essential to obtain as much precise information as possible about the situation on the ground. Over the duration of the mission, information priorities tend to change. In the early stage, it is important to collect information on possible casualties and on the territory surrounding the site of the incident. For instance, large open areas are needed to prepare emergency equipment or to assemble casualties. At a later stage, it is important to know the positions of people and vehicles.

To obtain an overview of the situation, the project used aerial photography. Stuttgart University developed drones to fly over the disaster area. The drones have the ability to fly autonomously to pre-determined waypoints. As part of this work, C-LAB developed two components: an intelligent image evaluation system, and a coordination and guidance component, capable of commanding a swarm of drones.

Camera-equipped drones are often used simply as intelligent carriers for cameras that do nothing more than fly autonomously to a waypoint, take pictures, and send them back to base. By contrast, C-LAB developed a system that analyzes picture data on board the drone. The system uses two cameras, one working in the visible spectrum and one in the infrared. This approach allows the analysis to take account of correlations between images. To support these comparisons, all the pictures are labeled with a time and location stamp. The analysis extracts relevant landscape features. These, too, are labeled with data on the position of the drone. The pictures and feature information are subsequently integrated in overview maps. Recognized features are transmitted to the base station before the pictures. This technique ensures that the essential information always reach the base station, even when interference reduces the available bandwidth. Later, at the base station, the pictures and feature information are assembled into an overview map, also showing the features recognized by the drones.

As mentioned earlier, C-LAB has developed a coordination and guidance component making it possible to command a swarm of drones. Obviously, it is important to define flight paths that avoid collisions. In emergency


Es wurde bereits eine einfache Simulationsumgebung entwickelt, welche die Evaluation von Koordinationsstrategien ermöglicht. Ein erster Ansatz zur Koordination eines Schwarms von Flugdrones wurde hierin bereits erfolgreich evaluiert.

AUSBLICK

Im weiteren Projektverlauf werden die Lösungen beider Partner weiterentwickelt und zusammengeführt, wobei die Steuerung der Drohnen und die Darstellung der von ihnen gelieferten Informationen mit der Leitstelle integriert werden.

SOGRO wird vom Bundesministerium für Forschung und Technologie (BMBF) im Rahmen der szenarienorientierten Sicherheitsforschung mit einer Laufzeit von drei Jahren seit 02/2009 gefördert.

In this situation, the coordination component has to ensure that the whole area has been covered. The guidance component allows on the spot emergency managers to direct drones to specific points or to instruct drones to provide ongoing surveillance of a particular area. If there are several target areas, the coordination component assigns different tasks to different drones in the swarm.

To facilitate the evaluation of different coordination strategies, C-LAB has developed a simple simulation environment and has successfully concluded a first exercise involving the coordination of a swarm of drones.

FUTURE PROSPECTS

As the project proceeds, the two partners will merge their respective contributions, integrating the drone guidance component with the information display functionality in the control room component.

SOGRO is funded by the Federal Ministry for Research and Technology (BMBF) as part of its scenario-oriented security research. The project, which began in February 2009, will run for three years.

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[1] Bundesministerium für Bildung und Forschung (Ministry for Education and Research)
[2] Deutsches Rotes Kreuz (German Red Cross)
Fahrzeugkategorien einführen. In diesem Kontext wird erwartet, dass bis zum Jahr 2015 die Anteile der Kosten der Elektronik im Automobil auf insgesamt 40 % steigen, wobei ca. 50 % davon der Software zuzurechnen sind.


**TIMMO-KONSORTIUM UND ZIELE**


Parallel zu TIMMO formierte sich nach Projektbeginn innerhalb von AUTOSAR WP II 1.2 eine Timing Arbeitsgruppe, mit der TIMMO die Arbeiten im Laufe des Projektes eng abgestimmte, sodass die TIMMO-Ergebnisse als prove the safety of specific categories of vehicle. These include the Electronic Stability Program (ESP), the Tire Pressure Monitoring System (TPMS), the Advanced Emergency Braking System (AEB) and the Lane Departure Warning System (LDWS). Against this background, it is expected that, by 2015, electronics will account for roughly 40% of the cost of a car. About 50% of these costs will be for software.

In recent years, the functions built into cars have become so complex that it is almost impossible for a single company to implement everything on its own. Car companies’ supply chains thus involve complex networks. In this setting, it is becoming ever more important to achieve effective integration between components. The goal of the AUTOSAR (Automotive Open System Architecture) development partnership is to standardize this process. The partnership currently has more than 100 members. At the end of 2009, it concluded its second phase of its activity with the release of AUTOSAR-Standard Release 4.0. This includes specifications for the operating system, communications, hardware abstractions and the Runtime Environment. Paderborn University became an AUTOSAR member through its role in the TIMMO project.

**GOALS OF THE TIMMO CONSORTIUM**

The AUTOSAR 3.1 Standard already included a broad range of specifications defining specific functional properties. More specifically, the standard defined events associated with specific subcomponent behaviors. However, it did not define a way of augmenting the exchange of information on the real time behavior of components with appropriate timing information.

The BMBF[1] funded TIMMO (Timing Model) ITEA2 project was designed to fill this gap. The goal of the project, launched in 2007, under the leadership of Continental Automotive, was to extend the AUTOSAR-Standard through the introduction of a time specification. C-LAB participated in TIMMO in collaboration with a number of car manufacturers and suppliers including Audi, Volkswagen, Volvo, Bosch, Continental, SyntaVision, TTTech and ZF Friedrichshafen. Several tool vendors including ETAS, Mentor Graphics and SyntaVision also participated in the work.

In parallel with the start of TIMMO, AUTOSAR WP II 1.2 created a timing group that worked in close collabo-
echte Ergänzung zum AUTOSAR 4.0 Standard angesehen werden können.

TIMMO-ERGEBNISSE


STEER-BY-WIRE VALIDATOR

Zur Validierung der TIMMO-Methode und von TADL wurden sechs Validatoren realisiert, bei denen Projekt-
partner a wide variety of scenarios and toolchains.

C-LAB conducted the validation of a Steer-by-Wire-validator in cooperation with the TTTech ComputerTechnik AG and the SymtaVision GmbH. This validator was based on the setup of a quarter-vehicle testbed, which had previously been developed in cooperation with Prof. A. Trächtler (Institute for RegulationTechnique and Mechatronics, University of Paderborn) and which had won University of Paderborn’s research award.

The validator implemented a Steer-by-Wire system with active shock absorbers - though the TIMMO project did not complete work on this latter component. The testbed consisted of up to 4 TTXUniversal Control Units, each equipped with a Tricore TC1796 microprocessor and a Freescale MFR 4310 FlexRay-Controller. The steering wheel and the wheel to be steered were coupled to the control units via CAN. This approach created a testbed incorporating heterogeneous busses, each with its own specific time behavior. The third control unit implemented an adaptive speed-dependent transmission strategy. The cluster design and the communications components were configured and generated using TTXPlan and TTXBuild. The code generated with these tools was subsequently extended to include the applications code for individual Control Units. Finally, the code was compiled with the Target compiler.

Bild 8: Steer-by-Wire Validator des C-LAB
Fig. 8: C-LAB Steer-by-Wire Validator

was an extension of a quarter-vehicle testbed which had been previously developed in cooperation with Prof. A. Trächtler (Institut für Regelungstechnik und Mechatronik, Universität Paderborn) and which had won University of Paderborn’s research award.

The validator implemented a Steer-by-Wire system with active shock absorbers – though the TIMMO project did not complete work on this latter component. The testbed consisted of up to 4 TTXUniversal Control Units, each equipped with a Tricore TC1796 microprocessor and a Freescale MFR 4310 FlexRay-Controller. The steering wheel and the wheel to be steered were coupled to the control units via CAN. This approach created a testbed incorporating heterogeneous busses, each with its own specific time behavior. The third control unit implemented an adaptive speed-dependent transmission strategy. The cluster design and the communications components were configured and generated using TTXPlan and TTXBuild. The code generated with these tools was subsequently extended to include the applications code for individual Control Units. Finally, the code was compiled with the Target compiler.


Generell wurde auf Basis des Versuchs- aufbaus die Verwendbarkeit von TADL und der TIMMO-Methode im Rahmen der Werkzeuge der Projektpartner im praktischen Gebrauch erfolgreich nachgewiesen. Nichtsdestotrotz wurde auch deutlich, dass es weiterer Arbeiten bedarf, um TADL zur Anwendung sowohl in früheren als auch in späteren Entwurfsphasen anzupassen bzw. zu erweitern, was in Nachfolgeprojekten durchgeführt werden soll.

Weitere Informationen zum Projekt: www.timmo.org

Bild 10: TADL zur Konfiguration, Simulation und Verifikation
Fig. 10: TADL for configuration, simulation and verification

More generally, the test bed successfully demonstrated the possibility of using partner tools incorporating TADL and TIMMO methods in practical applications. Nonetheless, it was also evident that TADL requires further work to extend its applications to earlier and later design phases. This is a goal for future projects.

For further information on the project visit: www.timmo.org

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[1] BMBF-Förderkennzeichen 01 IS 07 002
[2] FlexRay is ein eingetragenes Warenzeichen der Daimler AG

[1] BMBF promotional reference 01 IS 07 002
[2] FlexRay is a registered trademark of Daimler AG
Erfolgsfaktoren für das Management komplexer Kundenlösungen

Kundenlösungen und hybride Wertschöpfung sind durch eine kundenindividuelle Integration von Sach- und Dienstleistungen zu einem Leistungsbündel charakterisiert, was von vielen Unternehmen als Chance zur Differenzierung vom Wettbewerb gesehen wird. Dabei stellt Technologie einen bedeutenden Erfolgsfaktor für innovative Kundenlösungen dar.

Technologie als Treiber hybrider Wertschöpfung


Im Rahmen des BMBF-Forschungsprojekts Serv.biz hat die Gruppe Business Development die damit verbundenen Herausforderungen analysiert und eine Vielzahl von Erfolgsfaktoren für das Management technologisch geprägter Kundenlösungen identifiziert. Es zeigt sich, dass sich IT als Schnittstelle und Innovationstreiber eignet und zudem Wettbewerbsvorteile begründet. So können z.B. Entwicklungszeiten und -kosten für Kundenlösungen gesenkt werden. Zudem kann IT die Grundlage für Skaleneffekte bilden, wenn durch die Einführung einer innovativen Technologie z.B. ein kostengünstigerer

Critical success factors in the management of complex customer solutions

Customer solutions are characterized by the integration of products and services into a single offering, tailored to the specific needs of an individual customer, which is seen as a chance for firms to differentiate themselves from the competition. Thereby technology seems to be one important success factor for innovative customer solutions.

Technology as a driver for hybrid value creation

The introduction of technology-centered customer solutions and the consequent transformation of a company from being a producer of traditional goods to a solution provider is a very challenging management task. Thus, new competences with respect to the development and marketing of services have to be developed. Alternatively traditional goods and service providers can cooperate and seek new business partnerships to develop and market hybrid customer solutions. In this case, each partner benefits from the competences of the other. However, the need to integrate products and services from different companies can increase the complexity of the solutions and therefore hamper its management.

The Business Development group has been addressing these issues in the BMBF research project Serv.Biz, which has identified several critical success factors for the management of technology-centered customer solutions. The results show clearly that IT can facilitate integration between products and services, functioning as a driver of innovation as well as an important source of competitive advantage. For example, IT can be used to cut time and costs for the development of customer solutions. On many occasions, IT can enable the introduction of innovative technologies, thereby reducing production
Produktionsprozess ermöglicht wird. Die Nutzung von IT als Schnittstelle stellt aber auch hohe Anforderungen an das technologische Know-how der Mitarbeiter, sowohl der eigenen als auch der des Kunden.


**Modularität als Erfolgsfaktor von Kundenlösungen**


costs, and generating scaling effects. At the same time, however, IT generates new demands on the know-how of employees, on the side of the solution provider as well as the customer company.

For a value creation network to successfully generate solutions for customers, the partners need to play strategically complementary roles. More specifically, IT service providers should help partner companies, specialized in products, to build IT competences and partners specialized in products should transfer part of their sectorial know-how to the IT service provider. Another issue that needs to be clarified is the role of the general contractor. In value creation networks, the precise definition of contractual relationships can be extremely important. In particular, the partners need to carefully define all issues regarding patent applications and liability. However, the hardest challenge is specifying their individual contributions to the customer solution. These individual contributions deeply influence the business model adopted by the partnership.

Despite these real challenges, IT is useful for managing the transformation. For example, IT can build a bridge to connect physical products to the core and support processes of the customer company. However, experience shows that technology can also have negative effects; especially if it leads to a loss of contact with the customer. Besides, building up the industry-specific knowledge required for effective customer solutions is necessarily a slow process. Within companies, creating support for hybrid solutions requires intensive effort. Many traditional manufacturers are not yet aware of the potential of services, bundled with their traditional offering or fully integrated in a new customer solution.

**Modularity as a critical success factor for customer solutions**

In addition to the work just described, a dissertation, currently in progress, is investigating the role of modularity as a success factor for customer solutions. The study examines from a theoretical and an empirical viewpoint, the extent to which modularity influences the success of customer solutions. The work takes account of the way context-related factors can strengthen or weaken the impact of modularity, identifying implications for management.

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Embedded Systems

In 2009, the Advanced Design Technologies (ADT) group was involved in a large number of research projects and collaborations, some of which received external funding. Of particular note were the funded TIMMO, COCONUT, SATURN, SFB 614 projects and the group’s collaborations with dSPACE and with Fujitsu Technology Solutions (formerly Fujitsu Siemens Computers). Other collaborations with industry included work on AUTOSAR-based design as well as the development of virtualization technologies, firmware and server software. Other initiatives were carried out in collaboration with well-known research groups from University of California, Irvine (Prof. R. Dömer) and University of Texas, Austin (Prof. A. Gerstlauer). In what follows, we will limit the discussion to just some of these projects.

COCONUT (A Correct-by-Construction Workbench for Design and Verification of Embedded Systems) is an EU-funded project whose goal is to develop new verification techniques for TLM[1]-centred design. The ADT group has contributed the aRTOS SystemC library for the analysis of the properties of Real Time Operating Systems (RTOS) and Paderborn University’s ORCOS operating system. The SystemC library was developed to speed up offline simulations of multicores through the introduction of a canonical model for real time operating systems. The model provides primitives to describe context switching and the handling of hardware interrupts. This makes it possible to abstract away the details of existing operating systems and to produce fast simulation models. Despite the abstraction, it is still a key requirement that the system should accurately simulate execution times and the timing of interrupts. Recent tests show that it is possible to create very fast simulations with low rates of error in the 2–7\% range.

The work just described complemented the work carried out in the SATURN (SysML based modeling, architecture exploration, simulation and synthesis for complex embedded systems) project. In this initiative, the ADT group worked in close collaboration with Artisan Software Tools Ltd. and other industrial partners. The goal was to further develop the usage of SysML/UML in the design of electronic systems. In this area, we and our partners developed a UML profile making it possible to cus-
zum Entwurf elektronischer Systeme weiterentwickelt. Hier entwickelten wir in Kooperation mit den Industrie-
partnern ein UML-Profil zur Eingabe von synthetisierba-
rem SystemC mit eingebettetem C-Code zur Konfiguration
des SysML-Editors Artisan Studio. Eine anschließende
Codegenerierung erlaubt die Co-Simulation von SystemC
mit ausführbaren C-Programmen unter dem Software-
Emulator QEMU, gefolgt von einer optionalen Synthese
für Xilinx-FPGAs. Das Ziel dieser Arbeiten bis Ende kom-
menden Jahres ist die Entwicklung einer auf UML/SysML
basierten integrierten Modellierungs- und Simulations-
umgebung für SystemC, C und Matlab/Simulink.

Insbesondere bestehen noch große Potenziale der
UML2 zur Anwendung in frühen Anforderungsphasen
des Entwurfs kombinierter Hardware- und Softwaresys-
teme, was in dem vom BMBF geförderten VERDE-Projekt
(verification-oriented & component-based model driven
ingineering for real-time embedded systems) in den
nächsten drei Jahren untersucht wird. Weitere zukünfti-
ge Arbeiten befassen sich in dem Bereich mit der Testau-
tomatisierung und der Verwendung der UML2 zur Defini-
tion von Austauschformaten im Rahmen des BMBF-Pro-
jektes SANITAS (sichere Systeme auf Basis einer durch-
gängigen Verifikation entlang der gesamten Wertschöp-
fungskette).

Neben den Projektarbeiten war die Arbeitsgruppe an
der Organisation diverser nationaler und in-
ternationaler Konferenzen, Workshops und
Symposien wie DATE’09, DATE’10 und SEIS’10
beteiligt. Dr. W. Müller ist in diesem Rah-
men als Program Chair der DATE 2010 tätig.

Neben der Herausgabe mehrerer Beiträge
auf nationalen und internationalen Konfe-
renzen und Journalen wurde in Kooperation
mit Prof. Ecker (Infineon Technologies) und
Prof. Dömer (UC Irvine) das Buch Hardware-
dependent Software herausgegeben, das
Anfang 2009 im Springer Verlag erschien.

In the design of combined hardware and software sys-
tems, UML2 has great potential for the requirements-def-
inition phase This will be the theme of the three year,
BMBF funded VERDE (Verification-oriented & compo-
nent-based model driven engineering for real-time em-
bedded systems) project. Other planned ADT work in-
cludes the automation of tests and the use of UML2 for
the definition of data exchange formats in the BMBF-
funded SANITAS project. As suggested by the German
title (Sichere Systeme auf Basis einer durchgehängigen
Verifikation entlang der gesamten Wertschöpfungskette)
this project aims to develop secure systems through the
application of verification at all links along the value
chain.

In parallel with these project activities, the ADT group
has been involved in the organization of several national
and international conferences, workshops and symposia
including DATE’09, DATE’10 and SEIS’10.

Dr. W. Müller, for instance, is the Program
Chair for DATE 2010. He has also cooperated
with Prof. Ecker (Infineon Technologies) and
Prof. Dömer (UC Irvine) to produce a volume on Hardware-dependent Software.

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[1] Transaction Level Modeling
m Folgenden werden einige aktuelle Arbeiten des C-LAB zum Organic Computing mit den Schwerpunkten Selbstorganisation und Selbstoptimierung vorgestellt.


Der DFG Sonderforschungsbereich 614 Selbstoptimierende Systeme des Maschinenbaus (SFB 614) beschäftigt sich mit Strukturen, Verfahren und Methoden zum Entwurf fortschrittlicher mechatronischer Systeme, die auch zur Laufzeit eine Adaptivität bezüglich der System- und Umweltinflüsse in ihrem Verhalten aufweisen sollen. Ein Selbstoptimierungsprozess erlaubt die systeminhärente Manipulation sowohl klassisch maschinenbaulicher Strukturen als auch verhaltensbasierter Anteile in einem System. Im C-LAB wird eine hybride Planungsarchitektur für die hierarchisch modellierten Systeme
entwickelt, die zukünftig auf mehrere Hierarchie-
ebenen erweitert werden soll. Entscheidungsfin-
dung auf Basis statistischer Verfahren soll auch
für mehrere Teilsysteme gemeinsam untersucht
werden.

Im März 2009 wurde der SFB 614 mit exzellentem Re-
sultat begutachtet und eine weitere Förderphase von
vier Jahren wurde genehmigt. Im Rahmen der Begutac-
tung entstand ein verhaltensbasierter Demonstrator, an
dem der Prozess der Selbstoptimierung als Multiagen-
tensystem dargestellt wird. Ein Paderkicker Fußballro-
boter dient als Zentrale eines Sammelszenarios, in dem
mehrere kleine BeBots, die am Heinz-Nixdorf-Institut
entwickelt wurden, virtuelle Ladungssteile sammeln (Bild
11). Die BeBots sind mit einer farbig beleuchteten Haube
ausgestattet, die ihren inneren Zustand anzeigt und eine
indirekte Kommunikation zwischen den Robotern erlaubt.
Die Roboter sind mit interner Kamera und Bildverarbei-
tung sowie Verhaltenssystem ausgestattet und damit bis
auf eine Rollenzuweisung vom Paderkicker autonom. Ei-
e zur Laufzeit dynamische Rollenverteilung stellt einen
internen Freiheitsgrad des Gesamtsystems dar, mit dem
dieses auf wechselnde Anforderungen bzgl. der Erfül-
lung konkurrierender Systemziele (Energie sparen vs. ho-
he Sammelrate) reagieren kann.

Als Anwendungsbeispiele zur Erforschung von Aspek-
ten wie Vernetzung, Teamkoordination oder sozio-biolo-
gische Handlungssteuerung werden im C-LAB neben
SOGRO (siehe Kapitel Ausgewählte Projekte) die Pader-
kicker, eine Mannschaft von sieben Fußballrobotern, ent-
wickelt, die auch zu Ausbildungszwecken in der Lehre
eingesetzt werden. Daneben wird der Roboterkopf MEXI
weiterentwickelt, der Emotionen erkennen und adäquat
darauf reagieren kann, unter anderem durch Darstellen
der eigenen künstlichen Emotionen.

A review of SFB 614 in March 2009 gave excellent re-
sults and a further four years of research was authorized.
During the review, we showed a behavior-based demon-
strator, illustrating self-optimization in a multi-agent sys-
tem. In the demonstration scenario, a Paderkicker soccer
robot acted as the control center for a set of small Be-
Bots, developed by Heinz Nixdorf Institut. The BeBots
had the task of collecting virtual loads (Fig. 11). Each Be-
Bot had an illuminated “cap” whose color showed its in-
ternal state, allowing it to communicate indirectly with
the other robots. The robots were equipped with a cam-
era, an image processing system and a behavior system.
This meant that they could act autonomously. Only their
respective roles were assigned to them by the Paderkick-
er. Considering the multiple robots as a single system, the
ability to assign tasks dynamically at run-time, provides a
flexibility, allowing the system to react to changing de-
mands e. g. the satisfaction of competing system goals
such as energy saving vs. rapid task completion.

As an example of the way we can bring together net-
working, team coordination and socio-biological behav-
ior, outside the SOGRO project (see the chapter on se-
lected projects), C-LAB is developing the Paderkickers, a
team of seven soccer robots. The Paderkickers are also
used for teaching purposes. We are also working to en-
crease the MEXI robot head. MEXI’s capabilities include
the ability to recognize emotions and to react adequately,
for instance, by showing its own artificial emotions.

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OPTICAL INTERCONNECTION TECHNOLOGY

Modern information technology is generating rapidly growing volumes of data in practically all application domains. Without optical transmission technology to connect system components, it would be impossible to handle the large amount of data. Compared to electrical technologies, optical technology offers significantly higher data rates using less space and less energy. It is likely, therefore, that future circuit boards such as those used as a backplane for computer systems, will transmit data using light traveling through special optical waveguides embedded in the board. In 2009, C-LAB’s OIT group made further progress in its research and development with this key future technology.

SIMULATION- AND DESIGN TOOLS

C-LAB has developed its own design environment for optical interconnects on circuit boards. The lab has extended the simulation techniques used in the environment with its own ART procedures (3D ray tracing with analytical techniques) making it possible to provide very fast analysis of optical behavior. The environment offers a complete range of functionality for simulation based analysis of optical interconnections. The functionality on offer ranges from 3D modeling of the emission spectrum of an optical source, via calculation of the optical waves traveling through a waveguide, to the evaluation of the photo detector results. Layout data for waveguide net-

NETZWERKE UND ERGEBNISVERWERTUNG

BARRIEREFREIE GESTALTUNG:
HERAUSFORDERUNG UND CHANCE FÜR
UNTERNEHMEN


Ambient Assisted Living (AAL) ist die Zauberformel, mit der vor allem ältere Menschen durch intelligente Assistenzsysteme unterstützt werden. AAL-Lösungen werden jedoch nur dann erfolgreich sein, wenn sie von älteren Menschen bedient werden können, also barrierefrei sind.

Siemens stellt sich der Herausforderung!

Aufgabe des ACC ist die verantwortliche Leitung und Koordination der Siemens Access Initiative (SAI), die 1999 als Querschnittsaktivität gegründet wurde, um den gesetzlichen Anforderungen sowie der sozialen Verantwortung des Unternehmens gerecht zu werden. Die SAI vertritt die Interessen des Hauses Siemens im Bereich Accessibility nach innen und außen, z. B. in Verbänden wie DigitalEurope, BITKOM, ZVEI.

Am 06.04.2009 hatte der Leiter des ACC, Herr Wegge, die Gelegenheit, die Siemens Access Initiative dem Siemens-Vorstand (Hr. Löscher, Hr. Russwurm etc.) persönlich vorzustellen. Hier fand die Arbeit der SAI nicht nur große Anerkennung, sondern es wurde eine verlässliche

BARRIER-FREE DESIGN:
A CHALLENGE AND AN OPPORTUNITY
FOR BUSINESS

-C-LAB’s Accessibility Competence Center (ACC) helps Siemens sectors, divisions, and corporate departments and Siemens customers to provide reasonable and cost-effective implementations of accessibility in consumer products, services, work places, buildings, software and Internet Portals. The center’s strong role in the definition of international standards and regulations helps Siemens to develop well-harmonized products and services that are both technically feasible and affordable.

Accessibility is a key factor determining the quality of modern products and services. In other words, elderly people and people with various forms of disability, should be able to use them in their everyday lives, without difficulty and without help from other people. The aging of society is a megatrend. In this setting, sustainable implementation of accessible design is a challenge and an opportunity for business. The magic formula for providing intelligent support to elderly people is “Ambient Assisted Living” (AAL). But AAL-solutions will only be successful if they can actually be used by elderly people. In other words, they need to be accessible.

Siemens meets the challenge!

ACC has been assigned the task of leading and coordinating the Siemens Access Initiative (SAI). The goal of the initiative, launched in 1999, is to ensure that Siemens complies effectively with legal requirements and that it meets its social responsibilities. The SAI represents Siemens interests in accessibility, both inside the company and in external associations, e. g DigitalEurope, BITKOM, ZVEI.

On April 6, 2009 Mr. Wegge, the head of the SAI, had the opportunity to personally present the initiative to the Siemens Managing Board (Mr. Löscher, Mr. Russwurm, etc). During the meeting, the management team recognized the great importance of the work performed by the SAI and committed to provide extended and reliable funding. At the same time, it committed to making accessibility a business objective. This decision ensures that Siemens’ implementation of accessibility will be effective and sustainable.
und erweiterte Finanzierung zugesagt. Darüber hinaus beabsichtigt der Siemens-Vorstand, Barrierefreiheit als ein weiteres Unternehmensziel fest zu etablieren und damit die Grundlage für eine nachhaltige Umsetzung zu schaffen.

Die teilweise selbst betroffenen Experten des ACC haben bereits mehr als 10 Jahre Erfahrung im Accessibility Engineering. Wir wissen aus eigener Erfahrung, wovon wir reden!

**Aus der Arbeit des ACC in 2009**

Seit mehr als 5 Jahren sind ACC-Mitarbeiter in der Arbeitsgruppe ISO TC159 WG2 aktiv, die den im September 2008 veröffentlichten ISO Technical Report 22411 “Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities” überarbeitet.

Das ACC beteiligte sich an einem internationalen Projekt des japanischen National Institute of Advanced Industrial Science and Technology (AIST) zur Erhebung physischer, haptischer, visueller und auditiver Fähigkeiten von Menschen aus verschiedenen Altersgruppen.

Aktuelle Informationstechnologie bietet neue Möglichkeiten, ältere und behinderte Menschen bei alltäglichen Aufgaben zu unterstützen und ihre Lebensqualität zu steigern. Im EU-Förderprojekt MonAMI (Mainstreaming on AMbient Intelligence) (http://www.monami.info) werden barrierefreie Dienste über gängige Systeme kostengünstig realisiert, angepasst und ausführlich mit Nutzern erprobt. Dass dabei das Apple-iPhone mit seiner neuen VoiceOver-Technologie und Gesteunterstützung gerade für sehbehinderte und blinde Nutzer eine geeignete Bedienoberfläche für MonAMI-Services bietet, war dann aber auch für uns eine kleine Überraschung!

The ACC team has more than 10 years experience in accessibility engineering and some of our experts have disabilities themselves. We know what we are talking about from personal experience!

**ACC work in 2009**

ACC staff have been active for more than five years in the ISO TC159 WG2 work group. In September 2008, the group published ISO Technical Report 22411 “Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities”.

ACC was also involved in an international project to investigate the physical, haptic, visual and auditory capabilities of people from different age groups. The project was coordinated by the Japanese National Institute of Advanced Industrial Science and Technology (AIST).

Modern information technology offers new opportunities to assist elderly and disabled people in their daily living and to improve their quality of life. The EU Research Project MonAMI (Mainstreaming on AMbient Intelligence) (http://www.monami.info) is implementing accessible and affordable services over current systems and testing them with end-users. Nonetheless, it was a bit of a surprise for us when we discovered that the Apple-iPhone, with its new voiceover and gesture driven technologies, provides a convenient user interface for blind and visually impaired persons wishing to operate MonAMI-Services.

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Das vom BMWi seit Oktober 2006 geförderte Projekt robot2business – Informationstechnische Integration teilautonomer, mobiler Maschinen und Prozesse in Geschäfts- und Dienstleistungsmodelle (r2b) hat u. a. das Ziel, Arbeitsprozesse zu automatisieren, indem vorverdichtete Arbeitsdaten mobiler Einheiten (in diesem Fall Feldhäcksler und Traktoren) in die Prozesse integriert werden. Ein Beispiel für einen solchen Prozess ist die automatisierte Rechnungslegung sobald die Dienstleistung „Abernten eines Feldes“ erbracht wurde. Dabei ist es jedoch notwendig, die Daten über eine GPRS/UMTS-Verbindung in das Backend zu transferieren. Existiert jedoch gar keine flächendeckende, stationäre Funknetzabdeckung, stellt es sich als Herausforderung dar, die Daten zeitnah an das Backend zu übertragen. Um eine derartige robuste Kommunikation zu realisieren, werden die Daten von dem erntenden Feldhäcksler per WLAN an das Erntegut-Transportfahrzeug übergeben. Dieses Fahrzeug tauscht seine empfangenen Daten mit allen anderen Teilnehmern des Ernteprozesses, case harvesters and tractors). One example might be to automatically prepare the invoice as soon as harvesting of a field has been completed. To achieve this, the data has to be transferred over a radio link to the back-end. A key requirement is that the system can still ensure the transfer of the data even when the mobile network is not functioning properly. To implement this kind of robust communications, the system uses a mobile ad hoc network to transfer the data. Vehicles exchange the data they receive with all participants in the harvesting process who require the information. To achieve this goal, the project has implemented a so-called Store-Carry-Forward communications system. Data on the crop is transferred to the Farm Management System using avail-
able vehicles as intermediary stations. This makes it possible for external contractors to immediately invoice their services. Other data collected in this way can provide an improved basis for management decisions. The advantages include faster updates to work schedules and greater precision in planning. There are also legal advantages. In many areas of agriculture farmers have a legal obligation to maintain documentation showing which machines have used subsidized fuel on which dates or which quantities and kinds of manure have been spread on which fields. Automatic readings from sensors, automatic aggregation and interpretation of the values, and automatic transfer of the data to the relevant Back-end-Workflow-Systems make it possible to automate many processes that nowadays require heavy human machine interaction.

Another scenario, complementing back-end communication, is group communication. Modern harvesting procedures no longer depend just on individual machines. In many cases, they involve multiple machines, working either in parallel or in a sequence of operations. This means that farmers need an overview over the whole harvesting process. One way of ensuring that the harvest proceeds without interruptions or with minimal interruptions is to allow machines to communicate and interact with each other. For instance, if a machine finds an unknown obstacle in a field, it can identify the obstacle, label it with GPS coordinates, and use ad hoc communication capabilities to instantly communicate the data to other machines working. This kind of group communication does not merely optimize the process – it can sometimes prevent a complete failure of the harvest. An obstacle such as a concealed manhole cover can cause significant damage to a harvester, putting it out of operation for a long time.

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Better quality software solutions

In recent years, usability has increasingly become one of the key quality criteria deciding the success of software solutions. High usability means that the software provides efficient and effective support to users in their everyday work and that users are satisfied with what they receive.

There exists a broad spectrum of methods for ensuring this kind of quality. User-centered design or usability engineering, as it is sometimes known, bring them together in a single integrated strategy. Usability engineering systematically involves end users in every phase of the development process. This makes it possible to prioritize user requirements, to rapidly identify solutions, and to evaluate these solutions on a continuous basis (e.g. through user tests). In this way, conceptual and technical problems are detected at an early stage when they can still be corrected at low cost.

In classical software engineering, user-centered design methods are often applied ineffectively and in many cases too late. Although there are many reasons, most can be traced to insufficient knowledge and experience in integrating them in the development process. In C-LAB the "Interactive Dialog Systems" (IDS) group has integrated software and usability engineering both in its scientific work and in the practical application of procedures and methods. In the process, it has developed very strong know-how. This year saw the publication of a dissertation on integration between software and usability engineering. The methods it describes have already become part of our day to day practice. The group’s know-how is further strengthened by additional dissertation work, currently in progress, and by numerous publications.

Usability methods and Multi-Touch technology

Multi-Touch technology makes it possible to simultaneously perform multiple actions through a touch-based interface and offers new ways of providing input that are not present in classical devices such as the keyboard and the mouse. For instance, it allows users to manipulate screen objects using several fingers at once. If the screen is big enough they can even use both hands.

Multi-Touch-Hardware ist spätestens seit der Einführung des iPhone von Apple eine Trendtechnologie. Immer mehr Geräte in unterschiedlichen Formfaktoren – vom Smart Phone über Netbooks und Multi-Touch-Tables bis hin zu riesigen, berührungsgesteuerten Wänden – gelangen auf den Markt.


Die Gruppe IDS erforscht aktuell die Möglichkeiten und Grenzen der Interaktionsformen an eigens konstruierten Multi-Touch-Tischen in Kombination mit anderen Eingabemöglichkeiten und entwickelt Szenarien, die eben diese exklusiven Möglichkeiten dieser Geräte sinnvoll und nachhaltig sowohl in den wissenschaftlichen aber eben auch in den Geschäftskontext der Siemens IT Solutions und Services und ihrer Kunden überträgt.

Since the introduction of the Apple iPhone, Multi-Touch technology has become trendy, with the market offering an ever increasing number of devices with different form factors, from Smart Phones, Netbooks and Multi-Touch Tables through to very large touch-driven “Walls”.

In spring, 2008, it became possible to buy a Multi-Touch “Surface” from Microsoft, allowing multiple users to work and interact with a single system. To date, however, there has been a lack of realistic use scenarios describing how to exploit the advantages of these and similar systems. In most cases, demonstrators and prototypes have ported existing IT-applications to the new equipment without showing its true advantages over current technology. As a result the majority of demonstrators and commercial applications still rely on the “wow factor”, failing to show how the equipment can really improve efficiency.

The IDS group has built its own Multi-Touch table. The group is currently investigating scenarios in which it uses these tables in combination with other input devices. The new scenarios demonstrate meaningful ways of exploiting the unique potentiality of Multi-Touch technology, both in own scientific work, and in Siemens IT Solutions’ commercial offering to its customers.

Kontakt/Contact: Dr. Karsten Nebe
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SICHERHEIT, PRIVATSPHÄRE UND VERTRAUENSWÜRDIGKEIT IM MOBILEN ANWENDUNGSKONTEXT

Aus Nutzersicht sind im mobilen Kontext die Sicherheit der Daten, die Wahrung der Privatsphäre sowie die Rücksichtnahme auf Vertraulichkeit der Informationen (Security, Privacy and Trust, kurz SPT) von wesentlicher Bedeutung für die Akzeptanz von mobilen Diensten. Obwohl entsprechende kryptographische Verfahren längst gut verfügbar und auch als Bibliotheken implementiert sind, fehlt in der Regel auf der Benutzerebene adäquate Funktionalität. Ursachen dafür sind:

- SPT-Funktionalität ist nicht integriert, sondern wird nachträglich aufgesetzt.
- Es wird ein binäres „Entweder ganz oder gar nicht“-Modell von Sicherheit verwendet.
- Dialoge verwenden eine dem Anwender i. d. R. unverständliche Fachterminologie.
- Dialoge erscheinen häufig außerhalb eines passenden Kontexts.

Im Rahmen des europäischen Forschungsprojekts „Simple Mobile Services“ (SMS) wurde prototypisch Verbesserungspotenzial aufgezeigt:


SECURITY, PRIVACY AND TRUST-WORTHINESS IN MOBILE APPLICATION CONTEXTS

When deciding whether or not to use a mobile service, users place great importance on data security, privacy protection and trustworthy information – or SPT, as it is sometimes called. Cryptographic procedures supporting these requirements are readily available and have been implemented as software libraries. In general, however, they fail to offer adequate functionality at the user level. There are several reasons:

- SPT functionality is poorly integrated with applications and is often seen as a last minute add-on.
- The functionality provided is based on a binary “either or” security model.
- Dialogs use technical terminology that is incomprehensible to users.
- In many cases, the dialogs provided are unable to adapt to different contexts of use.

The C-LAB team in the European research project “Simple Mobile Services” (SMS) has created a prototype showing how to improve this situation.

The first stage of the work consisted of the development of a software library providing SPT functionality for data transmission. The library included declarative statements making it possible to specify the value of security parameters for different contexts of use (e.g. for different locations). The functionality provided by the library means that the application no longer needs to ask this information from users before transmitting information. A specially defined format – the mobile electronic message or MEM – incorporates cryptographic keys or electronic signatures. The service offers flexible granularity, allowing users to encrypt or sign just a part of the MEM. During the encryption process, the sender decides which part of the MEM or which meta-information (e. g. the name of the author, the name of the person forwarding the MEM) should remain confidential. When MEMs use electronic signatures, the sender can sign the part of the content she specifically wants to “guarantee”. When she has used information from third parties this information can be signed by the third parties themselves or not


Insgesamt hat sich gezeigt, dass ein erheblicher Aufwand in die richtige Integration von SPT-Funktionen investiert werden muss und dass der hier beschriebene deklarative Ansatz besser durchschaubar und vermittelbar ist als der bislang übliche funktionale Ansatz. Mit dem entwickelten Ansatz lässt sich die Sicherheit von mobilen Anwendungen leichter gewährleisten – aus Nutzer- wie auch aus Entwicklersicht.

signed at all. In neither case is the sender required to sign information she cannot vouch for.

During their work, the C-LAB team developed a layered security model making it possible to classify information as public, non-public, private, confidential and secret. A similar system is used to classify the recipient’s need to be sure of the sender’s identity. The different levels provided by the model correspond to the differences between postcards, letters, registered mail and private courier services. Each level implies specific requirements on data storage and key management. For private information it is enough to encrypt the message with simple, one-time keys. A secret message, on the other hand, might require the use of a key generated by a chip card.

To test the user interface design, the group developed a demonstrator application. The application, which we called RemCal, provided users with calendar information, adapting the information provided to the user’s current context. A first feature of the design was the decision to integrate SPT information in the interface rather than showing it in volatile pop-up menus. Another feature was the classification of calendar entries as public, private and work. The information shown by the application adapted to different contexts of use. For instance, when users were at work, names in private appointments were not shown while in private contexts, the application did not show the details of business meetings.

The calendar is just one example of a possible application for the concepts we have developed in our work. One key area is the growing use of mobile end user devices in business. The use of this kind of device has complex implications for SPT. Our research in SMS provides a good basis for intelligent solutions.

In summary, we have shown that proper integration of SPT functions in an application requires significant effort and that the declarative approach described here is more transparent and easier to explain than earlier functional approaches. The strategy we have developed in our work makes it significantly easier for users and developers to guarantee the security of mobile applications.

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LEHRVERANSTALTUNGEN / LECTURES

Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik
Institut für Informatik
B. Kleinjohann, L. Kleinjohann: Intelligenz in eingebetteten Systemen (SS 2009)

Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik
Institut für Elektrotechnik und Informationstechnik, Fachgebiet Theoretische Elektrotechnik
Y. Sönmez: Übungen/Klausuren Theoretische Elektrotechnik B (SS 2009)

Universität Paderborn, Fakultät für Kulturwissenschaften, Fachgebiet Psychologie
K. Nebe: Seminar, Methoden des User Centred Design (SS 2009)

Fachhochschule Köln, Fakultät für Informatik und Ingenieurwissenschaften
Institut für Informatik
K. Nebe: Vorlesung und Übung, Usability- und Software-Engineering (SS 2009)

Fachhochschule Gelsenkirchen, Fachbereich Informatik
F. Klompmaker: Vorlesung, Virtuelle Umgebungen A (SS 2009)

FHDW – Fachhochschule der Wirtschaft, Paderborn
Ch. Loeser: Vorlesung, Informatikgrundlagen (WS 2008/2009)

BÜCHER, KONFERENZ UND JOURNALBEITRÄGE / BOOKS, CONFERENCE AND JOURNAL PAPERS

S. Ahlheid, T. Friberg: „Hybrider Messansatz zur Bestimmung der Informations- qualität unstrukturierter Daten“; Proceedings of the 7th German Information Quality Management Conference & Workshop (GIQMC); November 2009

Die Arbeit von Dr. Esau ist ein Beispiel für die zunehmende Bedeutung von emotionalen Aspekten in der mensch-roboter-Interaktion. Sie zeichnet sich durch eine umfassende Analyse von Emotionen in der mensch-roboter-Interaktion aus, die auf einer soliden theoretischen Grundlage basiert.


Alexander Krupp: „A Verification Plan for Systematic Verification of Mechatronic Systems“, Prof. Dr. F. J. Rammig (University of Paderborn, Faculty of Computer Science, Electrical Engineering and Mathematics), Prof. Dr. W. Hardt (TU Chemnitz, Faculty of Computer Science)

Today, one of the key elements in the cost of developing mechatronic systems is verification. In model-based development, many sources of error can only be recognized if we first identify the underlying error in the design. This requires costly functional verification. Increased use of model-based development methods offers new possibilities for automated verification. However, the methods currently used for the verification of mechatronic systems have not eliminated the substantial, methodological gap between the methods used to define the requirements of the system and those used to define its formal properties. On the one hand, there are very few methods supporting the formalization of requirements expressed in natural language; on the other, there is no standardized, broadly accepted method for defining the formal properties, used to specify the goals of this kind of formalized verification planning.

Mr Krupp has developed an innovative method for the definition of a verification plan for mechatronic systems. The method he proposes integrates current developments in verification planning for digital electronics, with state of the art practices in the development and verification of mechatronic systems. The method makes significant extensions to Daimler's well-established CTEM/ES method, in which specifications are defined using classification trees. The method makes it possible to define formal properties and to specify execution control in an automated verification plan which can then be used to simulate and test the mechatronic system. The combination of innovative verification techniques and functional requirements significantly improves the visibility of the verification process. A unified notation allows more efficient definition of verification plans and facilitates new horizontal and vertical applications.

The method is embedded in a modern verification methodology for mechatronic systems, ready for application in special research domain B14.

Wilhelm Richert: “Learning and imitation in heterogeneous robot groups”, Prof. Dr. F. J. Rammig (University of Paderborn, Faculty of Computer Science, Electrical Engineering and Mathematics), Prof. Dr. H. Kleine-Büning (University of Paderborn, Faculty of Computer Science, Electrical Engineering and Mathematics), Prof. Dr. U. Brinkschulte (Frankfurt University, Faculty of Computer Science and Mathematics)

As robots become ever more affordable, they are performing ever more complex tasks for an ever broader range of applications. Today, it is usual to manually program robots to perform specific tasks. Sometimes, however, the operating environment or the tasks are so complex that this is not possible. In these cases, robots have to learn the desired behavior. In most cases, the learning process involves a long training phase in which the robot experiments with its environment. One way of reducing the time needed might be to use a group of robots with a common goal and the ability to imitate each other. The dissertation explores how this might be possible.

The dissertation describes the development of a robot architecture integrating learning and imitation. On the one side, the architecture supports self-driven learning through exploration; on the other, it allows the robot to integrate the knowledge it acquires from imitation, into its own behaviors. Learning new behaviors involves two separate levels of abstraction. Abstract strategies are learned in the form of abstract states and symbolically-represented actions corresponding to these states. The symbolic actions are provided by a special component that is able to discover and learn new elementary behaviors.

The approach adopted in the dissertation makes it possible for robots to imitate each other without knowing each other’s internal data structures. This implies that an imitator robot can use its observations to understand an observed behavior, and reproduce the behavior using its own capabilities. In this way it becomes possible to implement imitation in groups of heterogeneous robots. In most cases, the use of imitation in a group of robots with different capabilities would worsen their performance. The approach proposed here makes it possible to take account of similarities and differences in their behavioral capabilities. It can also be used to select similar robots for imitation tasks.
die Möglichkeit, das beobachtete Verhalten aus seinen Beobachtungen abzuleiten und mit seinen eigenen Fähigkeiten zu reproduzieren.


Oliver Stübbe: „Modellierungsverfahren für die zeiteffiziente Simulation von optischen Verbindungen auf Leiterplattenbene“, Prof. Dr. G. Mrozynski (Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik), Prof. Dr. R. Schuhmann (Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik)


Oliver Stübbe: “Procedures for the modeling of board level interconnections towards time efficient simulations”, Prof. Dr. G. Mrozynski (University of Paderborn, Faculty of Computer Science, Electrical Engineering and Mathematics), Prof. Dr. R. Schuhmann (University of Paderborn, Faculty of Computer Science, Electrical Engineering and Mathematics)

Ever increasing volumes of data are driving requirements for bandwidth at all levels of the interconnect hierarchy, from long haul down to on-chip interconnects. This is the so-called interconnect bottleneck problem. One solution, at the printed circuit board level, is to replace conventional high-speed electrical copper lines with embedded optical waveguides. It is likely, therefore, that future circuit boards will be enhanced with optical layers containing complex networks of such waveguides.

Today, there are no procedures for rapidly analyzing the transmission behavior of this kind of additional layer. Given that the waveguides are highly multimodal, one possibility is to use ray optical methods to develop time efficient models. The dissertation proposes two strategies to generate the required models. The first exploits symmetries in the core cross section of the waveguide. In this technique, every possible ray path within the waveguide is represented by two rays on orthogonal planes. The paths and the ray parameters for the rays are computed separately. In this way, there is always at least one ray path that can be computed rapidly using a small number of solvable analytical equations. The second strategy exploits redundancies in the computation of the ray path parameters. This approach makes it possible to generate a multiport model using algebraic methods. The resulting model can then be used to determine transmission behavior.

The computing time for the new models is independent of the geometry of the waveguides and the materials used.
Rasche, Christoph: Aufgabenbasierte Pfadplanung autonomer Drohnen; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Dr. B. Kleijnjohann, Prof. Dr. F. J. Ramming, C. Stern

Raupach, Stefan: Barrierefreie AAL-Services auf Basis einer OSGI-Anbindung eines URC-Servers; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. G. Szwillus, J. Gürlich, M. Dubielzig, K.-P. Wegge

Rommel, Heinrich: Skalierbares segmentelles Ausgleichserfahren für den automatisierten Entwurf planar-integrierter optischer Wellenleiter; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. R. Schuhmann, Dr. Th. Bierhoff

Sander, Björn: Drahtlose Steuerung des Onboard-Prüfsystems zur Qualitätssicherung der Fahrzeugmontage; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. B. Kleijnjohann, Prof. Dr. F. J. Ramming, Dr. Jörg Preißinger (BMW)

Schäf, Peter: Semantisches Clustering durch ein web-mining-basiertes Verfahren zur Gruppierung von Begriffen; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. G. Szwillus, Prof. Dr. W. Hauenschuld, Dr. K. Nebe

Schmelter, Stefan: Softwaretechnische Parallelisierung eines sequenziell arbeitenden diffusen Ray-Tracing-Verfahrens unter Berücksichtigung dynamischer Lasten; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. R. Schuhmann, Dr. Th. Bierhoff

Schröfel, Daniel: Explorative Accessibility-Evaluierung neuer Web-Technologien am Beispiel von Microsoft Silverlight; Universität Fulda: Prof. Dr. J. T. Milde, B. Claassen, K.-P. Wegge

Sollman, Ahmed: Ein Validator zur AUTOSAR-basierten Entwicklung von Kfz-Steuergeräten; Universität Paderborn, Fakultät für Maschinenbau; Prof. Dr. J. Gaussemeyer, Dr. W. Müller

Vogel, Jörn: Klassifikation taktiler Reize aus peripheren Nervensignalen; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. G. Hirziger, Dr. P. van der Smagt, Prof. Dr. F. J. Ramming

Westerholt, Jonathan: Entwicklung und Implementierung einer PMBus-kompatiblen Steuerung von Netzteilen; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. F. J. Ramming, Dr. W. Müller

Zhang, Yi: Konzeption und Evaluierung eines automatisierten Test eines Statetwo-Modells mithilfe von formalen Anforderungen zur Integration in den Conti Temic Entwicklungsprozess; Universität Paderborn, Fakultät für Elektrotechnik, Informatik und Mathematik; Prof. Dr. F. J. Ramming, Dr. W. Müller


OSAMI: OSAMI Commons (Open Source Ambient Intelligence) – Software-Plattform für flexible Dienstesysteme über Geräten und eingebetteten Systemen; 07/2008 – 06/2011

MATERNA GmbH, Siemens AG, ProSyst, Coscience GmbH & Co. KG, Schüttgott-Schüler’sche Kliniken, OFFIS e.V., Technische Universität Dortmund, Universität Paderborn, Universität Rostock


Andres Industries AG, Universität Stuttgart, Universität Paderborn, Universität Freiburg, Deutsches Rotes Kreuz Frankfurt, Siemens AG

Optical Link: Hochintegrierter Optical Link zur kosten- und energieeffizienten, hochbrütigen Datenübertragung im Kurzstreckenbereich; 04/2009 – 02/2012

Innolume GmbH, Fujitsu Technology Solutions, TU Dortmund, Universität Paderborn

VERDE: Verifikation-orientiert und -component-based model driven engineering für real-time embedded systems; 06/2009 – 05/2012

Robert Bosch GmbH, FZI Forschungszentrum Informatik an der Universität Karlsruhe, Infineon Technologies AG, ScopeSET Technology Deutschland GmbH, itemis GmbH, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V., Astraum GmbH, Universität Paderborn


Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V., FZI Forschungszentrum Informatik an der Universität Karlsruhe, Infineon Technologies AG, MICRONAS GmbH, Robert Bosch GmbH, Siemens AG, Tieto Deutschland GmbH, Universität Bremen, OFFIS e.V., Technische Universität München, Eberhard-Karls-Universität Tübingen, Universität Paderborn
wareIT@work; Empowering the mobile worker by wearable computing; 06/2004 – 05/2009

SPRINT; Open SoC Design Platform for Reuse and Integration of IPs; 02/2006 – 01/2009 Phillips Research Labs Eindhoven (NL), ST France (FR), ST Belgium (BE), Infineon Technologies AG (DE), Evatronix S.A. (PL), Sypol Asp (DK), Prosi log S.A. (FR), Universität Paderborn (DE), Kees DA (FR), TIMA/ADR (FR), Philips Semiconductors B.V. (NL), KTH (SE), Spiraltech (UK), ECSI (FR), ARM (UK) und Lauterbach (DE)

 DySCAS; Dynamically Self-Configuring Automotive Systems; 06/2006 – 02/2009 Volvo Technology AB (SE), DaimlerChrysler AG (DE), Enea Embedded Technology AB (SE), Robert Bosch GmbH (DE), University of Greenwich (UK), Universität Paderborn (DE), Kungliga Tekniska Högskolan (SE), ZealCore Embedded Solutions AB (SE) und Movimento AB (SE)

HYDRA; Networked Embedded System middleware for Heterogeneous physical devices in a distributed architecture; 07/2006 – 06/2010 C. International Ltd. (UK), CNET Svenska AB (SE), Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e. V. (DE), In–Jet APS (DK), Pri way APS (UK), T–Connect S.R.L. (IT), Telefónica Investigación Y Desarrollo SA Unipersonal (ES), Aarhus Universität (DK), Innova S.P.A. (IT), The University of Reading (UK), MESH–Technologies A/S (DK), Siemens AG (DE) und Technica Universita V Kosciaci (SK)


E-CAB; E-enabled Cabin and Associated Logistics for Improved Passenger Services and Operational Efficiency; 07/2006 – 10/2009


MeeAM; Mainstreaming on Ambient Intelligence; 09/2006 – 08/2010 Swedish Handicap Institute (SE), OpenHub (UK), University of Zaragoza (ES), France Telecom (FR), Electricité de France (FR), Kungliga Tekniska Högskolan (SE), London School of Economics (UK), HMC International (BE), Siemens AG (DE), Telefonica I+D (ES), Trialog (FR), Technical University of Kosice (SK), University of Passau (DE) und Europ Assistance France (FR)

EASY LINE+; Low cost Advanced White Goods for a longer independent life of elderly people; 01/2007 – 06/2009 BSH Elektrodomesticos Espana S.A. (ES), A D Software Solutions Limited (UK), Telefónica (ES), Geoelectitun Laitos (FI), BMT Group Limited (UK), Lunds Kommun (SE), Organizacion Nacional de Ciegos Españoles (ES), Kreis Soest (DE), Navteq B.V. (NL)

HaptiMap; Haptic, Audio and Visual Interfaces for Maps and Location-Based Services; 09/2008 – 08/2012 Queen’s University Belfast (UK), University of Glasgow (UK), Fundacion Robotiker (ES), OFIS e. V. (DE), Commissariat a l’Energie Atomique (FR), Siemens AG (DE), Geoelectitun Laitos (FI), BMT Group Limited (UK), Lunds Kommun (SE), Organizacion Nacional de Ciegos Españoles (ES), Kreis Soest (DE), Navteq B.V. (NL)


COCONUT; A Correct-by-Construction Workbench for Design and Verification of Embedded Systems; 01/2008 – 06/2010 Universität degli Studi di Verona (IT), AerieLogic (FR), CEA-Leti (FR), Cer tessa S.A. (FR), Fondazione Bruno Kessler (IT), University of Southampton (UK), Graz University of Technology (AT), Universität Paderborn (DE)
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Member of GI FB HCI „Human-computer-interaction“ (K. Nebe)
Stellvertretender Sprecher der RSS Fachgruppe 4, „Beschreibungssprachen und Modellierung von Schaltungen und Systemen“ (W. Müller)

IFIP:

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Publication Chair of IFIP WG 10.2 Embedded Systems (L. Kleinjohann)
German National Representative to IFIP TC10 (F. J. Rammig)
Member of IFIP WG 10.5 (F. J. Rammig)
Member of IFIP WG 10.2 Embedded Systems (F. J. Rammig)

ACM, IEEE:

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Member of ACM (K. Nebe, W. Müller)
Member of IEEE Computer Society (W. Kern, F. J. Rammig, W. Müller)
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Leitung des ZVEI-Arbeitskreises Design for All (K.-P. Wegge)
Mitarbeiter des DigitalEurope eAccessibility Cluster (K.-P. Wegge)
Mitarbeiter des DigitalEurope eInclusion Clusters (K.-P. Wegge)
Mitarbeiter der CECED Working Group New Approach, Safety and Accessibility (K.-P. Wegge)
Gast der VDE AAL-Initiative, Ambient Assisted Living (K.-P. Wegge)
Mitglied der Arbeitsgruppe „Usability Engineering & Software-Ergonomie“ der DATech (Deutsche Akkreditierungsstelle für Technik GmbH) (K. Nebe)
Member of Usability Professionals’ Association (UPA) (K. Nebe)
PROGRAM COMMITTEES, ORGANIZATION OF SESSIONS AT CONFERENCES:

Program Committee Member, SMT/HYBRID/PACKAGING 2009, Nürnberg, Germany, May 2009 (J. Schrage)
Program Committee, International Workshop on Open Design Spaces supporting User Innovation (ODS ‘09), Siegen, Germany, May 2009 (K. Nebe)

Chair, Program Committee, Workshop: Integration von Software Engineering und Usability Engineering on INFOR-MATIK 2009 GI-Jahrestagung, Lübeck, Germany, September 2009 (K. Nebe)
Vice Program Chair, DATE 2009, Nizza, France, April 2009 (W. Müller)
General Co-Chair, UML-SOC’09, San Francisco, USA, July 2009 (W. Müller)

DEUTSCHE NORMUNG (DIN/DKE)

Leitung, DIN NA 023-00-02 GA: Grundlagen zur barrierefreien Gestaltung/Accessibility (K.-P. Wegge)
Mitglied, DIN NA Erg-Lenk: Lenkungsausschuss des Normenbereichs Ergonomie im DIN (K.-P. Wegge)

INTERNATIONALE NORMUNG (ISO/IEC)

Mitarbeiter, ISO TC159 AGAD: Advisory Group for Accessible Design (K.-P. Wegge)
Leitung der deutschen Delegation, ISO TC159 WG2: Ergonomics for People with Special Requirements (K.-P. Wegge)
Mitglied, ISO TC159 WG2: Ergonomics for People with Special Requirements (C. Weiland, M. Dubielzig)

EUROPÄISCHE NORMUNG (CEN/CENELEC/ETSI)

Leitung der deutschen Delegation, CEN BT/WG185: eAccessibility (K.-P. Wegge)
Mitarbeiter, CEN BT/WG185 PT: Projektteam zur Bearbeitung von Phase I des EU Mandate 376 (K.-P. Wegge)
Mitarbeiter, CEN BT/WG: CEN Guide 6 – implementation mechanism (K.-P. Wegge)

Mitarbeiter, CEN ICT Standard Board, Sub Group DATSCG: Design for All and Assistive Technologies Standardization Co-ordination Group (K.-P. Wegge)
Mitarbeiter, CEN Workshop: UD-PROF, Curriculum for training professionals in Universal Design (K.-P. Wegge, C. Weiland)
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Herr Arbitter
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Frau Prof. Dr. Domik
Universität Paderborn
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Herr Prof. Dr. Engels
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Universität Paderborn
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Universität Paderborn

Herr Prof. Dr. Rückert
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Stand: 02.11.2009 / Position as per 02.11.2009