HUMAN–MACHINE INTERACTION

InnovationsAllianz
DER NRW-HOCHSCHULEN E.V.

PATTERN MATCH

HUMAN MACHINE INTERACTION

Account

THE UNIVERSITIES OF NORTH RHINE–WESTPHALIA:
YOUR PARTNERS FOR EUROPEAN RESEARCH PROJECTS

HUMAN–MACHINE INTERACTION:

COMPETENCIES OF NORTH RHINE–WESTPHALIA'S UNIVERSITIES

InnovationsAllianz
DER NRW-HOCHSCHULEN E.V.

THE UNIVERSITIES OF NORTH RHINE-WESTPHALIA:

YOUR PARTNERS FOR EUROPEAN RESEARCH PROJECTS IMPROVING "HUMAN-MACHINE INTERACTIONS"

With a total of 72 universities, some 670,000 students, and more than 50 non-university research institutes, North Rhine-Westphalia can boast the most concentrated science and research landscape in the whole of Europe. The state's universities and universities of applied sciences offer outstanding development potential and research expertise.

The NRW Innovation Alliance is a cooperative network of 27 universities, universities of applied sciences, and university transfer organisations in North Rhine-Westphalia. It was founded in 2007 to draw attention to the extensive range of services and research skills available in its universities, to strengthen the existing contacts between universities and industry, and to promote research and knowledge transfer.

In 2010, the NRW Innovation Alliance initiated a series of presentations on "The Universities of North Rhine-Westphalia: Your Partners for European Research Projects". To date, four catalogues describing excellent research projects have been produced. These were presented at symposia in Brussels at the Permanent Representation of North Rhine-Westphalia to the European Union.

In this latest presentation, we address "Human-Machine Interaction". It aims at making the usage of technical systems more comprehensible, intuitive and smooth in order to better support people in their everyday activities.

As people and technology are involved in human-machine interactions it goes without saying that the research is extremely interdisciplinary, ranging from production and automotive engineering to computer science to public health and medicine. The field is characterised, on the one hand, by strong cooperation between engineering, natural sciences, human and social sciences and, on the other hand, between scientists and end-users.

In this catalogue, scientists from the Alliance's member universities and member universities of applied sciences present new concepts and technological solutions to current topics of research. In the form of 40 descriptions, experts from computer science, health, several fields of engineering, product design, communication, and even biology, present their scientific expertise and resources. This catalogue also contains a list of scientists from North Rhine-Westphalia's Universities, their research activities, and contact information. A short presentation about the NRW Innovation Alliance concludes this publication. Obviously, the catalogue can only present a non-exhaustive selection of the chosen topics, but it is nevertheless a good guide for possible research cooperations with staff in the universities of NRW.

The topic of this catalogue "Human-Machine Interaction" relates in many ways to Horizon 2020, the EU Framework Programme for Research and Development, as well as to "Fortschritt NRW", a research strategy pursued by the government of the State of North Rhine-Westphalia Humans are central to these research activities that focus on increasing the usability of technical systems, making complex processes easier to handle, and optimising labour constraints by designing suitable interfaces.

The NRW Innovation Alliance will organise a symposium on "Human-Machine Interaction" in late summer 2014, not only to present the many fascinating research activities, but also to enable networking between scientists, company' representatives and stakeholders of politics and society. All activities are dedicated to enforce networks and competencies regarding activities within the frame of Horizon 2020.

On behalf of the board of directors
of the NRW Innovation Alliance

Dr. Dirk G. Ebling   Prof. Dr. Stefan Witte

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YOUR PARTNERS FOR EUROPEAN RESEARCH PROJECTS THAT ADRESS "HUMAN-MACHINE INTERACTION"

AIMS

With this catalogue, the members of the NRW Innovation Alliance outline their excellent research on the many aspects of "Human-Machine Interaction", an issue that is omnipresent and important in private life as well as in working environment of almost all European citizens. The presentations document the universities' scientific capabilities, highlighting the issues and research topics. The majority of the topcis are already being taken into consideration by the European Union in the Horizon 2020 programme. The collection of high-quality projects in this catalogue is arranged according to topics, enabling European companies and research institutions to easily identify and contact relevant research partners in North Rhine-Westphalia's universities.

THE SUBJECTS ARE:

■ Production and Ergonomics
■ Usability Engineering
■ Applications for Quality of Life
■ Traffic, Mobility, Transportation
■ Energy
■ Other Subjects

THE FIRST STEP

In autumn 2013, the "EU-Lobbying" team from the NRW Innovation Alliance, comprising representatives from more than ten universities, conducted an inquiry at all universities in North Rhine-Westphalia asking for research projects dealing with various aspects of "Human-Machine Interaction".

GUIDELINES

■ Focus on excellent research projects, e.g. collaborative research centres and priority programmes funded by the German Research Foundation (DFG, Deutsche Forschungsgemeinschaft), the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Economics and Energy (BMWi), the European Union, the government of the State of North Rhine-Westphalia, companies etc.

■ Not just basic research, but also applied projects.

■ Various points of contact for the issue "Human-Machine Interaction", e.g. technical, economical, socio-scientific, environmental, medical questions.

■ Cooperation with business partners.

■ European dimension, cooperation with partners from other European countries.

■ Easy-to-read representations.

■ Contact information on project leaders and participants.

16 universities participated in this survey and submitted details for 40 projects.

PROJECT PRESENTATION

ALL ARTICLES ARE STRUCTURED AS FOLLOWS:

■ Project title.
■ Name of the university, contact.
■ Abstract – description of work, objectives, main targets.
■ List of participants, business partners, research institutions, networks etc. (from North Rhine-Westphalia and from other member states of the EU).
■ Project start and duration, total costs and funding.
■ Perspectives, approaches and ideas for further development at the European level.

How we prepared the catalogue

Production and Ergonomics

P. 1

ANALYSIS OF MOTION AND USE OF HOSPITAL BEDS
ERGONOMIC INTERFACE BETWEEN MAN AND MACHINE

ABSTRACT

Hospital beds are often occupied and moved very frequently. The weight of the beds, with patients and equipment, subjects the staff who move them around – the bed operators – to physical strains that can develop into physiological problems.

In this research project, the influence of parameter changes on the relationship between ergonomics and motion resistance, both stationary and dynamic, has been analysed and evaluated. A new test system portal for investigating dynamic motion was used. The project focused on the human-machine interaction at the bed's grab rail, the mass inertia that must be overcome, the start torque, and positioning stability. Design, steering geometry, choice of materials, and floor systems are regarded as the major parameters. The percentage values of individual aspects of energy consumption were also recorded (for example, for rolling resistance, going round corners, and up slopes) with particular attention paid to dynamic behaviour and, above all, the conditions of different floor surfaces.

Both bed operators and nursing personnel will benefit equally from the findings. In the future, these results could also be transferred to other wheeled systems in the health service sector.

Hospital bed in the roll simulator in the test laboratory for motion analysis.

Prof. Dr.-Ing. Ralf Hörstmeier

LIST OF PARTICIPANTS

- Armstrong Floor Products Europe, Bietigheim-Bissingen
- Evangelisches Krankenhaus, Bielefeld
- Forbo Flooring GmbH, Paderborn
- Joh. Stiegelmeyer GmbH & Co.KG, Herford
- Klinikum Bielefeld Mitte, Bielefeld
- Klinikum Lippe GmbH, Detmold
- Spectaris e.V., Berlin
- Steinco Rollen GmbH, Wermelskirchen
- Tente-Rollen GmbH, Wermelskirchen
- TFI – Deutsches Forschungsinstitut für Bodensysteme e.V., Aachen
- ZIG Zentrum für Innovation in der Gesundheitswirtschaft e.V., Bielefeld

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: June 2011 – July 2013

Costs: 260,000 Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Many ideas have been developed during the course of the research project and now offer solid opportunities for initiating further studies. As an example, it might be possible to reduce motion resistance in hospital beds by over 50%. The "Hospital Bed of the Future" could be redesigned according to optimal parameters to facilitate handling.

This research generates a lot of data that could form the basis for the future development of a matrix, linking wheels and floor coverings in an optimal combination. Application of the new knowledge could extend the service life and minimize the wear, not only of castors and wheels, but also of floor coverings, such as PVC, linoleum or carpeting.

Further research could lead to new possibilities, promoting economically reasonable decisions for new acquisitions in non-residential buildings (hospitals, care homes, schools). Although inappropriate decisions might be avoided during the planning stage, future studies will offer additional detailed practical information for decision-makers in the sectors of planning and facility management, permitting a more targeted investment and avoiding extra expenses for corrective measures.

Bielefeld University of Applied Sciences

CONTACT: Centre of Competence for Motion Processes, **Prof. Dr.–Ing. Ralf Hörstmeier**

Production and Ergonomics

P. 2 CoA²MPLy
COST ANALYSIS FOR ADDITIVE MANUFACTURING DURING PRODUCT LIFECYCLE

ABSTRACT

Additive Manufacturing (AM) is a layerwise manufacturing technology for producing complex products without tools. The main objective of this project is to understand and rate the cost drivers that act as the largest contributors to unit costs in Additive Manufacturing in order to facilitate future cost reduction activities. The results could be used to develop an interface that allows non-experts to exploit the opportunities effectively. Knowledge of cost drivers is important for future developments of AM machines because the production parameters considerably influence the costs. The future design of machine control interfaces should take account of the cost factors analysed in this project to enable cost-efficient manufacturing by the machine operators.

This will help increase the fields of application for additive manufactured parts with a focus on Metal Additive Manufacturing (MAM). In order to decrease costs from MAM, it is critical to understand relative cost analysis. A better understanding of the cost structure will help to compare AM costs with opportunity costs of the classical manufacturing technologies and make it easier to justify the use of AM manufactured parts. An elaborated user interface allows for uncomplicated integration into existing process chains and supports the operation of the machine. This project focuses on the costs over the product's lifecycle, which are similar for all AM technologies, starting in the design phase and ending with supply of spare parts.

Objectives:

■ Identification of the machine rate cost structure relative to current state MAM (AM) part suppliers.

■ Development of a concept for a human-machine interaction to enhance the cost calculation directly at the machine. Therefore, a technical interface will be developed that is able to analyse the data input and to prepare a graphical output for the operator to support the decision process with regard to cost-efficient manufacturing.

■ Analysis of existing business processes to understand the unit cost structure on the basis of the production quantity and machine rate for the conventional machining and MAM machines.

■ Redesign of a part to take advantage of MAM (AM) technology and comparison of costing and assembly using conventional machine parts.

LIST OF PARTICIPANTS

■ University of Paderborn, Faculty of Mechanical Engineering, Computer Application and Integration in Design and Planning (C.I.K.), Univ.-Prof. Dr.-Ing. Rainer Koch

■ University of Paderborn, Direct Manufacturing Research Center (DMRC)

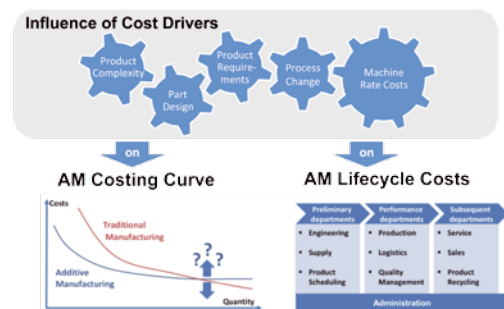### PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

This project will build a framework for costing analysis to be utilised by European OEMs, Additive Manufacturing part suppliers and Additive Manufacturing part users. The integration of a human-machine interaction on the basis of the cost analysis offers the chance to expand the technology and its application areas and to improve the product's characteristics. AM cost analysis will be continued in another project that considers plastics in addition to metal. Since AM will have considerable influence on the existing supply chains, an analysis of the effect could be investigated treating Europe as one huge trading area.
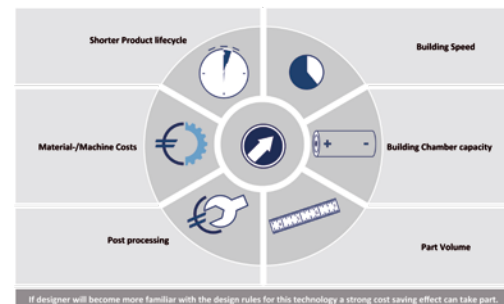
Approach of the work based on cost drivers.
[© DMRC]

Overview of the topics that are investigated during the project.
[© DMRC]

University of Paderborn

Production and Ergonomics

Ostwestfalen–Lippe University of Applied Sciences

P. 3 **ProErgo**
ERGONOMIC DESIGN OF PRODUCTION MACHINES

ABSTRACT

An insufficient consideration of ergonomics in the design of produc-
tion machinery is detrimental - firstly, for individuals in their different
roles (machine operator, maintenance personnel, programmer etc.),
secondly, for the machine manufacturers and, thirdly, for the produc-
tion company using the machine.

Use of production machines with poorly designed operating processes,
setting-up procedures, or machine maintenance, can lead to stressful
situations, especially when users are working under time pressure or
in unpleasant environmental conditions, such as loud noise. Long term
work under such conditions can lead to health problems. For machine
manufacturers, ergonomic design deficits can result in customer com-
plaints and ultimately in a decline in revenue and profit. In other
words, ergonomically designed production machines represent a stra-
tegic competitive advantage. For production companies using produc-
tion machines, ergonomic deficits usually cause a deterioration in the
return-on-investment, as the overall equipment effectiveness, pro-
ductivity, and employee satisfaction are adversely affected.

These negative effects of non-ergonomically designed production ma-
chines are reinforced by further challenges and trends in the mecha-
nical engineering industry.

These trends include:
- increasing technological complexity of machines,
- networking of machines via the internet
  ("Industry 4.0 / Cyber-Physical Systems"),
- increasing global competition with engineering
  companies from emerging nations,
- demographic change and an ageing workforce in Western
  industrialised nations.

The aim of the research is:
- to explore innovative ergonomic standards for production
  machines together with the manufacturers, operators, and
  users of these machines,
- to test the developed technical and organisational standards
  in the context of machine prototypes,
- to operate ergonomically designed production machines
  for demonstration purposes ("Best Practices"),
- to develop or refine ergonomic methods - from product ideas
  to machine concepts, prototypes, and the completion of a
  machine.

In an initial study, which was conducted as part of the project, the
work processes of laser sintering machines were analysed. The proce-
dure was guided by the standard DIN EN ISO 9241-210:2010 and in-
cluded recordings of the context of use, usability tests, and the devel-
opment of design recommendations. The results of the study show
that there are significant ergonomic opportunities for improvement.
Implementation of these design recommendations will improve both
the work situation of the employees as well as the productivity of the
work system.

LIST OF PARTICIPANTS

**Hochschule Ostwestfalen–Lippe – University of
Applied Sciences, Lemgo and Detmold:**
- Faculty of Production and Economics, Laboratory of Industrial
  Engineering, Prof. Dr.-Ing. Sven Hinrichsen (project speaker)
- Faculty of Electrical Engineering and Computer Science,
  Prof. Dr.-Ing. Jürgen Jasperneite; Prof. Dr. rer. nat. Oliver
  Niggemann; Prof. Dr. rer. nat. Volker Paelke
- Faculty of Production and Economics,
  Prof. Dr.-Ing. Elmar Hartweg; Prof. Dr. rer. pol. Wilfried Jungkind;
  Prof. Dr.-Ing. Adrian Riegel; Prof. Dr.-Ing. Franz-Josef Villmer
- Faculty of Architecture, Prof. Dipl.-Ing. Ulrich Nether;
  Prof. Dr.-Ing. Uta Pottgiesser

Further partners (sample):
- Fraunhofer Application Center Industrial Automation INA
- OWL Maschinenbau e.V., Bielefeld
- DMG Mori Seiki AG, Bielefeld
- Strothmann Machines & Handling GmbH,
  Schloß Holte-Stukenbrock
- Phoenix Contact GmbH & Co. KG, Blomberg
- HORA Holter Regelarmaturen GmbH & Co. KG,
  Schloß Holte-Stukenbrock

**PROJECT START AND DURATION,
TOTAL COSTS AND FUNDING**

Project: January 2014 – December 2017

Costs: 320,000 Euro

Funding: 205,000 Euro by the Ministry of Innovation,
Science and Research of the State of
North Rhine-Westphalia

**PERSPECTIVES, APPROACHES AND IDEAS FOR
FURTHER DEVELOPMENT AT THE EU LEVEL**

An important aim, beyond the project's duration, is the establish-
ment of this research cluster at the University of Applied Sciences
Ostwestfalen-Lippe. We are also interested in close collaborations
with universities, research institutions, and companies from other
EU countries.

U.1 ADAPTIVE USER INTERFACES – INTELLIGENT INTERACTION CONCEPTS FOR AN AGEING SOCIETY
USABILITY OF ASSISTANCE AND INFORMATION SYSTEMS AT HOME (UsAHome)

ABSTRACT

With increasing age and/or the extension of certain diseases or disa-
bilities, the ability to work with current standard user interfaces is
more and more limited. Two prominent reasons for this are impaired
vision and reduced fine motor skills.

Currently this situation is addressed with specialised systems, such as
special cell phones for seniors, but these suffer from low functionality,
unattractive designs, and are not able to support individual usage
problems. Consequently, user acceptance is low.

Our idea is based on universal design principles. The system should
learn individual disabilities and automatically adapt to allow further
usage of the well-known and well-accepted product over a longer
time. A simple example is the enlargement of buttons on touch inter-
faces when it is recognised that the precision-of-pointing action is
diminished.

Another source for adaptation parameters can be different sensors
available in different devices, e.g. acceleration sensors in smart
phones.

In the project, disabilities will be categorised, and algorithms deve-
loped to recognise them automatically. With the results from this
phase, automatic adaptation can be performed and a flexible user
interface (UI) pattern developed.

*The user interface adapts to user needs as recognised by sensors
and user observation.*

PERSPECTIVES, APPROACHES AND IDEAS FOR
FURTHER DEVELOPMENT AT THE EU LEVEL

The principle ideas need to be optimised for different fields of appli-
cations and target groups, with cooperation in projects that focus on
human-machine-interactions for an ageing society and/or people
with disabilities.

Additionally, it would be of interest to broaden this approach to other
fields of application. For example, automobiles, where adaption is
highly influenced by the driving situation, as recognised by different
sensors in modern cars, and the driver's performance, or distraction,
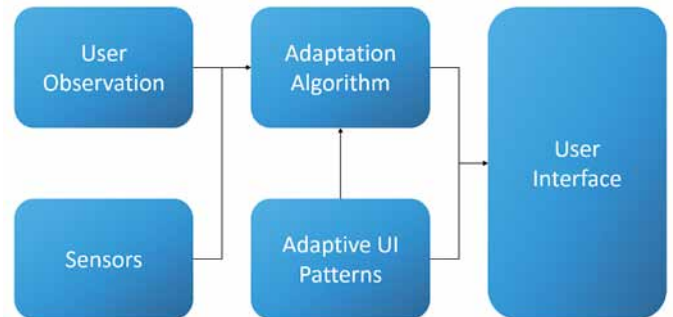due to secondary tasks.

LIST OF PARTICIPANTS

- Fraunhofer-Institute for Software and Systems
  Technology – ISST, Dortmund
- inHaus GmbH, Duisburg
- Sozialwerk St. Georg, Gelsenkirchen
- MedEcon Ruhr e.V. and MedEcon Ruhr GmbH, Bochum
- Hochschule Ruhr West – Computer Science Institute

PROJECT START AND DURATION,
TOTAL COSTS AND FUNDING

Project: January 2013 – December 2016

Costs: 530,000 Euro

Funding: 240,000 Euro by the Ministry of Innovation,
            Science and Research of the State of
            North Rhine-Westphalia ("FH Struktur")

Prof. Dr. Stefan Geisler

Cornelia Geyer

CONTACT: Computer Science Institute, **Prof. Dr. Stefan Geisler**

Usability Engineering

Hochschule Ruhr West – University of Applied Sciences

U. 2 **BAYESIAN LEARNING OF HIERARCHICAL REPRESENTATION OF LANGUAGE FROM RAW SPEECH**
UNSUPERVISED LEARNING TECHNOLOGIES FOR AUDIO AND SPEECH DATA

Usability Engineering

ABSTRACT

Conventional automatic speech recognition systems rely on supervised learning that involves a pronunciation lexicon and labeled training data.

However, there are many applications which could benefit from an unsupervised learning approach to speech recognition, i.e. training on the raw speech input in the absence of a pronunciation lexicon and without labeled training data. Therefore the goal of this project is to develop dictionary learning techniques for unsupervised language acquisition. Examples include:

- The development of speech technologies for people with speech impairments, for which standard speech recognition systems do not work.

- Preservation of endangered languages that are only spoken, but not written.

- Teaching a robot an application-specific vocabulary.

- Semantic analysis of an acoustic scene, i.e., acoustic scene understanding (for audio monitoring, surveillance, etc.).

LIST OF PARTICIPANTS

Cooperation Partners:

- University of Leuven, Prof. H. Van hamme, Belgium

- Carnegie Mellon University, Prof. B. Raj, Pittsburgh, USA

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: April 2012 – March 2015

Funding: DFG priority programme "Autonomous Learning"

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Multimodal adaptive interfaces for the elderly or for people with speech impairments.

Acoustic scene understanding for security applications or for ambient assisted living.

University of Paderborn

Diarization of an Audio Signal through Acoustic Scene Understanding Technologies

Example: Hierarchical representation of an audio signal - From the signal over acoustic units to a semantic interpretation - A home automation system focusing on a person and executing a task: Turn on the Light!
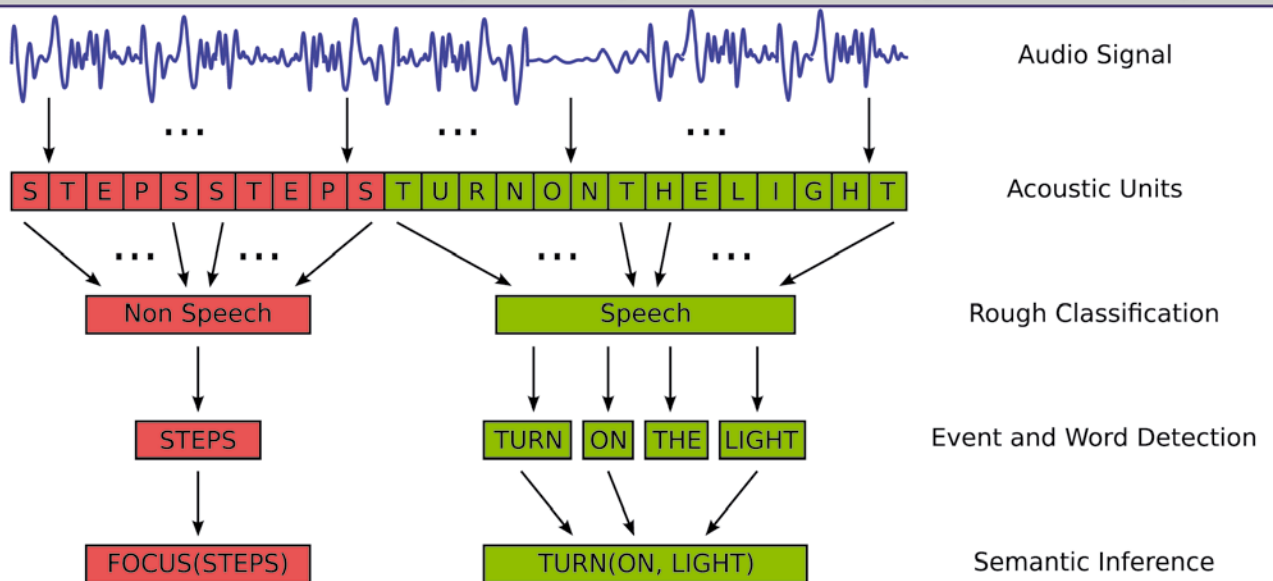
U. 3 CREATIVITY FOR AMAZING USER INTERFACES
NATURAL USER INTERFACES WITH TOUCH TABLES

ABSTRACT

Touch tables have been available for several years, but commercial usage is still limited, primarily to public spaces, such as museums, schools or fairs. Some models are limited to touch recognition, but can also recognise objects placed on their surface.

This project pursues two goals. First, at creativity workshops with potential users, new ideas for applications of commercial interest can be developed and demonstration models built. Empirical findings will be assigned to best practice reports.

Second, the object recognition capabilities can be extended with special, improved algorithms optimised for certain uses.

LIST OF PARTICIPANTS

■ aaitechnologies GmbH, Essen

PROJECT START AND DURATION,
TOTAL COSTS AND FUNDING

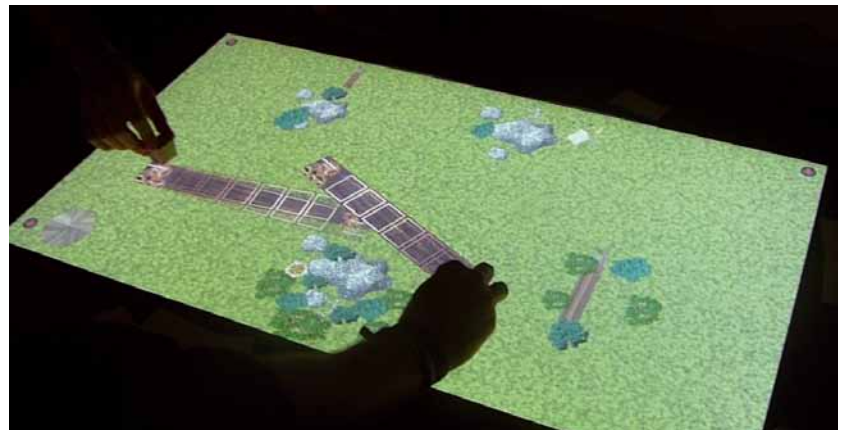|	
Project:	January 2014 – December 2014
Costs:	18,750 Euro
Funding:	Partially by Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia ("Innovation Voucher")

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The format of participative creativity workshops has the potential to develop intuitive and amazing user interface for different kinds of applications. Included users can provide informative feedback on individual preferences or requirements for the interaction design.

Natural user interfaces with touch tables offer possibilities for new interaction concepts in areas where information technology might normally not be visible. Therefore active and assisted living projects give a scope for further development.

Usability Engineering

Hochschule Ruhr West – University of Applied Sciences
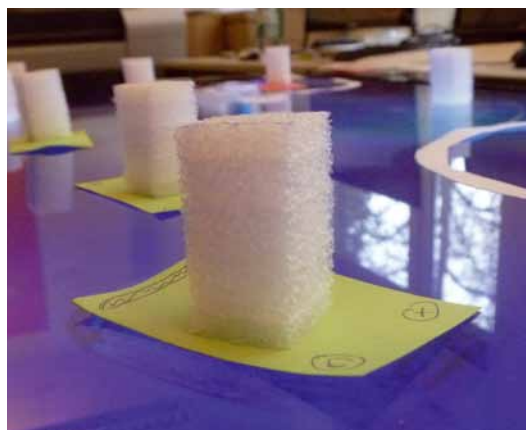
First ideas for an interaction concept as rapid prototype.

First implementation steps for a demonstrator.

CONTACT: Computer Science Institute, **Prof. Dr. Stefan Geisler**

Dortmund University of Applied Sciences and Arts

Usability Engineering

U.4   INKA
INFORMATION DESIGN IN COOPERATIVE APPLICATIONS

ABSTRACT

Computer-aided human communications, such as audio and video conferencing, e-mails, or online chatting are omnipresent. To investigate these forms of communication and the associated changes in human communication, analytical tools are needed that allow automated recording and processing of the interaction data.

The INKA Suite is an integrated interaction and analysis platform. It is designed to automatically record and process text-based synchronous interactions using eye-tracking as the input sensor, since this is a common means for analysing human interactions with computer interfaces. The processed eye-tracking data will help in the design of new, innovative user interfaces that include gaze awareness and reading detection.

INKA is part of the main research project iBIS at the University of Applied Sciences and Arts Dortmund and member of the DFG-network empirikom.

LIST OF PARTICIPANTS
- INKA – Information Design in Cooperative Applications
- iBIS – Main research intelligent Business Information Services
- empirikom – Network Empirical Research on Internet-based Communication, www.empirikom.net

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project INKA: September 2009 – August 2014
Costs: 36,500 Euro
Funding: Federal Ministry of Education and Research (BMBF)

Project iBIS: January 2013 – December 2016
Costs: 250,000 Euro
Funding: 90,000 Euro by the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia

Project empirikom: October 2010 – March 2014
Costs: 100,000 Euro
Funding: 15,000 Euro by the German Research Foundation (DFG)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The work on innovative eye-tracking based user interfaces has only just begun. Gaze awareness and reading detection are promising approaches for increasing the efficiency and ease-of-use of communication processes. This work is also a starting point for adaptive systems (based on user eye movements and awareness) in the fields of computer support for cooperative work (CSCW) and learning (CSCL).
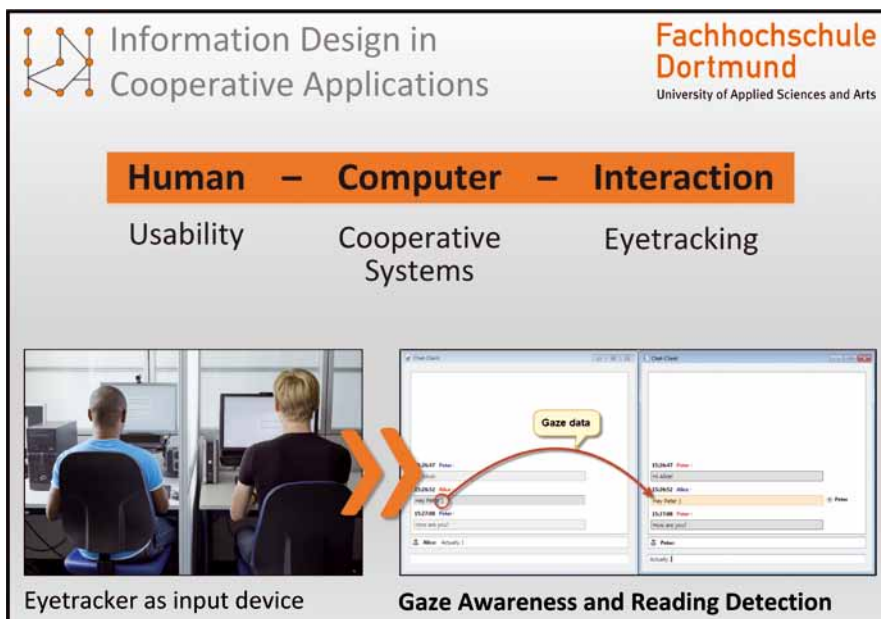
© A. Kienle

CONTACT: Institute for Computer Science, **Prof. Dr. Andrea Kienle**

FH Aachen – University of Applied Sciences

Usability Engineering

U. 5 PROSENSE
VISUALISATION OF COMPLEX DATA IN CYBER–PHYSICAL PRODUCTION MANAGEMENT

ProSense-App Prototype: Machine Capacity 3/2014.

ABSTRACT

Companies are confronted with a major challenge when trying to re-act flexibly to fluctuating customer demands for personalised pro-ducts while maintaining stable and on-time production. The IT sys-tems currently used to plan resources and deadlines cannot react quickly enough to dynamic demands and the user-comprehensibility of their planning decisions is limited. Thus, planning and reality often are poles apart. ProSense will be promoted within the BMBF's frame-work concept, 'Research for tomorrow's production', as a contribution to the future project 'Industrie 4.0'. The interdisciplinary consortium for the applied research project is developing a cyber-physical system (CPS) that balances the reality of production with virtual planning. This will enable a self-optimisation of fine planning that combines intuitive interactions between man and machine. Data quality is im-proved through the use of smart sensors in the cybernetic support system.

At the design faculty of the Aachen University of Applied Sciences, interactive visualisation is being designed to generate clear views from real-time data. These infographics are embedded in a user-friendly interface that offers users an overview and decision support on either mobile or stationary (multi-) touch devices. By graphically encoding target values and information parameters, people can intui-tively register the situation at a glance. All relevant information and interrelationships are simultaneously converted into a visual form using abstract designed and clearly encoded graphics. The icons and visual variables for each type of information are used consistently across all levels of process planning and product production. Their combination into infographic views make the information density clear and legible for the user. The aim is to allow the partners, controllers and operators involved in the production process to create a correct mental model of the situation and make the right decisions intuitively.

The research project is developing innovative infographic representa-tions that show cybernetic system associations. These make the com-plex networks of data clearer and more comprehensible. The principles and functions of the system are reduced to essentials. The aim is to represent big data in an understandable way without reducing its complexity. Intelligently coupled, interactive visualisation offers new methods of exploration and allows data to be viewed from different perspectives. Linked interdependencies can be registered by changing perspectives. Enlightening patterns can show users things that a ma-chine may not have been able to filter using mathematical algorithms.
Further information: vitting.design.fh-aachen.de, www.prosense.info

LIST OF PARTICIPANTS
RWTH Aachen University:
- Laboratory for Machine Tools and Production Engineering (WZL)
- Institute for Industrial Management (FIR)
- Institute of Industrial Engineering and Ergonomics (IAW)
- Aachen University of Applied Sciences, Faculty of Design

Industry Partners:
- Ortlinghaus Group, Wermelskirchen
- MSR Technologies, Laupheim
- PSIPENTA Software Systems, Berlin
- SICK AG, Waldkirch
- Ergoneers GmbH, Manching
- etagis GmbH, Kerpen

Cooperation Partners:
- DIN – German Institute for Standardisation, Berlin
- VDMA (German Engineering Federation), Frankfurt

Project Executing Organisation:
- The Project Management Agency Karlsruhe (PTKA)

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

BETREUT VOM

PTKA Projektträger Karlsruhe
im Karlsruher Institut für Technologie

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

There are many fields of activity for the visual encoding of informa-tion in generically produced infographics. Innovative visualisation methods for the evaluation, research and mediation of complex data are needed in widely varying disciplines.

CONTACT: Faculty of Design, **Prof. Dipl.–Des. Eva Vitting**

Niederrhein University of Applied Sciences *(vertical, left margin)*

Usability Engineering *(vertical, left margin)*

U. 6 ROBUST SPEECH RECOGNITION
ALGORITHMS AND APPLICATIONS

ABSTRACT

Performance and application of automatic speech recognition is often restricted due to the acoustic environment. For example, the speech signal can be modified by the background noise. The term, robustness, has been introduced to describe the requirements that have to be fulfilled by a good recognition system.

We are interested in developing algorithmic solutions for improving the recognition performance under realistic acoustic conditions, like the presence of background noise or hands-free speech input in a reverberant room. In addition to these basic investigations, we are interested in applying these robust algorithms to a human-machine interface. We have developed a telephone-based speech dialogue system for getting information about the traffic situation on motorways. Another example is the integration of a speech dialogue to improve the human-machine interface of an automated railway ticket machine.

Robust speech recognition and its application is investigated in several projects. New algorithms are being developed within an ongoing project funded by the Deutsche Forschungsgemeinschaft (DFG). In a recent project, speech recognition was applied to an emergency system for use in the monitoring of elderly and handicapped people.

LIST OF PARTICIPANTS

- RUB Ruhr University Bochum, Institute of Communication Acoustics
- Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS), St. Augustin
- Scheidt & Bachmann, Mönchengladbach
- T-Systems, Frankfurt

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

There are several projects where robust speech recognition and its applications are being investigated. New algorithms are being developed within a DFG-funded project:

Project: July 2012 – June 2015
Costs: 250,000 Euro
Funding: Deutsche Forschungsgemeinschaft (DFG)

Project: January 2014 - December 2014
Costs: 36,000 Euro
Funding: T-Systems

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

- Cooperation with European research groups in the field of robust speech recognition.
- Integration of speech-based services in monitoring systems for elderly and handicapped people.
- Combination of speech processing with image processing and image recognition. The Institute for Pattern Recognition also has great expertise at recognising objects in images or documents and tracking objects in videos.

Effects of the acoustic environment.

CONTACT: Institute of Pattern Recognition, **Hans–Günter Hirsch**
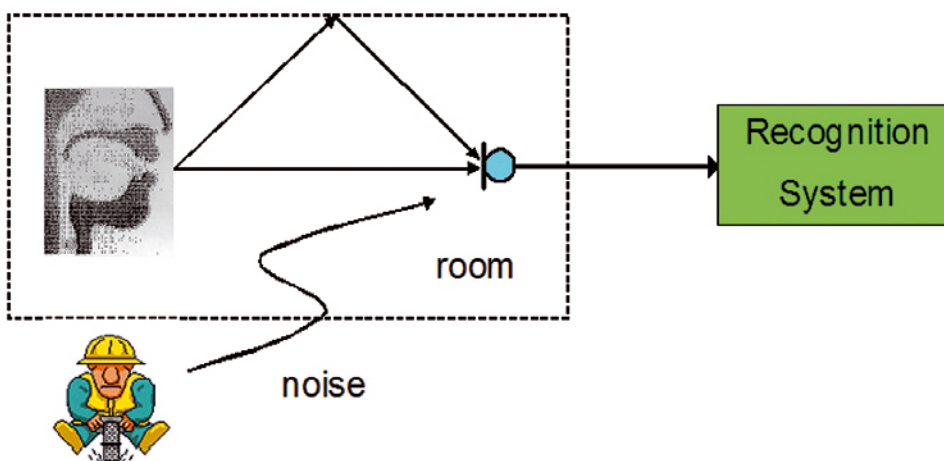
U.7 TaaS – TERMINOLOGY AS A SERVICE
CLOUD-BASED TERMINOLOGY SERVICES ON DEMAND

ABSTRACT

There is an increasing need for terminology on-demand to keep up with the explosion of information available on the Web. Current practices of acquiring, updating, and sharing terminological data have not kept up with demand. The Terminology as a Service (TaaS) project aims at creating an open language resource for the EU's official working languages, providing an easily accessible platform for consistent, harmonised, and up-to-date terminology: the missing piece in Europe's search for meaning.

The TaaS platform fills the void by providing tools for acquiring terminology and translation equivalents from the Web and other repositories, for glossary creation, and for cleaning, sharing and re-using terminological data. The project is co-funded by the European Commission and involves a consortium of thought and innovation leaders. More information: http://www.taas-project.eu.

LIST OF PARTICIPANTS

- Tilde, Riga, Latvia (Coordinator)
- TAUS, Amsterdam, The Netherlands
- Kilgray Translation Technologies, Budapest, Hungary
- The University of Sheffield, UK
- Cologne University of Applied Sciences

**PROJECT START AND DURATION,
TOTAL COSTS AND FUNDING**

Project: June 2012 – May 2014

Costs: 2.9 mio. Euro (EU funding 1.8 mio. Euro)

Usability Engineering

Cologne University of Applied Sciences

Usability Engineering

FH Aachen – University of Applied Sciences
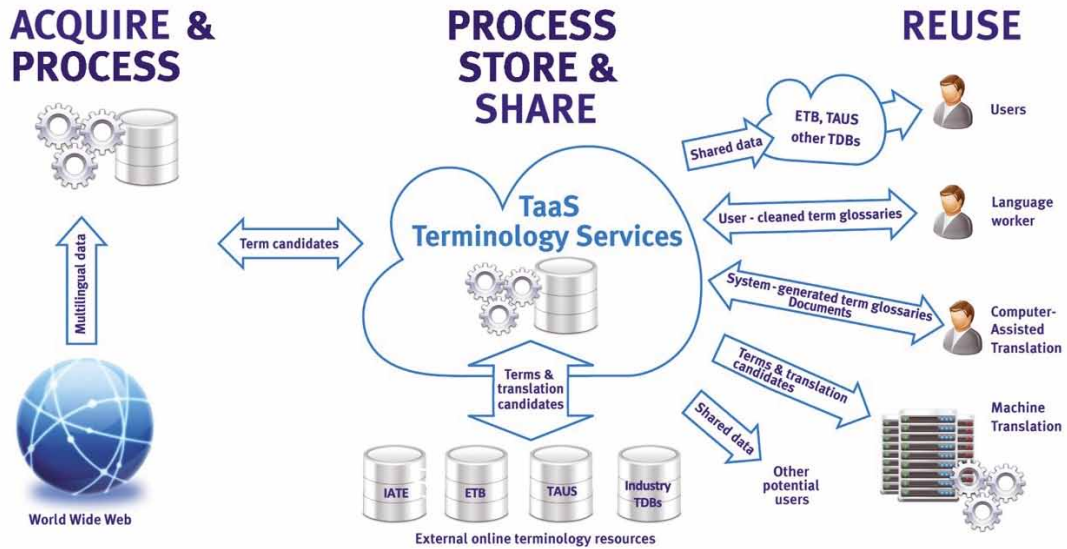
U. 8 USABILITY ENGINEERING OF MOBILE ENTERPRISE SOFTWARE FOR SMES
ENABLING SMES TO DEVELOP USABLE MOBILE APPLICATIONS

ABSTRACT

The market for innovative mobile business software is booming. However, mobile company software is subject to particular usability requirements. This is often a problem for small and medium-sized enterprises (SMEs) because neither current process models for software development, nor approaches at improving usability (usability engineering) are suitable for the development of SME-compatible mobile solutions that possess a high degree of usability. Particularities of SMEs, such as limited resources, are not taken into account. Additionally, current process methods lack simple, pragmatic templates and assistance.

Against this background, we want to develop the following three solutions as part of the project "KompUEterchen4KMU":

1. SME-suitable process models for user-centered development of mobile business software.

2. An online platform for SMEs in the form of pragmatic tools and templates that provides support in the use of these process models.

3. A centre of competence for SMEs where method competence is bundled and corresponding services are offered to manufacturers of mobile enterprise software to improve the usability of their products.

The aim is to support small and medium-sized manufacturers with usability engineering expertise whilst ensuring their competitiveness and, in addition, to increase the acceptance of the usability topic within the target group.

The funding project, KompUEterchen4KMU, is part of the funding initiative "Einfach intuitiv - Usability für den Mittelstand" which is part of the funding priority "Mittelstand-Digital – IKT-Anwendungen in der Wirtschaft" promoted by the German Federal Ministry of Economic Affairs and Energy (BMWi).

LIST OF PARTICIPANTS

- Bundesverband IT-Mittelstand e.V., Aachen
- CAS Software AG, Karlsruhe
- cluetec GmbH, Karlsruhe
- GRÜN Software AG, Aachen
- YellowMap AG, Karlsruhe

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: August 2012 – January 2015

Costs: 1.5 mio. Euro

Funding: 1.1 mio. Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

"Usability engineering" and "user experience design" are topics that are widely accepted and distributed in countries like North America. In Germany – especially for small and medium-sized enterprises – the situation is not so advanced. Established process models and suitable methods for ensuring the usability of mobile business software are still being explored and are not yet available. The situation in other European countries regarding usability issues needs to be investigated because at present it is ambiguous. Based on knowledge gained, existing solutions, such as the modular process model approach ('construction kit') from KompUEterchen4KMU, as well as the developed services of the Competence Centre, can be checked for suitability to SMEs in other EU Member countries. If necessary, further adjustments have to be made, for example, with regard to cultural aspects.

In addition, technological change should also be considered for future projects. In recent years the mobile device landscape has greatly expanded. Next to well-established devices, such as tablets, the so-called wearables, like Google Glasses, smartwatches etc. are edging into the mobile market. In addition to usability for individual devices, it is also important to pay attention to the usability of applications that are used cross-channel. Future work will make use of different (mobile) systems to accomplish tasks. In the same way that different tools are found in a toolbox, various interacting applications will be used on various adequate devices to solve problems and tasks, therefore a seamless transition is needed. The currently emerging trend towards a holistic user experience will also affect future research.

U.9 VAPVoS –
VIRTUAL ACADEMY PLATFORM FOR VOCATIONAL SCHOOLS

ABSTRACT

The computer science and electrical engineering industries are characterised by a continuous advancement of existing technologies together with rapidly occurring innovations. This provides quite a challenge for higher education institutions, especially the vocational schools, that try to keep up with the high pace of technological innovation. To maintain European leadership in product development, vocational education in engineering fields needs to be attractive to both students and full-time employees. For vocational education institutions, the main problems are the availability of (often expensive) up-to-date laboratory hardware, insufficient space in classes for large equipment, and the lack of qualified teachers and ICT-based learning materials for classes.

The project, VAPVoS, provides a web platform to encourage a remote sharing of expensive lab equipment via the internet. Within the VAPVoS platform, real hardware labs, as well as virtualised experiments and didactical materials, can be shared among different institutions all over Europe. The main concepts that have been transferred are the Distance Lab idea, Virtual Micro-Controller (VMCU), and the Network of Excellence, all of which are results of former LEONARDO DA VINCI projects. The results from these projects were successfully transferred to vocational schools in Germany, Estonia and Finland, and combined into a collaborative learning platform. VAPVoS's major achievement is the consolidation of results from these projects into a single platform.

LIST OF PARTICIPANTS

- Coventry University, UK
- RUB Ruhr University Bochum
- Aalto University School of Science and Technology, Finland
- Tallinn University of Technology, Estonia
- Berufskolleg am Haspel, Wuppertal
- Innovationszentrum Schule-Technik IST.Bochum.NRW, Bochum
- it:matters UG, Bochum
- ITT Group, Tallinn, Estonia
- Svenska Framtidsskolan i Helsingforsregionen Ab, Helsingfors, Finland
- Tallinn Lasnamäe School of Mechanic, Estonia

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: October 2011 – September 2013
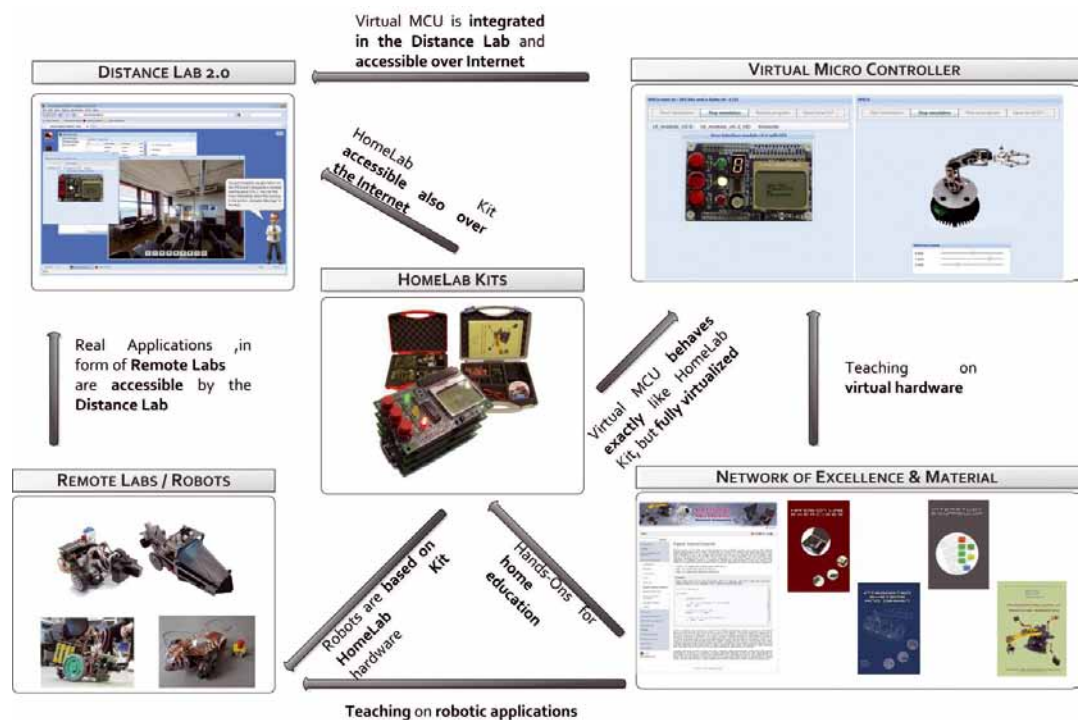
A. 1 CardiaKytos
MEASURING CONTRACTION OF STEM CELL DERIVED CARDIOMYOCYTES

ABSTRACT

Although the major function of the heart is the generation of force and tension, there is a remarkable lack of in vitro methods for routine mechanical testing of cardiac myocytes. This shortcoming arises primarily from the fact that set-ups for mechanical measurements (e.g. the Langendorff heart) tend to be complex, hard to control and labour-intensive. Additionally, these methods depend on animal experiments that raise issues like cross-species translation and ethical concerns.

To avoid animal experiments, it is the aim of this project to develop a system which is based on donor cells and that specialises in applications for personalised medicine. For example, the patients' cells could be examined for their response to different drugs and toxins.

The cells used for this purpose are human induced pluripotent stem cells (hiPS cells) which offer great potential for numerous applications, from pharmacology to toxicology. By reprogramming human skin cells, it is now possible to obtain self-beating cardiomyocytes in an unlimited quantity.

The system itself is the so called CellDrum™ (fig. 1) which provides a sophisticated environment for the measurement of the mechanical properties of cellular monolayers and thin tissue constructs based on collagen matrices. In brief, the cells are cultured on an ultra-thin, highly flexible circular silicone membrane. Through the application of pneumatic pressure, the membrane is variably deflected by the forces exerted by the cultured cells. Hence the CellDrum™ system offers a pre-setting of the extracellular tension and a measurement of the cellular responses at the same time. As an example, figure 2 shows a pharmacological examination: the amplitude and frequency of beating hiPS cells depends on the concentration of S-Bay K8644.

To our knowledge, this study provides the first insight into the mechanics and hence the fundamental function of hiPS derived cardiomyocytes.
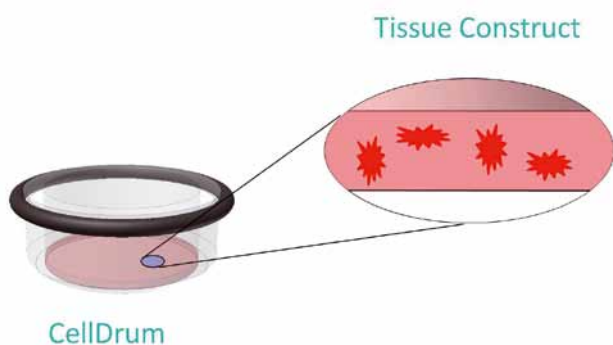
LIST OF PARTICIPANTS

- FH Aachen University of Applied Sciences, Dept. Engineering and Mechatronics, Aachen
- Axiogenesis AG, Köln
- Hitec Zang GmbH, Herzogenrath
- RWTH Aaachen University, Institute of Pharmacology and Toxicology

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2011 – March 2014

Costs: 481,222 Euro

Funding: 400,222 Euro from the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia (MIWF), and the European Regional Development Fund (EFRE) 81,000 Euro from Axiogenesis and FH Aachen University of Applied Sciences

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Wie applied for several programmes as KMU-innovativ, Exist, Horizon 2020 and Translational Stem Cell Research NRW (Translationale Stammzellforschung NRW). Our work is not restricted to cardiovascular research, but can also be transferred to other organ systems in the field of personalised medicine.

CellDrum™ principle.
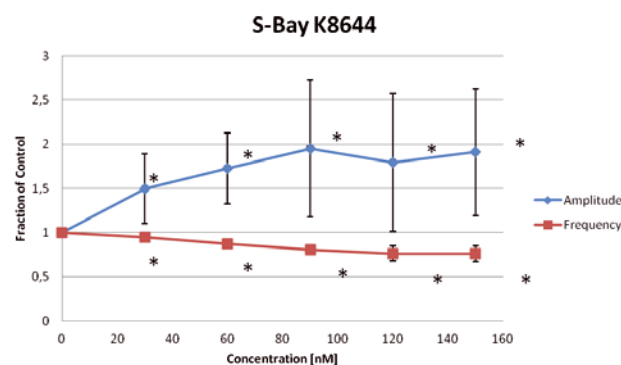
Amplitude and frequency of beating human induced pluripotent stem cells depending on the concentration of S-Bay K8644.

FH Aachen – University of Applied Sciences

Applications for Quality of Life

A.2   EASY LIVING IN OLD AGE
BRAIN–COMPUTER INTERFACES SUITABLE FOR DAILY USE

Initial tests with different user interfaces.

ABSTRACT

The effects of ageing present physical handicaps that all-too-often prevent older people from maintaining relationships and actively participating in social life, even when they can live safely and independently in their own homes. Modern communication technologies could help elderly people with physical impairments if they provided special interfaces that worked independently of the persons' limitations. The project, "Brain Computer Interfaces suitable for daily use", pursues a solution-based approach for the development of appropriate communication technologies. Applications of this system might improve quality of life for physically handicapped old persons and their families.

Our approach concentrates on designing a lightweight adaptive system, based on a Brain-Computer Interface (BCI) using steady-state visually evoked potentials (SSVEP). The system will be modular and expandable through the acquisition of additional control signals, e.g. magnetic or tongue control.

The desired solution should improve the reliability of BCI signal detection by exploring new methods for signal processing and handling, and by simplifying the mounting of EEG (electroencephalogram) electrodes. A new BCI system could be deployed where additional channels of communication between people and their environment are found to be beneficial. Combining a cost-effective BCI with a low-cost integration of the newly-developed BCI module into existing systems should result in increased sales.

The results of the project will be tested on relevant study groups as a demonstration to potential manufacturers and users.

LIST OF PARTICIPANTS

■   Brain Products GmbH, Gilching

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2014 – December 2015
Costs: 199,462 Euro
Funding: Federal Ministry of Education and Research (BMBF)

SPONSORED BY THE

Federal Ministry
of Education
and Research

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The main focus of our research activities is on effective communication with human beings. Through international collaboration at the EU level, the topic "Human-Machine Interaction" can reach the necessary critical mass to achieve high quality inter- and transdisciplinary research.

Applications for Quality of Life

Rhine–Waal University of Applied Sciences

CONTACT: Faculty of Technology and Bionics, **Prof. Dr.–Ing. Ivan Volosyak**

A. 3 EMOROBOT
EMOTION STIMULATING ASSISTIVE ROBOTS

ABSTRACT

"EmoRobot", launched on June 1st 2013, is a collaborative research project between three Universities of Applied Sciences: Fulda, Bonn-Rhein-Sieg and FHS St. Gallen, together with the Technical University of Dortmund. The name "EmoRobot" stands for emotion-stimulating assistive robots in the field of dementia care for patients in long-term treatment.

Possible applications for assistive technical systems in dementia care will be identified, tested, and evaluated using the perspectives of nursing science and residents' needs. The main target of the project is to explore how dementia patients might benefit from emotional approaches stimulated by several assistive robotic systems.

The project keeps the residents' interest strictly in focus while examining how such systems can be designed and programmed to meet residents' needs. Nursing and computer scientists are cooperating in a number of research phases at the nursing home "Katharinenstift" in Wiesbaden, supported by the gerontology expert, Dr. Thomas Beer, from FHS St. Gallen. They are working together with the residential nursing staff to collect the required data, test the assistive systems, and evaluate applications and improvements. The multidisciplinary approach is completed by sociological analysis provided by Prof. Dr. Ronald Hitzler, TU Dortmund.

The results are expected to address the fields of care and nursing science, as well as service robotics. They may provide a deeper understanding of mechanisms of dementia, and insights into the possibilities and limitations of assistive systems and their integration into the care process. On the one hand, this could lead to advances in dementia care using novel tools to stimulate the client's emotions, while on the other hand, it could lead to the development of criteria and specific demands for assistive robotic systems and applications.

The Bonn-Rhein-Sieg University of Applied Sciences' team is led by Prof. Dr. Erwin Prassler and Dr. Björn Kahl. The work with the robots and other assistive systems in the Katharinenstift in Wiesbaden is conducted by research associate Matthias Füller (robot control and motion planning) and the student Teena Hassan (human robot interaction and automatic emotion recognition).

The study, set up for a period of three years, is funded by the German Federal Ministry of Education and Research. The research project is led by Prof. Dr. Helma Bleses of Fulda University of Applied Sciences.

LIST OF PARTICIPANTS

- Fulda University of Applied Sciences, Prof. Dr. Helma Bleses
- Bonn-Rhein-Sieg University of Applied Sciences
- FHS St. Gallen University of Applied Sciences, Switzerland
- Technical University Dortmund
- EVIM Gemeinnützige Altenhilfe GmbH, Wiesbaden

Emotion stimulation in dementia care in future robotic systems could assist care professionals. © Helma Bleses

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: June 2013 – May 2016
Costs: 635,482 Euro
Funding: 635,482 Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Long term-treatment of dementia is a major challenge for European societies and health care systems: economically, socially and – most importantly – for patients and their social entourage. Top priorities for the ageing societies of Europe include a better understanding of dementia, matching requirements caused by the disease and meeting patients needs, and the development of new assistance models for patient support and care. Technical assistance systems, together with improvements in both professional and private care, are urgently needed that are suitable for the diverse economic, cultural and social structures across Europe. Therefore, it is necessary to bring together industry, patients' organisations, care professionals and services, science and society at a European level. The EmoRobot-consortium would like to add its multi- and transdisciplinary research experience.

CONTACT: Dept. of Computer Science, **Prof. Dr. Erwin Prassler**

A. 4 DEVELOPING A VOICE OUTPUT COMMUNICATION AID
APPLICATION OF THE COLOGNE CORE VOCABULARY FOR CHILDREN WITH COMPLEX COMMUNICATION NEEDS

ABSTRACT

Communication is a difficult challenge for some 200,000 children and youths and approx. 400,000 adults in Germany, who have severe impairments like cerebral palsy, aphasia, cognitive disability, or traumatic brain injury. They have complex communication needs and may rely on a speech generating device. To meet their communication needs a vocabulary of relevant words and messages provided by voice output communication aids (vocas) is of the highest importance.

Based on speech samples of German-speaking children and adolescents, the German core vocabulary was identified and provided on the new communication aid "MyCore". The core words are those that are widely used across many topics. Easy access to these mostly grammatical words (like yes, a, is, and, I, can, not, and what) is fundamental to any conversation. Satisfying communication is possible by combining them with topical words, organised into categories and subcategories.

Besides a strong focus on the vocabulary and grammar provided, hardware and software were developed to make the use of MyCore as convenient as possible, including symbol-based functions for children with disabilities who cannot rely on written language, several voices to choose from, and diverse access options, like manual selection or eye-tracking.

The aim of the MyCore development was to provide a voice output communication device that integrates the latest research from linguistics, accessibility, and functionality specifically designed for the needs of the user group.

LIST OF PARTICIPANTS

- RehaMedia Handelsgesellschaft mbH, Duisburg
- Jabbla, Gent, Belgium

The MyCore communication aid: Symbol-based vocabulary is provided on a static frame with core vocabulary and topic/fringe vocabulary organised in categories.

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: July 2011 – June 2013

Costs: 174,000 Euro

Funding: Federal Ministry of Economic Affairs and Energy (BMWi), Central SME* Innovation Programme (Zentrales Innovationsprogramm Mittelstand, ZIM)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The basic approach of providing fast and easy access to the core vocabulary (i.e. the most frequently used words of a language) on symbol-based communication aids is applicable to any other language in the European Union. Based on data for language use, as well as culturally suitable symbols, this project can and will be transferred to other languages.

Applications for Quality of Life

University of Cologne

Applications for Quality of Life

Hochschule Ruhr West – University of Applied Sciences

A.5 INFORMATION LOGISTICS AND CONTEXT MODELLING
USABILITY OF ASSISTANCE AND INFORMATION SYSTEMS AT HOME (UsAHome)

ABSTRACT

Information Logistics (ILOG) is defined as the supply of data, information, and services to meet the demands of information and communication system users. ILOG aims to deliver the right information/services in the appropriate quality/quantity when and where the information need arises. To a large extent, the user's actual context (e.g. at home, in the office, in transit) determines their need for information or services. This can be characterised, for example, by their current task or question, their location, the actual time, their technical setting/equipment (tablet-PC, desktop-PC, smartphone, TV), and/or their preferences, interests, and previous knowledge. A precise survey and description of each application-specific context model is a key issue when designing a user-friendly application. Information Logistics has an important role to play in avoiding information overload for the target-user group, especially for assistance and information systems in domestic environments.

As part of the work package, "Information Logistics and Context Modelling", the contexts of information and service utilisation of assistance systems in the domestic environment will be analysed, then a context component for assistance systems will be designed, implemented, and evaluated for improvements in usability.

LIST OF PARTICIPANTS

- Fraunhofer-Institute for Software and Systems Technology – ISST, Dortmund
- inHaus GmbH, Duisburg
- Sozialwerk St. Georg, Gelsenkirchen
- MedEcon Ruhr e.V. and MedEcon Ruhr GmbH, Bochum
- Hochschule Ruhr-West, Computer Science Institut

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2013 – December 2016

Costs: 530,000 Euro

Funding: 240,000 Euro by the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia ("FH Struktur")

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Application of the context modelling approach to filter and/or select data from big data collections (sensor data collections in tele-monitoring or smart living scenarios).

Using context components in smartphone-based mobile web services.

Prof. Dr. Oliver Koch
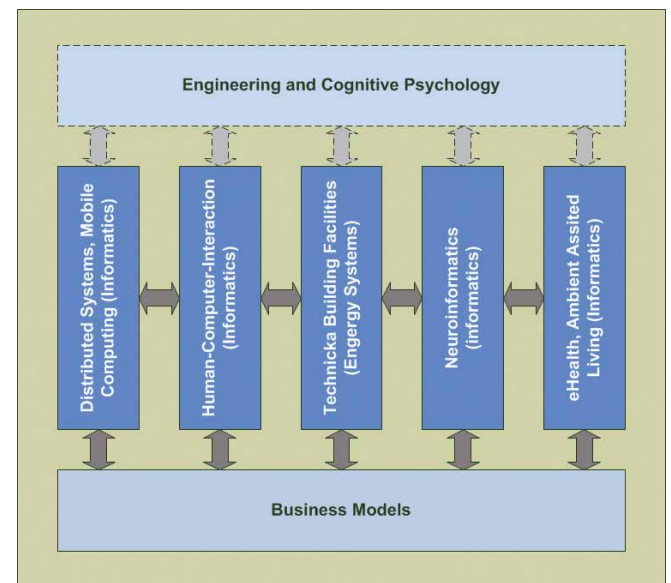
Project structure.

A. 6 mHEALTH: SUPPORTING eHEALTH SCENARIOS BY MOBILE DEVICES
USABILITY OF ASSISTANCE AND INFORMATION SYSTEMS AT HOME (UsAHome)

ABSTRACT

Although the use of smartphones and other mobile devices continues to increase, the functions on smartphones are much more than simple voice calling and text messaging. People use mobile phones to access their mail accounts, to share their calendars, or as a routing device (i.e., the ones equipped with the GPS). In this way, smart mobile devices can collect personalised information about their users, such as personal/business contacts, messages (emails, short text messages, like SMS, ...), social interactions and social contacts, calling history, work history, and footprints of internet usage (e.g., the browsing history of a mobile web browser). Additionally, the set of applications a user has installed on his/her device provides a rough usage profile of the device itself.

In societies where demographic change leads to a prevalance of the elderly over other age groups, health management becomes a significant problem. To achieve healthy and successful ageing, it may be helpful to use personalised data gathered by smart mobile devices, especially if it is enriched with contextual information. This information can ideally be used in modern eHealth and mobile health (mHealth) scenarios. Two major advantages from the increased usage of mobile devices are: first, the devices are mobile and can, theoretically, be used to follow their users everywhere.

Secondly, smart mobile devices are usually equipped with a large set of different sensors that allow contextualisation of the users' current tasks, e.g., by tracking the current position of a user in order to provide better support for the current task, or to gather further metadata for a later contextualisation and/or analysis. In addition to GPS, other sensors for acceleration and motion, such as a digital compass, could be used on modern mobile devices. In the context of eHealth scenarios, additional sensors for monitoring the user's current vital signs could also be connected to a mobile device.

In this way, modern mobile devices could provide an architecture that allows storage of personal data on ones' own device and not in some central database, providing a big advantage with respect to security and privacy in eHealth scenarios. But such devices could also be used to combine vital data (gathered by specialised eHealth sensors connected to a standard mobile device) and contextualisation data (gathered by standard sensors of a mobile device) in an integrated and secure way. This would be hard to achieve without the usage of mobile devices.

LIST OF PARTICIPANTS

- Fraunhofer-Institute for Software and Systems Technology – ISST, Dortmund
- inHaus GmbH, Duisburg
- Sozialwerk St. Georg, Gelsenkirchen
- MedEcon Ruhr e.V. and MedEcon Ruhr GmbH, Bochum
- Hochschule Ruhr-West, Computer Science Institut

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2013 – December 2016

Costs: 530,000 Euro

Funding: 240,000 Euro by the Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia ("FH Struktur")

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL
Usage of Context Components in Smartphone-based Mobile Web Services.

Prof. Dr. Oliver Koch

Prof. Dr. Marc Jansen

Mobile App.

CONTACT: Computer Science Institute, **Prof. Dr. Marc Jansen**

Hochschule Ruhr West – University of Applied Sciences

Applications for Quality of Life

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A.7 MOBILITYMOTIVATOR
A MOTIVATING GAME-LIKE ENVIRONMENT TO ENHANCE MOBILITY AND COGNITIVE SKILLS

Applications for Quality of Life

Westfälische Hochschule University of Applied Sciences

ABSTRACT

The aim of the project "MobilityMotivator" is to design and develop an engaging software-environment to promote mobility in elderly people (primary users). Using devices like tablet-PCs or smartphones, the primary users can collaborate and encourage each other to address challenges that often inhibit them from venturing out into the urban environment.

Furthermore, the technology will provide secondary users with unique tools to assess progressive improvements in both movement and cognitive abilities. Development of a solution will be based on rigorous assessment and monitoring of user needs and interests, and this will be tested through three user-representative organisations in three different European countries. The project will run for 36 months and culminate in a comprehensive and practical gaming solution ready for commercialisation.

Website of the project: www.mobility-motivator.uvsq.fr

LIST OF PARTICIPANTS

- University of Versailles-St Quentin en Yvelines (project leader), France
- Westfälische Hochschule, Institute for Work and Technology, Gelsenkirchen
- Audemat, France
- Studio 352, Luxemburg
- Inventya Ltd., SME, UK
- E-Seniors, France
- Hôpitaux Universitaires de Genève, Switzerland
- German Red Cross, Mettmann
- La Mosca, Belgium

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: February 2013 – January 2016

Costs: 4 mio. Euro

Funding: Country specific

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

In many cases Ambient Assisted Living (AAL) and tele-medical products fail during the diffusion phase of the innovation process, especially when focusing on older persons as the target group. Typical obstacles and barriers are the users' technical inexperience, exorbitant prices, and a lack of information about the needs of the target group.

Previous research has shown that a crucial aspect in the development of technical devices is the integration of potential users. Therefore, it is necessary to understand their needs and requirements. However, it is often not recognised that elderly people as a group are very heterogeneous, e.g. in terms of income, health or education. For this reason, there is a special focus on social inequalities. Our research aims to find out more about the relationship between social inequalities and the acceptance and use of technology with the goal of developing strategies to overcome existing obstacles.

Prof. Dr. Josef Hilbert

CONTACT: Institute for Work and Technology, **Prof. Dr. Josef Hilbert**

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A. 8 OptAAL: OPTIMISATION OF AMBIENT ASSISTED LIVING (AAL) SOLUTION ENGINEERING
INTEGRATION OF BUILDING AUTOMATION–BASED AAL APPLICATIONS AND MOBILE DEVICES

ABSTRACT

Demographic changes and ageing of the population has resulted in a higher proportion of older people who have health problems. In order to maintain an independent lifestyle in their preferred environment, the autonomy, self-confidence and mobility of such people has to be assured. Ambient Assisted Living (AAL) technology supports ambulatory care for this group. In recent years, industry and science have responded to this need by offering a variety of products, such as wristlets made for monitoring vital signs, or sensors for fall detection.

Due to the heterogeneity of the technical context and user groups, AAL solutions use a holistic approach to achieve practical, economic systems. Its engineering starts with a contextual inquiry and includes software ergonomics that lead to high quality Human-Machine interfaces. These interfaces include touchscreens (e.g. smartphones, tablet PCs) as well as various sensors and actors.

OptAAL aims at optimising implementation efforts and usability of AAL solutions. The main project targets are

- enabling the reuse of existing building automation infrastructure by integrating it into an AAL solution via UPnP (Universal Plug and Play) and
- identifying relevant requirements for design and implementation of appropriate AAL solutions that possess a high degree of usability focussed on ease of use.

With the increasing use of current building automation systems in modern houses, a variety of currently available sensors and actuators can also be used for other applications, such as Ambient Assisted Living. For this purpose, appropriate networking of these components and an open and documented external interface are prerequisites. Since it is already possible to operate and configure building automation systems by means of smartphones or tablet PCs, the same interface can be used for connecting external applications. Frequently, this is a web interface that can employ established web technologies, such as JavaScript, AJAX, Java Enterprise Edition or ASP.net.

However, this project goes a step further because not only does the underlying building automation infrastructure come with a web interface, it is also completely implemented using web technology. It is based on the established standard UPnP. UPnP is characterised by its high flexibility, extensibility and configurability. It is therefore particularly suitable as connection technology between the classical building automation and modern fields of application, such as Ambient Assisted Living.

LIST OF PARTICIPANTS

- locate solution GmbH, Essen
- Bochum University of Applied Sciences, Software Engineering Institute, Campus Velbert/Heiligenhaus
- Protestant University of Applied Sciences Rhineland-Westphalia-Lippe, Dept. Inclusive Education and Nursing, Bochum

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2012 – December 2015

Funding: Bochum University of Applied Sciences and participating partners

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Improving mobile usability engineering.

Improving usability of AAL software systems.

UPnP integration of further building automation systems.
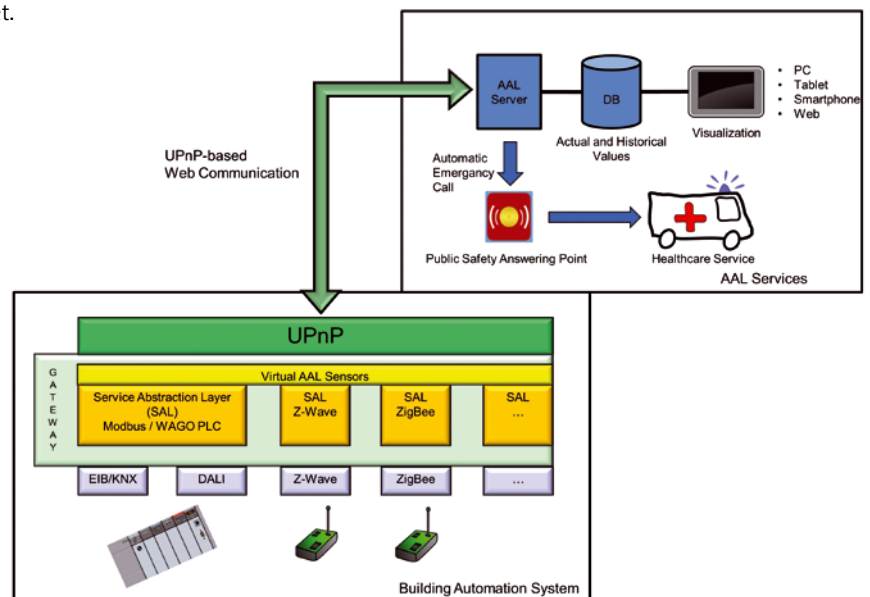
System approach of a building automation–based AAL-implementation.

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Applications for Quality of Life

Bochum University of Applied Sciences

CONTACT: Software Engineering Institute, Campus Velbert/Heiligenhaus, **Prof. Dr.-Ing. Christian Weidauer**   **25**

Applications for Quality of Life

Ostwestfalen–Lippe University of Applied Sciences

A. 9 PERCEPTIONLAB
ANALYSIS AND EVALUATION OF HUMAN PERCEPTION IN SPATIAL CONTEXTS

ABSTRACT

How do humans perceive objects, space, and media environments? These questions are central to PerceptionLab, which aims to develop concepts and solutions for objects and spaces with a special focus on Universal Design and sustainable solutions. Application-based research on orientation, effect, acceptance, and usability could lead to improvements in products, space, and environment.

The research team brings together diverse disciplines from design and planning, as well as external experts in other fields, in particular psychologists and medical doctors. As this is a complex subject, the approach of PerceptionLab is holistic and interdisciplinary with a practical and user-focused orientation. Depending on the specific research goals, different methods are chosen and solutions developed.

Research carried out in the PerceptionLab leads to optimal applications in products, space and the environment. Analysis of orientation, usability, acceptance and sensitivities for products and spaces leads to new concepts and solutions with special attention to issues of Universal Design and sustainable solutions.

The methods and techniques used for investigating the effects of surfaces, spaces, and objects, as well as real and virtual two- and three-dimensional arrangements, vary greatly since they are always adapted to the research projects. Many studies are carried out as field trials in existing surroundings using provided objects, from city outskirts to operator panels. Laboratory testing in the Raumlabor allows a mapping of spaces and objects at a scale of 1:1 and a display on the 'powerwall' which shows a virtual three-dimensional environment. An artificial sky is also available to give daylight situations, as well as a light laboratory where lighting scenarios are set out.

A mobile eye-tracking-system is used, in particular for orientation and usability. Studies on object and spatial effects are coupled to a biofeedback system which measures bodily functions, and thus provides information about the condition of a test person and their changes. Video cameras and sound recordings document observations.

All research projects are, as a rule, based on psychological methods or empirical social research, i.e. observation, oral questioning (such as guided interviews or thinking aloud) or else written methods such as specially prepared questionnaires, semantic differentials or cognitive cards. Depending on the investigated tasks, technical instruments are used to bring these hypotheses and research designs into the spatial context.

The aim is

- to establish the lasting impact of spaces and spatial concepts on people's psyche and quality of life.
- to create the basis for comprehensible judgment on the aesthetic evaluation of spaces.
- to develop tools for planning and design.
- to establish sustainable research in the fields of architecture and interior design.

PerceptionLab Image.

The spheres of activity are extremely diverse: living spaces and work environments, communication and experimental rooms, salesrooms, exhibition spaces and museums, care facilities, therapy and service spaces, as well as educational and learning places. Moreover, media environments receive particular attention, as they are gaining more and more ground in our daily lives. The study results will be general or specific statements concerning the impact of objects, spaces, or medial environments. Based on these results, the PerceptionLab makes recommendations for measures of optimisation, works out concepts and solutions and develops design proposals from the dependencies identified. Based on this human-oriented research, PerceptionLab not only involves people in studies upon the effect of space, product and environment, but also in projects working towards a human-centered design.

LIST OF PARTICIPANTS

Hochschule Ostwestfalen–Lippe – University of Applied Sciences:

- Faculty of Architecture, Prof. Ulrich Nether (project speaker), Prof. Eva Filter, Prof. Mary-Anne Kyriakou, Prof. Marco Hemmerling, Prof. Dr. Martin Ludwig Hofmann, Prof. Ulrike Kerber, Prof. Dr. Uta Pottgiesser, PD Dr. med. Manfred Pilgramm
- Faculty of Media Production, Prof. Dr. Guido Falkemeier, Prof. Heizo Schulze

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2008 – ongoing

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

An important aim of this project is to establish this research cluster at the University of Applied Sciences Ostwestfalen-Lippe beyond the project's duration. Furthermore we are interested in close collaborations with universities, research institutions, and companies from other EU countries.

CONTACT: Institute of Product Design and Ergonomics, **Prof. Dipl.–Ing. Ulrich Nether**

Hochschule Ruhr West – University of Applied Sciences

A.10 PERSON–SPECIFIC CONTACTLESS INTERACTION
USABILITY OF ASSISTANCE AND INFORMATION SYSTEMS AT HOME (UsAHome)

ABSTRACT

With a rapidly ageing population, it is increasingly important to develop devices for elderly and disabled people that can support and aid them in their daily lives, helping them to live at home as long as possible. The goal of this project is to implement a human-machine interaction and assistance system that can offer personalised health support for elderly people, or for those who have special needs in the home environment.

To generate service systems that provide person-dependent assistance, a method for identifying the interaction partner is needed. This basic requirement is divided into two subsystems – first, to recognise the person; second, to identify the prescribed drugs. The former is based on the analysis of one or more biometric features, while the latter uses an NFC-based recognition system to recognise the drug used.

Various biometric traits are being employed depending on the targeted application and environment. For instance, adequate fingerprint samples require user cooperation, whereas face and iris images can be captured by a surveillance camera. In pursuit of our goal of building a touch-less assistance system, we have used faces, finger veins, and hand palm veins to identify/verify the interaction partner. These features do not demand any direct contact with the sensor and hence meet our goal of remaining touch-less. In addition, these features can be captured incidentally rather than deliberately. Cameras integrated in bathroom mirrors or the doors of first-aid boxes could capture the face image, or that of the iris, where capturing the iris pattern requires a distance of 30 cm or less. Capturing the hand palm vein image could be achieved by using a suitable sensor encapsulated within a hand air dryer.

Typically, and independent of the trait used, biometric systems perform three basic tasks, namely sensor data acquisition, feature extraction, and decision-making as depicted in the second figure. Image pre-processing and enhancements could be achieved in order to get features with reliable quality for the next steps. Extracted features – information on the shape and texture of facial images or the positions and forms of veins within finger/hand palm images – are then compared to the people's stored features before reaching the final identification decision.
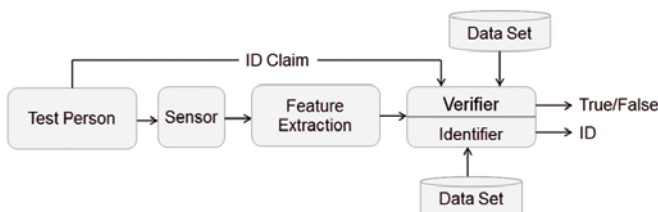
Three basic steps for data acquisition, feature, and decision-making in the modes for person identification and verification.

LIST OF PARTICIPANTS

- Fraunhofer-Institute for Software and Systems Technology (ISST), Dortmund
- inHaus GmbH, Duisburg
- Sozialwerk St. Georg, Gelsenkirchen
- MedEcon Ruhr e.V. and MedEcon Ruhr GmbH, Bochum
- Hochschule Ruhr-West, Computer Science Institut

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2013 – December 2016

Costs: 530,000 Euro

Funding: 240,000 Euro by Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia ("FH Struktur")

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Use of biometric devices in the field of personalised Human-Machine Interaction.
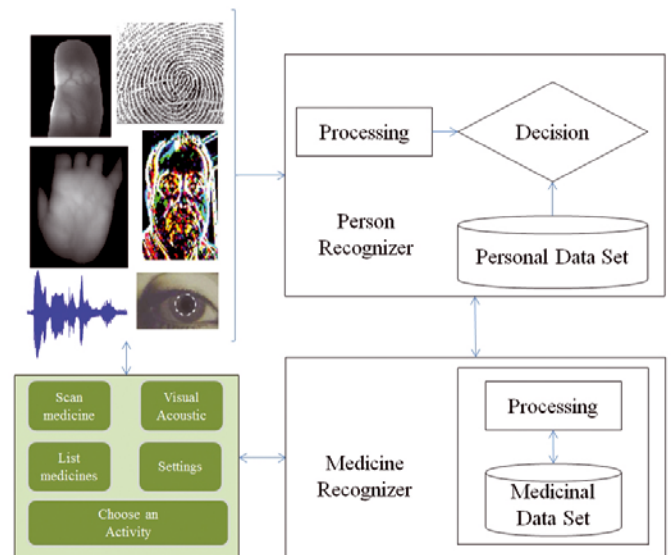
Basic architecture of the medical assistance system. The person is identified by using personal recognition, while the drug is identified by using NFC-based medicine recognition.

Dr.-Ing. Ahmad Rabie
© private

Prof. Dr.-Ing. Uwe Handmann

CONTACT: Computer Science Institute, **Prof. Dr.–Ing. Uwe Handmann**

Applications for Quality of Life

A.11 RoCKIn
ROBOT COMPETITIONS KICK INNOVATION IN COGNITIVE SYSTEMS AND ROBOTICS

Domestic servce robot "Jenny" preparing for RoCKIn@Home tournament.

© Eric Lichtenscheid

Applications for Quality of Life

Bonn–Rhein–Sieg University of Applied Sciences

ABSTRACT

Robot competitions have proved to be an effective instrument for fostering scientific research and advances in the field. Teams participating in a competition must identify best practice solutions covering a wide range of functions and integrate them into practical systems. These systems have to work in the real world, outside of the usual laboratory conditions. The competition experience helps to transfer applied methods and tools to high-impact, real-world applications. Other benefits of robot competitions include attracting young students to science and engineering disciplines, and the demonstration of the relevance of robotics research to ordinary citizens. However, some limitations can emerge as competitions mature: The effort required to enter the competition grows and may present a barrier for the participation of new teams. A gap can develop between the benchmarking of complete systems in competition and of subsystems in research and this can limit the usefulness of competition results for industry.

The goal of RoCKIn is to speed up the progress towards smarter robots through scientific competitions. Two particular challenges have been selected because of their relevance and impact upon Europe's social and industrial needs: domestic service robots (RoCKIn@ Home) and innovative robot applications in industry (RoCKIn@ Work). Both challenges were inspired by activities in the RoboCup community, but RoCKIn improves and extends them by introducing new research topics, like natural interactions with humans, or networking of mobile robots with sensors in environments with ambient intelligence, in addition to specifying concrete benchmark criteria for assessing progress.

The RoCKIn project

- designs open domain test beds for competitions targeting these two challenges, usable by researchers worldwide;
- develops methods for benchmarking through competitions that allows assessment of both particular subsystems and the integrated system;
- organises two robot competition events, each of them based on the two challenges and test beds;
- organises camps open to student participants to help new teams get involved in the competitions;
- promotes dissemination activities to target stakeholders in industry and academia, as well as the general public.

LIST OF PARTICIPANTS

- Hochschule Bonn-Rhein-Sieg, St. Augustin (BRSU)
- Associacao do Instituto Superior Técnico para a Investigacao e Desenvolvimento (IST-ID), Lisboa, Portugal
- Universita degli Studi di Roma La Sapienza (UNIROMA), Italy
- KUKA Laboratories GmbH (KUKA), Augsburg
- Politecnico di Milano (POLIMI), Italy
- InnoCentive Ltd. (INNO), UK

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2013 – December 2015

Costs: 2 mio. Euro

Funding: 1.7 mio. Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The RoCKIn project represents a remarkable cornerstone in the EU strategy for adopting competitions to foster, accelerate, and disseminate research. By combining the competition concept with scientific benchmarking, the project develops key concepts for improved technology assessment in Horizon 2020, thereby paving the way to future benchmarking and standardisation efforts. BRSU's Autonomous Systems research group contributes broad expertise on cognitive and functional systems, software architecture, and competence in professional software development for robotics that has been proven in FP7 projects - like BRICS and ECHORD. The group is strongly interested in joining upcoming consortia, contributing its competence and driving the technology readiness levels of concepts, methods and tools. Focus areas of interest are domestic service robots for healthy aging / ambient assited living, mobile manipulators for logistics and assembly processes in the factory of the future.

A.12 USER–CENTRED DEVELOPMENT OF AMBIENT TECHNOLOGIES FOR PEOPLE WITH DEMENTIA
RESEARCH "NUTZERWELTEN"

ABSTRACT

Currently, in Europe there is enthusiasm for technical innovations that help to care for an ageing population. However, in practice, there is a limited uptake of the developed solutions. This is possibly the result of a technology push where many projects lack a user perspective. The key to success is a well-designed human-machine interaction and its integration into daily life. But this can only be achieved when disciplines work hand-in-hand.

The focus of the new interdisciplinary research initiative "NutzerWelten" (= "User Worlds") from the University of Applied Sciences Düsseldorf and its partners, is to evaluate and improve the effects of technological innovations on the quality of life of senior citizens. In particular, the focus is on non-institutionalised people with dementia, who are living at home. Methods for such collaboration are scarce, which is why partners from academia and industry are working together on this initiative to establish a sustainable research and development approach that ensures the long-term participation of all stakeholders in creating new socio-technical solutions.

The project's innovation is two-fold: first, people with dementia will be actively involved in the process through newly developed methods that are sensitive to their abilities and limitations and, second, quality of life is considered to be a key concept that is addressed in the design and implementation of technologies, and evaluated from a social science perspective. Derived practical knowledge regarding design and usability of technology, its acceptance, and effects on life quality, will be made available to the public. It may be utilised across Europe to ensure improvements in the health and well-being of the senior population and general care systems.

LIST OF PARTICIPANTS

University of Applied Science Düsseldorf:

- Dept. Media, Prof. Dr. Christian Geiger, Prof. Dr. Manfred Wojciechowski, Dr. Alina Huldtgren
- Dept. Social Sciences and Cultural Studies, Prof. Dr. Manuela Weidekamp-Maicher
- Dept. Design, Prof. Anton van der Laaken, Prof. Anja Vormann
- Dept. Electrical Engineering, Prof. Dr. Wolfgang Lux, Prof. Dr. Ulrich Schaarschmidt

Research Partners:

- German Center for Neurodegenerative Diseases (DZNE), Prof. Dr. Martina Roes, Witten
- Fraunhofer Institute for Software und Systemtechnology (ISST), Dortmund
- Fraunhofer Institute for Applied Information Technology FIT, Dept. of Mixed Reality Solutions, Dr. Leif Oppermann, St. Augustin
- Oldenburg Research Centre for Information Technology OFFIS, Oldenburg

Business Partners:

- Service Centre for Dementia Düsseldorf
- Landesverband der Alzheimer-Gesellschaften Nordrhein-Westfalen e.V., Düsseldorf
- LVR-Clinic Düsseldorf, Dept. of Gerontopsychiatry, Prof. Dr. Tillmann Supprian
- Velamed GmbH, Medical Technologies and Biomechanical Concepts, Köln
- Residential Counseling, Düsseldorf

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2014 – December 2018

Costs: 480,000 Euro

Funding: 240,000 Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

In the recently launched European framework programme for research and innovation, Horizon 2020, 'health, demographic change and well-being' is a key area addressed in several calls and European initiatives (such as the Active and Healthy Ageing partnership). Personalising healthcare has been identified as a major driver to successfully tackle the demographic challenges lying ahead. Social frameworks supported by ICT will become part of the solution as envisioned by the Ambient Assisted Living Joint Program. Interdisciplinary partnerships are the key to this endeavour, utilising knowledge from ICT, medical sciences, social sciences, and design. Furthermore, the end-user perspective has to be central at all times and solutions need to be co-created. Nutzer-Welten takes a major step in creating an interdisciplinary environment in which innovative tools for user-centered and value-sensitive co-design will be developed, tested, and iteratively improved. These tools, which will focus in particular on the inclusion of people with dementia, will be made available to the European research and innovation community. Furthermore, NutzerWelten will use these tools in early case studies focusing on active and independent living for seniors facing the challenges of dementia. The development of solutions that support identity and communication with relatives will represent major improvements to the care system in Europe.

Applications for Quality of Life

Düsseldorf University of Applied Sciences

CONTACT: Mixed Reality & Visualisation, **Prof. Dr. Christian Geiger**

MÜNSTER UNIVERSITY OF APPLIED SCIENCES

A.13 WiHMo
WIRELESS HEALTH MONITORING

ABSTRACT

This project aims to reduce costs in European health systems (particularly in Germany and the Netherlands) by reducing the length of in-patient stays. Patients who need prolonged medical therapies and nursing could be provided with outpatient treatment where their vital signals can be continuously monitored. Having patients live at home not only reduces health service costs, it can also improve their quality of life.

To achieve this, we intend to develop tiny wireless sensor nodes and an open source software development environment as an inexpensive platform for further development.

LIST OF PARTICIPANTS

- University of Applied Sciences Münster, Dept. of Electrical Engineering and Computer Science
- University of Applied Sciences Münster, Centre for Medical Engineering and Ergonomics
- Vector Fabrics BV, Eindhoven, The Netherlands
- Centric Tsolve, Hengelo, The Netherlands
- University of Twente, Pervasive Systems Group, The Netherlands
- Medisch Spectrum Twente, The Netherlands
- Technical University of Braunschweig, Chair for Circuit-Design and Computer Engineering
- Barmer Ersatzkasse
- Apotheke am Bauhaus

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2011 – 2014

Costs: 2 mio. Euro

Funding: INTERREG IV A, European Regional Development Fund, Ministry of Economic Affairs, Energy and Industry of the State North Rhine-Westphalia, Province of Overijssel

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

A direct outcome of this project will be to facilitate commercialisation of the realised prototypes in cooperation with the involved stakeholders. We also plan to adopt the Open Source Wireless Sensor Protocol (WSP) to further uses, such as monitoring and control applications. In this way, we will leverage our energy harvesting and low power circuit design skills.
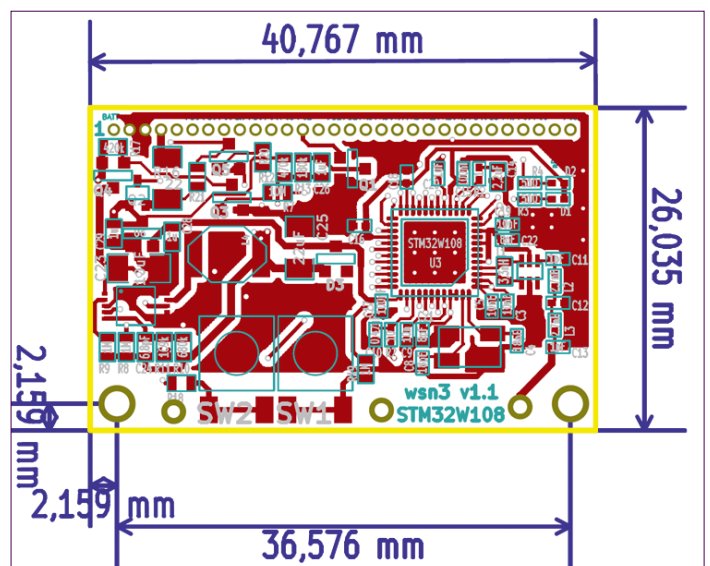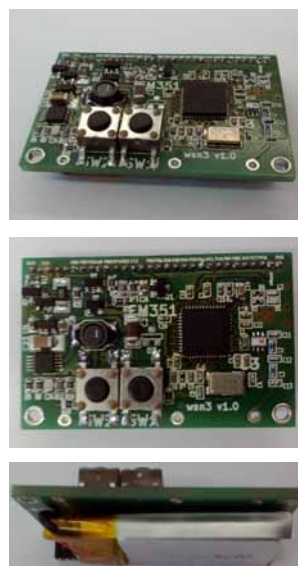
Prototype hardware of intelligent wireless sensor node with preprocessing capabilities.

Applications for Quality of Life

Münster University of Applied Sciences

T. 1 WIRELESS SENSOR NODE FOR AVIATION SAFETY
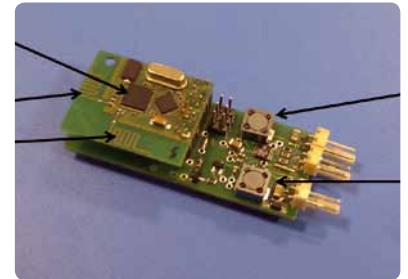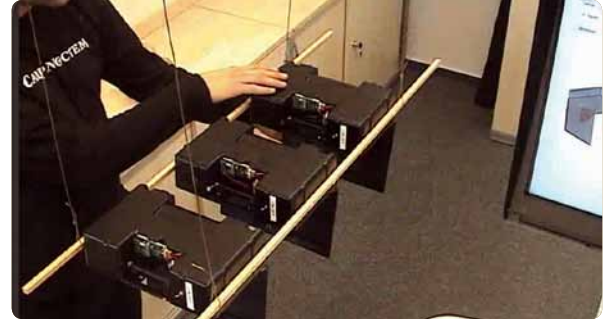
Self-sustaining wireless oxygen box and energy harvesting.

ABSTRACT

On board every commercial aircraft there are oxygen emergency compartments for all its passengers. Currently used systems are based on a wired, dead alarm system. The cables carry no current if the oxygen system isn't activated. This means that only regular practical tests indicate inoperative devices.

A wireless sensor node protocol has been developed that allows bidirectional communication between all oxygen boxes and a central hub. The link to each sensor node is checked automatically. In case of an emergency – if the outer hull of the plane has been compromised and air pressure drops – all oxygen boxes get activated. This represents an advantage of radio-based alarms compared to the current cable-based installations.

LIST OF PARTICIPANTS

- EADS Deutschland GmbH, Hamburg
- Zodiac Cabin Controls GmbH, Hamburg
- Deutsche Airbus GmbH, Hamburg

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2011 – 2013

Costs: 50,000 Euro

Funding: Zodiac Cabin Controls, Spitzencluster Förderung City of Hamburg

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Improve wireless sensor node protocol for different application scenarios.

Traffic, Mobility, Transportation

Münster University of Applied Sciences

CONTACT: Dept. of Electrical Engineering and Computer Science, **Prof. Dr. Peter Glösekötter**

T. 2 AUTOMOTIVE HMI-SYSTEMS
OPTIMISATION OF DRIVER FEEDBACK

ABSTRACT

The project is focussed on optimising vehicles and automotive systems in order to improve the feedback given to the driver. The aim is to improve the driver's control over the vehicle. These activities will contribute significantly to better road safety, efficiency and comfort. To achieve this, mechatronic systems – the systems containing mechanical, electrical and computer science related components such as the steering or driver assist systems and algorithms – need to be re-engineered; for instance the shaping of the steering system's dynamic behaviour to provide better road feedback to the driver.

Actual and future topics are:

- Test new functions and algorithms for vehicle dynamics and driver assist technology on HIL (Hardware-In-the-Loop) and SIL (Software-In-the-Loop) benches.

- Upgrade the institute's HIL driving-simulator is in order to support investigations for improving the human-machine interaction or automotive steering systems, vehicle dynamics, and driver assist technology (DAT).

- Apply CAN-based real-time testing of ECUs and algorithms within a multibody-simulation of vehicles based on the software, CarMaker, on HIL driving-simulator from IPG-Automotive.

At an early stage, before the vehicle is physically available, the working group uses simulations of vehicles, functions, and the human-machine interaction of a test person (driver) for tests. It will also simulate dangerous or extremely expensive tests rather than using a prototype. This means that tests such as highway ascend assist systems or emergency steer assist functions can be conducted before starting fine-tuning on test-tracks or public roads. The project group clusters broad expert knowledge from the development departments of leading automobile manufacturers, especially in vehicle dynamics, steering and driver assistance technologies.

LIST OF PARTICIPANTS

- Bochum University of Applied Sciences, Campus Velbert/Heiligenhaus

- IPG-Automotive, Karlsruhe

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: Since April 2013

Funding: Ministry of Innovation, Science and Research of the State of North Rhine-Westphalia and participating partners

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The group is interested in extending its research activities to adjacent and related topics, such as:

- human-machine interface optimisation for vehicle dynamics,
- steering and driver assist technologies,
- model optimisation for pre-prototype phase evaluations of new DAT and vehicle dynamics concepts,
- customer clinic investigations for new concepts,
- subjective-objective correlation for automotive applications,
- research on integration or collaboration issues for multiple vehicle dynamics and DAT systems, automated and autonomous driving.

The group is looking for additional partners within the automotive industry, research institutes and universities – on a national and international basis. Possible areas of activity in Horizon 2020 are in the section "Excellent Science": the Initial Training Networks (ITN, Marie Skodowska Curie), and in the section "Leadership in Enabling and Industrial Technologies" (LEIT) as well as in Innovation in SMEs. Co-operations are also possible within the sections "Social Challenges "Health, Demographic Change and Wellbeing", "Smart, Green and Integrated Transport", "Climate Action, Environment, Resource Efficiency and Raw Materials".

Additional interest concerns participation in the "Long-life Learning Programs" as well as in projects of the "European Structural and Investment Funds".

CONTACT: Institute of Control and Automotive Systems Engineering, **Prof. Dr.–Ing. Markus Lemmen**

Westfälische Hochschule University of Applied Sciences

Traffic, Mobility, Transportation

T. 3   ELMO[S]
ELECTROMOBILITY SOLUTIONS FOR CITIES AND REGIONS

ABSTRACT

ELMOS overall goal is to promote more sustainable transport through the development of electromobility solutions for cities and regions. The project aims at delivering concepts for a better exchange of electromobility knowledge at regional and EU levels, including new business models and cross-border field tests. This should lead to an improved standardisation in electromobility technology and provide new insights in applied science. The project will enhance regional capacities for fostering a sustainable transport-related economy.

There is a major problem of congested roads with highly polluting stop-and-go traffic in and around agglomerations. Electric vehicles are regarded as one of the cleanest solutions for urban mobility. Electromobility with zero-emissions in cities can bring large and quick gains in greenhouse gas reduction and alleviation of air and noise pollution. Moreover, innovative green vehicle concepts will lead to new and sustainable mobility forms in urban mobility. Some can already see a new electric mobility age developing.

However, a fast uptake of electromobility depends on appropriate regional infrastructures, a shift in user patterns, and intelligent vehicle-use concepts embedded in the urban transport environment. The market potential is considered to be enormous.

Our working scheme is designed to achieve these objectives: High-level expert round tables and international networks will gather additional expertise. Two EU-mentoring regions are involved from the outset, together with six RDCs (research driven clusters) from the ICT (information and computer technology), automotive, and renewable energy sectors. Their initiative for joint cross-border testing of electromobility concepts is new and has never been done before. As concrete outcomes, a joint action and business plan, concepts for smart specialisation, a joint agenda for future RTDI and training tools will be developed and exciting dissemination activities will be undertaken.

LIST OF PARTICIPANTS

- TCBE - ICT Cluster Bern, Switzerland (Coordinator)
- Westphalian University of Applied Sciences, Institute for Work & Technology (Coordinator)
- autocluster.ch, Uster, Switzerland
- Bern University of Applied Sciences, Switzerland
- Pôle Véhicule du Futur, Etupes, France
- CARS - Economic Development Agency Region Stuttgart
- City System GmbH, Duisburg
- VLOTTE - Vorarlberg Electric Vehicle Planning & Consulting, Bregenz, Austria
- Pannon Novum West Innovation Agency, Hungary
- GIZ ACS - Automotive Cluster Slovenia, Ljubljana, Slovenia

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: December 2011 – November 2014

Costs: 2.7 mio. Euro

Funding: 2.3 mio. Euro

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

A great number of technological, engineering and business innovations have occurred in the field of sustainable mobility. ELMOS has revealed that the social dimension and the use of electric vehicles constitute a central bottleneck related to the further uptake of sustainable mobility solutions. Social innovations in the form of social acceptance and changes in mobility patterns from vehicle ownership to usage, as well as intermodal concepts, are driving forces for the market penetration of green mobility. Share economy approaches such as 'car-sharing' and 'car-pooling', or civil society initiatives such as 'citizen coaches' cannot be neglected on the path towards more sustainable transport economies. Within the scope of green future mobility, societal challenges should as well be taken into account in technical research projects as investigated separately. IAT will study individual aspects of mobility as well as social innovations in depths during the next five years.

CONTACT: Institute for Work & Technology, **Judith Terstriep**
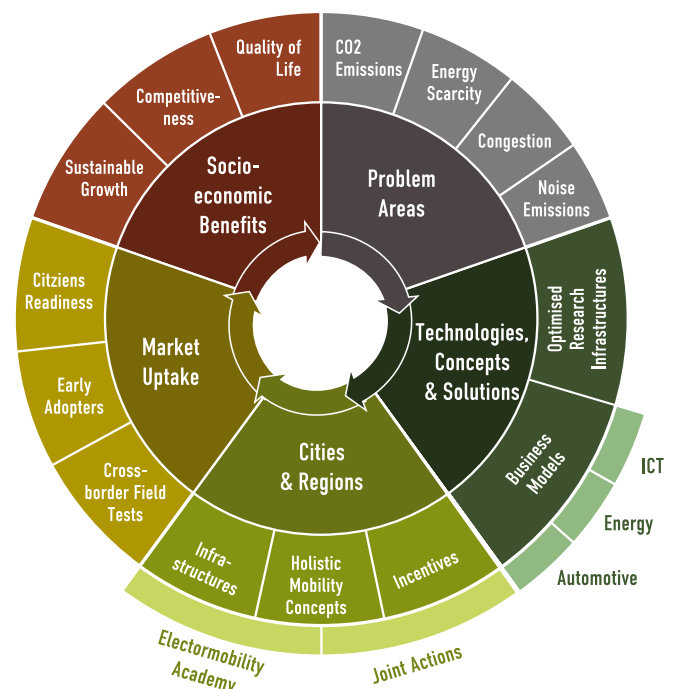
T. 4 euroFOT
EUROPEAN LARGE-SCALE FIELD OPERATIONAL TEST FOR IN-VEHICLE SYSTEMS

Driving simulator at the Institute of Automotive Engineering.

Emergency braking in use.   © Peter Winandy (2)

ABSTRACT

euroFOT has been a research project co-funded by the European Commission's DG Information Society and Media. 28 partners joined forces in an effort to test eight intelligent vehicle systems (IVS) on European roads.

euroFOT analysed the efficiency of Advanced Driver Assistance Systems (ADAS) in real-world conditions, using ordinary people as drivers over a time period that enabled the collection and processing of data in a statistically sound way. Extensive field operational tests were used to assess the impact of ADAS in real traffic, in order to determine how the effectiveness of ADAS can be improved with respect to traffic efficiency, safety, and the environment. Altogether over 1000 test vehicles from different manufacturers with different ADAS took part in the FOT. Valuable information on the short and long-term impact of ADAS was collected.

euroFOT investigated systems that are already present in the market or sufficiently mature to represent a commercial application. Based on the recommendations for existing roadmaps and on the availability of well-developed systems, the following group of nine systems has been selected for euroFOT:

- Longitudinal systems: Adaptive Cruise Control (ACC), Forward Collision Warning (FCW) and Speed Limiter (SL).
- Lateral systems: Lane Departure Warning (LDW), Impairment Warning (IW) and Blind Spot Information System (BLIS).
- Advanced applications: Curve Speed Warning (CSW), Fuel Efficiency Advisory (FEA) and Safe Human-Machine Interaction (SafeHMI).

The detailed analysis of the effects of ACC and FCW usage showed positive effects on traffic safety, driver behaviour and driver acceptance, as well as upon fuel consumption.

The relevant factor for the reduction in the number of harsh braking events, incidents etc. can be attributed to changed distance behaviour. The analysis shows that the average time-headway was increased by about 16 %. In addition to the usage rate of 50 %, the analysis of acceptance rating revealed a positive perception of the ACC and FCW. Furthermore, a reduction in fuel consumption of 2.8 % was observed, resulting in lower CO_2 emissions.

Based on these insights regarding how drivers use the systems, valuable input has been provided for the various stakeholders (suppliers, vehicle manufacturers, and research institutes) to improve system design and promote product development.

LIST OF PARTICIPANTS

28 different partners across Europe are cooperating to bring euroFOT to fruition, including:

- Vehicle manufacturers (FORD, BMW Group, DAIMLER, CRF, MAN, VOLVO, VOLVO Technology Corp., VW, AUDI)
- Automotive suppliers (BOSCH, CONTINENTAL, DELPHI, Harman International)
- Universities and Research centres (Allianz, BAST, CHALMERS, CTAG, CEESAR, ICCS, RWTH Aachen University/IKA, INRETS, IZVW, Politecnico di Torino, TNO, University of Leeds)
- Other organisations (ADAS, ALCOR, EICT, ERTICO)

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: May 2008 – June 2012

Costs: 22 mio. Euro

Funding: 14 mio. Euro by EC under FP7

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The positive results may also raise public awareness about the potential impact of ADAS on safety and efficiency support. These will provide further impulses for consideration of ADAS in the customer's purchase decision and could become a major contribution for improving road traffic safety.

CONTACT: Institute of Automotive Engineering, **Dr.-Ing. Adrian Zlocki**

T. 5 GALILEO ABOVE
APPLICATION CENTRE FOR GROUND-BASED TRANSPORTATION
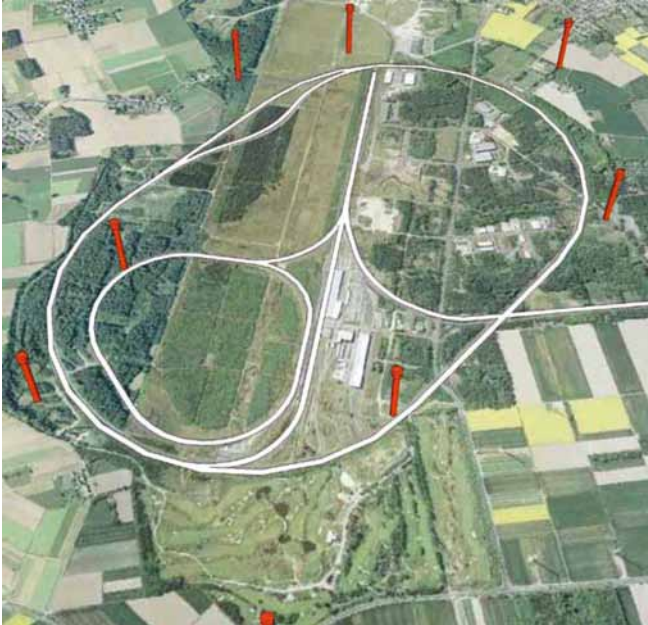
Locations of Pseudolites at the railGATE (IRT).

ABSTRACT

RWTH Aachen University has built two Galileo test and development environments (GATE) for automotive and rail applications. AutomotiveGATE has been set up at the university's recently established automotive test facility, the Aldenhoven Testing Centre. Meanwhile RailGATE uses the existing rail test facility at Siemens AG's Test and Validation Centre in Wegberg-Wildenrath.

In both test areas, so-called pseudolites, placed on poles up to 60 m high, transmit Galileo signals allowing precise positioning of multiple users. AutomotiveGATE is providing ideal test conditions for the development of future driver-assistance systems. In railGATE, automated driving of rail vehicles using Galileo can be explored and advantages evaluated for train control and safety systems.

Initial projects are being carried out in the two Galileo test facilities. In the automotive domain, a collision avoidance system is being investigated which can intervene if the driver does not react properly to prevent an impending collision. The system decides whether to brake or to make an evasion manoeuvre based on location and sensor data, a digital map, and car2car communication. In the rail domain, an automation of shunting operations based on Galileo positioning is being investigated. Here the shunting locomotive will be automatically controlled. Only the coupling of cars has to be done manually.

LIST OF PARTICIPANTS

RWTH Aachen University:
- Institute of Automatic Control (IRT)
- Institute of Rail Vehicles and Materials-Handling Technology (IFS)

Other Partners:
- ATC- Aldenhoven Testing Center of RWTH Aachen University GmbH
- Test and Validationcentre Wegberg-Wildenrath of Siemens AG
- Automotive & Rail Innovation Centre Aachen

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: April 2009 – June 2014

Costs: 7.7 mio. Euro

Funding: Space Agency of the German Aerospace Center (DLR) with funding by the Federal Ministry for Economic Affairs and Energy (in compliance with a resolution of the German Parliament)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Galileo, the European satellite navigation system, will offer services from the end of 2014. Galileo will reach full operational capability by the end of the decade. Future mobility will depend on precise and reliable positioning information from Galileo. Today, the test environments, railGATE and automotiveGATE, offer unique conditions for research and development of applications for rail and road traffic. Research in the field of future mobility focuses on satellite navigation in combination with other sensor technologies and wireless communications. The major perspective is automated driving.

Test vehicle – Institute of Rail Vehicles and Materials-Handling Technology. © Peter Winandy

Traffic, Mobility, Transportation

RWTH Aachen University

CONTACT: Institute of Automatic Control (IRT), **Björn Schäfer**

T. 6 **MOBILE: STAYING MOBILE**
(MOBIL IM LEBEN)

Traffic, Mobility, Transportation

Niederrhein / Rhine-Waal – Universities of Applied Sciences

ABSTRACT

The project "Mobile" supports the use of public transport services by cognitively- or physically-handicapped people through the development of a seamless smartphone-based navigation system. This system adapts to the current traffic situation, and to individual user requirements, e.g. by providing a route that takes individual limitations into account.

The system allows an easy way of travelling "from door to door" and assists, e.g. once the means of transportation needs to be changed. It aims at improving the mobility of people who would otherwise be largely excluded from the use of public transport.

However, the system could also be attractive to non-disabled users, preventing stigmatisation and increasing public acceptance. Additional features will enable users to evaluate transport routes and services quickly and easily. Transport companies will benefit from an immediate user feedback and will be given the chance to tackle the special challenges and problems these users might face.

Two examples of how a navigation system may interact with the user.

LIST OF PARTICIPANTS

- Niederrhein University of Applied Sciences
- Rhine-Waal University of Applied Sciences
- SWK Mobil GmbH, Krefeld
- moBIEL GmbH, Bielefeld
- Von Bodelschwinghsche Stiftung Bethel – Bethel regional
- Inoges AG, Krefeld

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: April 2013 – March 2016

Costs: 3.1 mio. Euro

Funding: 2.46 mio. Euro funded by the Federal Ministry for Economic Affairs and Energy (BMWi)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Mobility is an important factor for planning autonomous living and leisure. New and improved mobility solutions are needed to meet demographic changes and increasing traffic. Elderly people will increasingly wish to travel internationally, whether for leisure activities or heath access (e.g. more choice of doctors). Therefore, standards to generate and retrieve localisation and context information are essential. The autonomy of handicapped people should also be considered when developing new mobility concepts.

CONTACT: Niederrhein University of Applied Sciences, Competence Centre FAST, **Prof. Dr. Gudrun Stockmanns**
Rhine-Waal University of Applied Sciences, Faculty of Communication and Environment, **Prof. Dr. Christian Ressel** 36

T. 7 PrimAIR
A PRIMARY AIR RESCUE SYSTEM FOR STRUCTURALLY WEAK REGIONS

PrimAIR

ABSTRACT

Due to demographic and structural changes, adequate medical care is becoming more and more difficult to provide in sparsely populated areas. Obtaining fast and professional help in regions with low population densities and minor medical infrastructure is ineffective due to a suboptimal relationship between the hold-back time necessary for providing aid in the given period, and the occupancy rate of Emergency Medical Services (EMS). The aim of the PrimAIR project is to develop an innovative model for EMS in such regions. The developed concept will ensure emergency medical care in a time-frame oriented towards emergency medical demands. Furthermore, the concept will take into consideration cost-effectiveness under defined conditions.

In principle, emergency medical services are land-based. Today, air rescue provides a back-up to the system and is predominantly used as fast transport for EMS doctors and/or patients. This results in planning-related and financial redundancy and means that the potential capacity of air rescue is not completely utilised. In addition, response time-related emergency medical care requires numerous ambulance stations causing high costs per operation due to the low frequency of emergencies. This makes cost-effectiveness increasingly difficult. Furthermore, due to this low rate, EMS crews lack the necessary routine and ongoing specialisation and centralisation of hospitals results in increasing transport times, i.e. to get the patient to the appropriate clinic, hence adequate emergency medical aid is delayed.

The German federal state of Mecklenburg-Western Pomerania represents the test region for a practical orientation of the PrimAIR project design. Findings from this model region will be standardised and published as a code of best practice, providing a tool that can be adapted to similar regions.

LIST OF PARTICIPANTS

- antwortING, Cologne (project coordinator)
- Fraunhofer Institute for Transportation and Infrastructure Systems (IVI), Dresden
- Asklepios Hospital Group, Institute for Emergency Medicine, Hamburg
- University Hospital of Munich, Institute of Emergency Medicine and Management in Medicine (INM)
- Cologne University of Applied Sciences, Institute of Rescue Engineering and Civil Protection (IRG)

Associated partners:

- ADAC Air Rescue, München
- German Federal Police's Flying Squadron, St. Augustin
- DRF Air Rescue, Filderstadt
- AOK Nordost, Berlin
- Federal Office of Civil Protection and Disaster Assistance (BBK), Bonn
- Ministry of Labour, Equality and Social Affairs of the Federal State of Mecklenburg-Western Pomerania, Schwerin

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: June 2013 – May 2015

Costs: approx. 2.5 mio. Euro

Funding: Federal Ministry of Education and Research (BMBF)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The problems faced by PrimAIR exist in many rural areas throughout Europe. Hence, although the project is aimed currently at a German national level, the results and further research (especially when it comes to testing the concept within a model area) could be handled as a project with partners from different European countries.

routes of transportation: airborne land-based

© PrimAIR consortium

Cologne University of Applied Sciences

Traffic, Mobility, Transportation
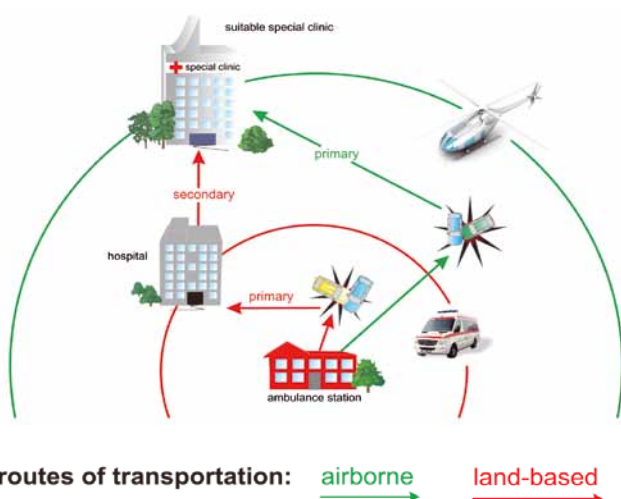
CONTACT: Institute of Rescue Engineering and Civil Protection, **Ulrike Pohl–Meuthen**

MÜNSTER UNIVERSITY OF APPLIED SCIENCES

E. 1 EASY ENERGY EFFICIENT HEATING AND BUILDING AUTOMATION
IMPROVING ENERGY EFFICIENCY IN RESIDENTIAL BUILDING

iEXERGY

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: 2011 – 2014

Costs: 580,000 Euro

Funding: Federal Ministry of Economic Affairs and Energy (BMWi)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Develop an open and secure platform for inexpensive home automation solutions. Our unique approach merges the do-it-yourself market with the professional artisan sector in such a way that vendor independent solutions add value to the customer.

ABSTRACT

Building owners put emphasis on improved energy efficiency in their houses. However existing automated energy efficiency systems are usually too expensive to install and too complicated to configure for use in residential buildings.

To remedy this problem, new company has been founded to develop new home automation systems: iExergy will bring new products to the market that reduce energy consumption and provide advanced convenience for private households.

The roots of this project go back to the time frame 2008 - 2011. The research project "EGtech" was supported by the Federal Ministry for Economic Affairs and Energy and paved the way for the project described here.

LIST OF PARTICIPANTS

■ Münster University of Applied Sciences
Dept. Energy, Buildings, Environment
Lab of Semiconductor Devices and Bus Systems

■ iExergy GmbH, Münster

E. 2 INTELLIGENT SMART GRID ENERGY–MANAGEMENT
DESIGN OF DISTRIBUTED INFORMATION AND COMMUNICATION SYSTEMS

ABSTRACT

One objective of a smart grid is to manage the production and consumption of energy on a local scale while decreasing the load of the higher network levels. Its architecture should be dynamically scalable to achieve a balancing aggregation of time-shiftable loads (several thermal processes, e-mobility systems), the generators (Combined Heat and Power Plants, CHP, solar power systems) and the energy storages (electrical, thermal). The smallest possible grid is a private household controlled by a Smart-Energy Controller unit (SEC). More complex systems, like commercial facilities, need distributed controller arrangements such as Smart Building Management Systems. These systems can describe time-dependent properties of the energy consumption and production process under characteristic conditions.

However, the energy marketplace of the future will also include the so-called aggregator system, that can control and optimise these conditions in relation to a given balance profile.

Taking all of this into account, the Institute for Communications Technology is working on the fields of

- intelligent IP-based system architectures,
- conditional data acquisition and signal processing,
- conditional data aggregation and secure data exchange,
- local process control based on grid parameters (autonomous, grid-controlled),
- aggregation and balancing systems at the grid level,
- monitoring of data and human interfaces,
- and their interaction (M2M communication) as well as M2H communication.

LIST OF PARTICIPANTS

- Dortmunder Energie- und Wasserversorgung GmbH, DEW21, Dortmund
- Hager Electro GmbH & Co. KG
- Heinz Lackmann GmbH & Co. KG, Münster
- Miele & Cie. KG
- Prosyst Software GmbH, Köln
- RWE Energy AG
- Siemens AG
- SWK Stadtwerke Krefeld AG
- DKFI, Deutsches Forschungszentrum für Künstliche Intelligenz GmbH
- University of Duisburg/Essen
- University of Applied Sciences South Westphalia
- Obuda University Budapest, Hungary
- Technical University Dortmund

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project e–energy@home: October 2008 – December 2011

Project E–DeMa: January 2009 – July 2013

Project EENEAS: September 2009 – December 2012

Project GUIDED_AB: October 2013 – October 2016

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Based on concepts of modern intelligent energy networks, the Institute for Communications Technology is contributing to the field of load balancing and demand response with a distributed architecture (Smart Energy Architecture, SEA) that includes mechanisms for aggregation optimisation, power balancing, energy data monitoring / visualisation and energy efficiency optimisation. Future research projects will take account of these domains while seeking to optimise single systems and energy networks (e.g. smart grids) using digital signal processing technologies.

CONTACT: Institute for Communications Technology, **Markus Kuller**
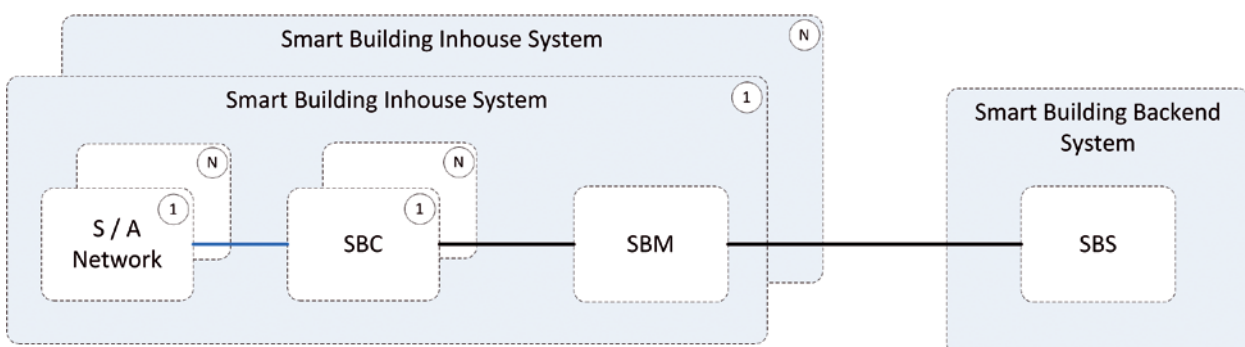
0. 1 AdMotional
BETTER ONLINE ADVERTISEMENTS THROUGH PERSONALISED BANNERS

ABSTRACT

Many online users are annoyed by ads that lack personal relevance. Consequently they ignore them. The AdMotional project investigates how a win-win situation can be achieved for online advertisers and web users alike, through optimisation of the campaign selection process and the creation of individually personalised ads.

The project focuses on three aspects: first on the initial targeting process, second on the run-time personalisation of ad media design, and third on automatic improvements through a self-learning optimisation component.

AdMotional combines and enhances state-of-the-art targeting technologies by using a novel concept of emotional targeting that allows for campaign selections based on consumer moods. This step is further extended by moving from the traditional (campaign-based) targeting to an additional more fine-grained ad-based targeting – aiming for the single, best-matching advertisement. After selection, specific customisation points are identified as the basis for individual customisation of the ad media, resulting in a personalised ad. Ad personalisation furthermore demands the dynamic creation of the ad itself, for which different approaches have been evaluated using templates and an XML-based banner design language.

A typical scenario for the use of AdMotional (figure): Imagine, a web user is spending some time visiting various dating sites (1 to 3), then moves to an online music store (4) and checks out the track list of the latest CD of his favourite artist (5). While traditional behaviour targeting would lead to an ad being displayed either tailored to the socio-demographic or interests profile, emotional targeting also tries to take into account the user's emotional situation. As he spends quite some time on dating sites, he may be emotionally involved in some joyful communication. Combining this with results e.g. from behaviour and geo targeting (user's location) will lead to an individually (but automatically) designed advertisement e.g. offering tickets for a concert coming soon in a nearby arena using a romantic background and a text message tailored to the user's age and gender like "Get the last tickets and bring your girl to…" or a more serious version for the senior audience.

Finally, the system's self-learning feedback component complements the overall system by constantly monitoring and analysing ad performances in an attempt to derive rules not only for optimising the targeting and personalisation processes, but also to inform ad designers of the most influential factors to be considered. On a more technical level, inductive learning will inform ad designers about most influential factors, e.g. changing colour schemes, typography, or layout aspects.

The main results of the project have been published in the following journal paper: M. Meyer, M. Balsam, A. O'Keefe, C. Schlüter: AdMotional: Towards Personalized Online Ads. Intern. Journal of Computer Science and Applications (IJCSA), Vol. 8, No. 2, pp. 59 – 80, 2011.

LIST OF PARTICIPANTS

Westfälische Hochschule – University of Applied Sciences:
- Dept. of Mechanical Engineering, Bocholt (project coordinator)
- Dept. of Electrical Engineering, Bocholt
- Institute of Journalism and Public Relations, Gelsenkirchen

Other Partners:
- Life and Brain GmbH, Bonn
- The AdInsider GmbH, Bocholt

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Perspectives for ongoing efforts also include the evaluation and fine-tuning of the feedback-based ad optimisation techniques in longterm real-life tests. The AdMotional system with its fine-grained contextual analysis can also be used for retargeting due to its general and flexible architecture, for brand protection by avoiding misplacements of ads in a probably brand-damaging environment, or for early identification of sentiments shifts to avoid brand damage or to act on the stock market.

© M. Tewiele Mediendesign

CONTACT: Dept. of Mechanical Engineering, **Prof. Dr. Manfred Meyer**

HRW HOCHSCHULE RUHR WEST
UNIVERSITY OF APPLIED SCIENCES

Hochschule Ruhr West – University of Applied Sciences

0.2 CONTACTLESS GESTURES
INTELLIGENT GESTURE RECOGNITION AND INTERACTION CONCEPTS
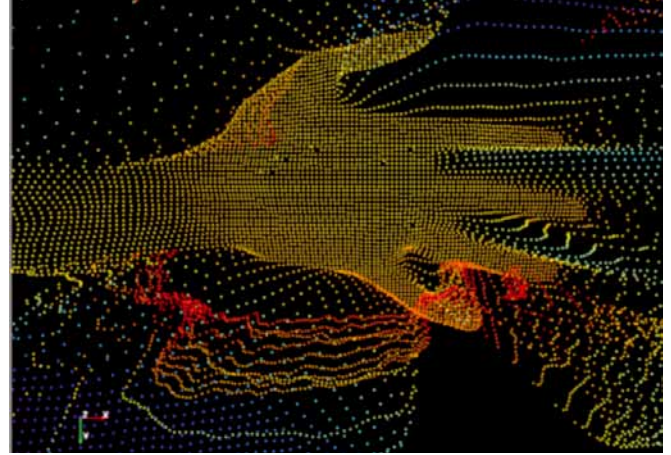
Intensity image from the PMD ToF–sensor and a visualisation of the point cloud image acquired from the ToF–camera.

ABSTRACT

With the introduction of Apple's iPhone, gesture control became popular and was perceived as an intuitive means of interaction. Contactless gestures received broad attention with the X-Box Kinect.

Current technology is limited to a small number of uses, mainly in entertainment systems. The target of this project is to increase the range of possible applications, e.g. to the field of automotive, industrial applications (manufacturing plants), assisted living in contexts ranging from private households to hospitals (interaction for people with disabilities) and many more. Research is performed in three areas:

- Technology improvements: using the most recent time-of-flight cameras embedded in the field of multi-sensor-fusion.
- 3D Gesture recognition and machine learning algorithms.
- Development of interaction concepts for various areas of applications.

LIST OF PARTICIPANTS

- NISYS GmbH, Bochum

PROJECT START AND DURATION,
TOTAL COSTS AND FUNDING

Project: December 2013 – August 2015

Funding: 171,255 Euro by the Federal Ministry for Economic Affairs and Energy (BMWi)

PERSPECTIVES, APPROACHES AND IDEAS FOR
FURTHER DEVELOPMENT AT THE EU LEVEL

Algorithms and concepts for intelligent gesture recognition are currently being developed in a generic approach. To achieve higher usability, further research regarding new applications and targeted user groups will be required.

Current ideas include automotive applications, such as HMI (Human-Machine-Intaction) for higher automated driving and new mobility concepts, but also as part of an improved HMI concept in traditional cars with respect to distracted driving and increased safety, e.g. finger gestures with the hands on the steering wheel to control head-up displays while keeping the eyes fixed on the road ahead. Such interaction concepts can also be applied to support active assistance, e.g. replacing multiple remote controls with more intuitive gestures could help elderly and disabled people.

Hand pose database.

Thomas Kopinski

Prof. Dr. Stefan Geisler

Prof. Dr.-Ing. Uwe Handmann

CONTACT: Computer Science Institute, **Prof. Dr.–Ing. Uwe Handmann**

Other Subjects

O. 3 INTERACTIVE VISUALISATION IN THE PLANNING PROCESS FOR PRE–FABRICATED HOUSES (IVAB)

ABSTRACT

Current systems for planning and previewing pre-fabricated houses (Vi2000) provide a basic visualisation component that takes no account of realistic lighting effects, such as diffuse reflections between surfaces. Integrating these effects into a high-quality graphical interaction system offers customers a new level of visual realism for their future homes. Therefore, a main focus of this project is to enable users to intuitively interact with the highly realistic virtual environment, including an easy retrieval from a large catalogue of interior materials.

To get the most out of a database of hundreds of different materials and furniture, physically-based light transport is employed. For an interactive preview, screen-space methods are used that approximate realistic illumination effects on a post-processing basis. For the path tracing part, a hierarchical parallel computing approach is used. Work is distributed to several rendering servers, each providing a set of reasonably-priced consumer GPUs. The physically-based renderer, together with the screen-space renderer, are either running independently or attached to the Vi2000 software by an abstraction layer for cluster-based rendering.

This is just one application-oriented project from the High-Quality Rendering Group within the Institute for Visual Computing. Other applications studied include:

■ Human-Computer Interaction for Big Data Analytics. The overwhelming information density of high resolution data and displays is a challenge in every data analyst's task. At IVC, PhD students create new paradigms for reducing the cognitive load of users.

■ A Virtual Reality application for the automotive sector, enabling interactive, physically correct simulation of tube-like flexible objects. The scientific objective is to describe flexible objects by a set of parameters (length, diameter and material constants) instead of rigid geometry (triangular meshes) and to give the user the possibility to add, delete, and manipulate these flexible objects in a stereo-projected environment in real-time.

■ The integration of Ray Tracing in interactive environments for medical visualisation, product engineering, and design review processes. In order to achieve real-time frame rates, a GPU cluster was used connected through a gigabit Ethernet network.

■ Human Factor Driven Design of 3D Multi-Sensory Interfaces. This IVC-group focusses on the analysis, design, and validation of 3D multi-sensory interfaces. It is predominantly concerned with spatial interactions exploring the domains of augmented and virtual reality (AR and VR). Human factors play a key role: our research is driven by a fascination for what is truly possible with the human sensorimotor system.

■ A FPGA-based image combining system for parallel graphics was developed in order to reduce network traffic and latency for increasing performance in parallel visualisation systems. The architecture allows loading of huge datasets without any pre-processing step (e.g. Level of Detail).

LIST OF PARTICIPANTS

■ Softwareparadies GmbH & Co. KG, Dresden

■ pdv-systeme Sachsen GmbH, Dresden

■ University of Stuttgart, Institute of Human Factors and Technology Management

■ Fraunhofer IAO, Stuttgart

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2012 – December 2013

Costs: 700,000 Euro

Funding: 175,000 Euro by the Federal Ministry of Economic Affairs and Energy (BMWi) ZIM grant no. KF2644106ED1

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

High-end visualisation is going to play an important role in upcoming production processes, manufacturing services and related business cases, as well as in the analysis and presentation of Big Data. Enabling interactive, physically correct simulation of future products, assembly parts, or even production lines, will speed up development cycles, reduce production costs and enable solutions for individual customers. Utilisation of Big Data, i.e. GIS and environmental data sets, for prediction and visualisation tasks also marks a new challenge for advanced rendering techniques. BRSU's Institute for Visual Computing is expanding its network to develop advanced visualisation systems and techniques suitable not only for big industry but also for SMEs.

User perspective of IVAB visualisation.
© Institute of Visual Computing

CONTACT: Institute of Visual Computing, **Prof. Dr. André Hinkenjann**

MÜNSTER UNIVERSITY OF APPLIED SCIENCES

Münster University of Applied Sciences

0.4 PATRIA 2
PATTERN RECOGNITION IN AUTOMATIC RISK-INCIDENCE ASSESSMENT

ABSTRACT

The project aims to develop an automated monitoring system to avoid mistakes and erroneous actions by staff engaged in routine activities, notably in fields such as medicine, transport and industry. The system seeks to reduce risk by assessing the task being performed and identifying activities that affect the likelihood of an avoidable error occurring. This is achieved by using a combination of non-invasive camera-based detection techniques: gaze tracking, facial expression recognition, gesture tracking and body posture evaluation. Data from these sources, as well as from user-input through keystrokes and mouse clicks, are used to extract performance parameters. These can be used to estimate the level of risk and to initiate a corrective action when necessary. The system can be applied in daily work practice where processes are standardised and repeated in a prescribed form, as well as in the context of training.

LIST OF PARTICIPANTS

- Noldus Information Technology, Wageningen, The Netherlands
- Münster University of Applied Sciences, Centre for Medical Technology and Ergonomics (MTE)
- Dr. Koldijk Consultancy, Hardenberg, The Netherlands
- University of Twente, Enschede, The Netherlands
- VicarVision, Amsterdam, The Netherlands
- Feintechnik R. Rittmeyer GmbH, Münster

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: October 2010 – March 2013

Costs: 891,869 Euro

Funding: INTERREG IV A-Programme Deutschland - Nederland 2007-2013; Europäische Territoriale Zusammenarbeit (ETZ)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The future focus will be on refining the system and applying it in the training of medical personnel in order to improve patient safety.

Setup for training session.

INTERREG
Deutschland
Nederland

INTERREG - Grenzregionen gestalten Europa
Europäischer Fonds für Regionale Entwicklung der Europäischen Union
INTERREG - Grensregio's bouwen aan Europa
Europees Fonds voor Regionale Ontwikkeling van de Europese Unie

CONTACT: MTE - Centre for Medical Technology and Ergonomics, **Professor Dr.-Ing. Uvo M. Hölscher**

0.5 SENSORCLOUD
BUILDING A FIRST DOMOTIC (HOME AUTOMATION) SENSORCLOUD NODE

ABSTRACT

The SensorCloud is a cooperative project between industry and university partners funded by the Federal Ministry of Economic Affairs and Energy in the context of TrustedCloud. It aims at building a new and versatile standard for the inter-operation of cloud apps and sensor actuator networks with applications in industry (e.g. maintenance of machines) and buildings (e.g. theft prevention by remote control of cameras and sensors in buildings).

The CUAS research group built a first domotic (home automation) SensorCloud node with an 'intelligent' camera and interworking sensors and actuators using multiple in-house bus standards e.g. KNX, BidCoS and ZigBee. Furthermore, this node holds a database for buffering data during times of unreachability. It is connected to the SensorCloud by means of an 'intelligent' gateway which implements the services needed by the TrustedCloud principles, e.g. security of data, controlled access only by authenticated applications etc.
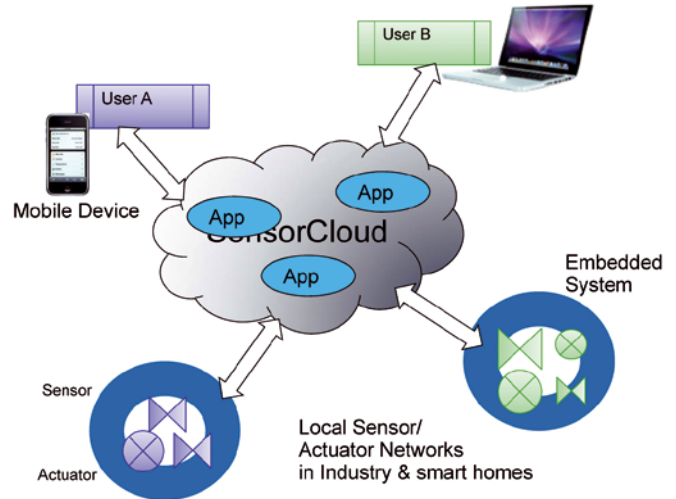
Building a first Domotic SensorCloud® Node. ©QSC AG

LIST OF PARTICIPANTS

- QSC AG, Cologne
- Symmedia GmbH, Bielefeld

RWTH Aachen University:

- Institute of Communication and Distributed Systems
- Institute of Software Engineering
- Institute of Sociology of Technology and Organisation
- Cologne University of Applied Sciences, Institute of Communication Systems

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project: January 2012 - December 2014
Costs: 788,000 Euro as part of CUAS
Funding: Federal Ministry of Economic Affairs and Energy (BMWi)

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The trusted connection of sensors/actuators to the internet (cloud) and the availability of a VisionSensor may be seen in the context of the EU initiative 'European Innovation Partnership on Smart Cities and Communities'. To build Smart Cities, a network of smart sensors and actuators is needed. Thus, together with our partners in SensorCloud, we are currently defining research projects that include the central ideas of SensorCloud, namely:

- Secure and owner-controlled transfer of sensor data using embedded technology.
- Machine-interpretable representation of data using ontological concepts which allow for writing flexible apps.
- Intelligent sensors, especially our VisionSensor, which allows use of pre-processed visual data to perform intelligent tasks.

Our first demonstration models, especially a smart observer camera that only sends pictures if needed, show the potential of these ideas. We envisage multiple further projects using the SensorCloud principles.

CONTACT: Institute of Communication Systems, **Prof. Dr. Gregor Büchel** 44

O.6   SMART TEXTILES AND WEARABLE TECHNOLOGY
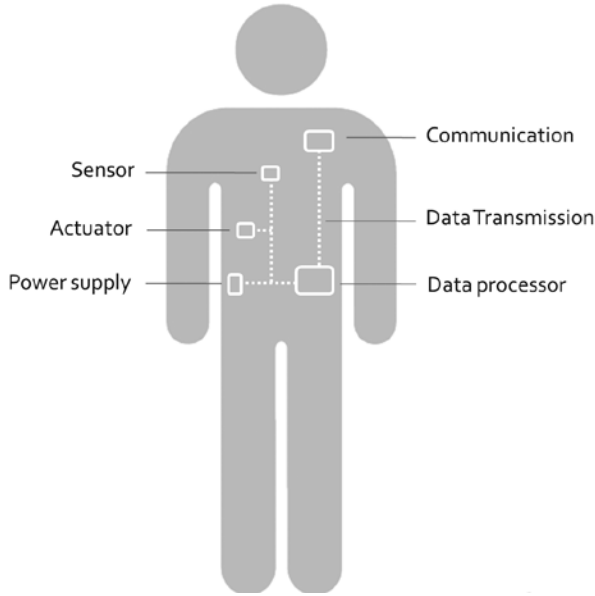
ABSTRACT

In our daily environment, two significant trends can be observed: Electronics that are miniaturised and flexible can be worn by people. Textiles, on the other hand, constantly increase in functionality: beyond their protective and decorative function, they could serve as an active interface between the wearer and the environment. Hence, through the convergence and rejuvenation of the electronics and textile industries, specialised markets are emerging, such as continuous health and risk monitoring, awareness and prevention. Continuous and personalised monitoring will facilitate patient care at the point of need, implying the responsible participation of the patient. To become acceptable to the elderly generation, monitoring systems need to be easily manageable, and they should not limit freedom of movement or mobility. Therefore, these systems need to be seamlessly integrated into the patient's environment, allowing an unobtrusive personal assistance, 24/7.

Textiles and garments are very attractive surfaces/carriers for the continuous and personalised monitoring of body parameters, such as heart rate, respiration rate, and body temperature, since they could host invisible integrated computer systems.

We have co-developed several textile-based healthcare systems in the framework of various national and European-funded projects, which are listed below.

LIST OF PARTICIPANTS

- Collaboration with numerous European companies and research institutions
- Member of the European Textile Platform

PROJECT START AND DURATION, TOTAL COSTS AND FUNDING

Project CLEVERTEX: October 2005 – September 2007
Costs: 487,190 Euro
Funding: EU (FP6)
Project PROeTEX: February 2006 – October 2010
Costs: 12.79 mio. Euro
Funding: 8.1 mio. Euro by the EU (FP6)

Project PROCOTEX: August 2010 – July 2012
Costs: 291,600 Euro
Funding: 291,600 Euro by the EU (FP7)

Project All4Rest: January 2011 – December 2012
Costs: 1.5 mio. Euro
Funding: 900,000 Euro by the EU

National projects
Project InoTrack: 2010 – 2011
Funding: Federal Ministry for Economic Affairs and Energy (BMWi), Zentrales Innovationsprogramm Mittelstand (ZIM), filed as FKZ KF2258702MS9

Project HORST: 2009 – 2011
Funding: Federal Ministry for Economic Affairs and Energy (BMWi), Industrielle Gemeinschaftsforschung (IGF) filed as FKZ 16119N

Project GloveNet: 2009 - 2011
Funding: Federal Ministry for Education and Research (BMBF), KMU-innovativ filed as FKZ 13N9857

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

Perspectives and Ideas:

- Wearable technology solutions for an ageing population.
- Textiles as wearable computer platforms for protective clothing.
- Textiles as intuitive human-machine interfaces.
- Assessment of principal smart textiles and wearable technology concepts.
- Lab-site assessment of smart textile/wearable technology prototypes.

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YOUR PARTNERS FOR EUROPEAN RESEARCH PROJECTS THAT ADDRESS "HUMAN–MACHINE INTERACTION"

EDITOR

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