Information Systems and Database Technology

Staff

- Professors:
  - Prof. Dr. rer. pol. Matthias Jarke
  - Prof. Dr. Thomas Berlage
  - Prof. Gerhard Lakemeyer, Ph.D.
  - Prof. Wolfgang Prinz, Ph.D.
  - Prof. Dr. Thomas Rose

- Secretary:

  Gabriele Hoeppermanns

  Tel: (0241) 80-21501, Fax: (0241) 80-22321
  E-mail: sekris@i5.informatik.rwth-aachen.de
  WWW: http://www-i5.informatik.rwth-aachen.de

- Researchers:

  Sebastian Brandt
  Yiwei Cao
  Mohamed Amine Chatti
  Aida Jertila (until 14.09.2006)
  David Kensche
  Dr. Ralf Klamma
  Dr. Erika Linz
  Dominik Lübbers
  Michael Miatidis
  Dr. Christoph Quix
  Marcus Raddatz
  Dr. Lemonia Ragia (until 01.06.2006)
  Dr. Marcus Schlüter
• Researchers continued:
  Dominik Schmitz (until 30.04.2006)
  Christian Seeling (until 30.06.2006)
  Marc Spaniol
  Satish Srirama

• Visiting Lecturers:
  Dr. Andreas Becks, Fraunhofer FIT
  Dr. Wolfgang Broll, Fraunhofer FIT
  Jessica Huster, Fraunhofer FIT
  Dominik Schmitz, Fraunhofer FIT (since 02.05.2006)
  Christian Seeling, Fraunhofer FIT (since 01.07.2006)
  Dr. Yehya Mohamad, Fraunhofer FIT

• Technical Staff:
  Tatiana Liberzon
  Reinhard Linde
  Eric Heder

• Student Researchers:
  Anamika Agrawal, Thomas Arzdorf, Martin Bachwerk, Michael Comanns, Dimitar Denev, Tian Gan, Adam Gasior, Marcus Gelderie, Anna Glukhova, Heike Haegert, Zille Huma, Muhammad Ikram, Iliyana Ivanova, Holger Janßen, Ewanela Lapi, Yan Leng, Xiang Li, Xuan Li, Andrea Martini, Matthias Moers, Alberto Moyano Sánchez, Nanda Firdausi Muhammad, Negah Nabi, Takhmina Namozova, Tim Niemüller, Tomas Novotny, Malek Obaid, Achim Passen, Zinayida Petrushyna, Manh Cuong Pham, Monika Pienkos, Johannes Renner, Dominik Renzel, Sebastian Rüsche, Patrick Selders, Leszek Seweryn, Irfan Simsek, Sabrina Steinfels, Bingfeng Wang, Sascha Witte, Onusa Yamcharoen, Edwin Yaqub, Peifang Zhang
Overview

Informatik 5 represents the field of databases and information systems at RWTH Aachen University. A major focus is the formal analysis, prototypical development, and practical application of metadata systems. Specific areas include Internet Information Systems and Knowledge Management, Electronic Learning, Database and Repository Technologies, and Requirements Engineering for Complex Systems.

Informatik 5 cooperates closely with the Fraunhofer Institute for Applied Information Technology (FIT) of which Prof. Jarke is Executive Director. Two FIT area managers, Prof. Wolfgang Prinz and Prof. Thomas Berlage, hold cross appointments as Associate Professors in Informatik 5. Prof. Jarke is also one of the Founding Directors of the Bonn-Aachen International Center for Information Technology (B-IT); within B-IT, a third joint professorship has been established and filled with Prof. Thomas Rose.

In September 2006, the Chair of Information Systems celebrated its 15th Anniversary with an international alumni meeting. Presentations by Dr. Matthias Nicola (IBM San Jose) and Dr. Markus Baumeister (Philips Labs Aachen) were followed by the traditional joint dinner at Vaalsbroek Castle.

Informatik 5 in front of Vaalsbroek Castle to celebrate its 15th Anniversary

Other joint activities with FIT include the European Network of Excellence in Technology-Assisted Learning (PROLEARN). Dr. Ralf Klamma of Informatik 5 chaired the highly successful second PROLEARN Summer School with over 45 doctoral students, held in Bled, Slovenia. Moreover, the group co-organized the second International

Two major efforts characterized much of 2006 in Informatik 5. Firstly, as president of the German Computer Society GI, Prof. Jarke served as scientific coordinator of the Informatikjahr - the Science Year 2006 dedicated to the field of Informatics by the German Ministry of Research. Secondly, Informatik 5 took leading roles in proposals for excellence clusters and graduate schools within the so-called Excellence Initiative of the German government. Prof. Jarke is Area Coordinator “Mobile Applications and Services” in the UMIC Excellence Cluster on Ultra-Highspeed Mobile Information and Communication approved in October 2006, and Coordinator of the BITGRAD Proposal for a Bonn-Aachen International Graduate School for Applied Informatics that has reached the final round for the decision in fall 2007.

33 diploma and master theses were also completed at Informatik 5 in 2006. Carla Valle defended her doctoral dissertation; she is now with the United Nations headquarters in New York. Aida Jertila joined the German Institute of Medical Documentation and Information in Köln. Dr. Ragia followed an offer for a visiting professorship at the University of Toronto and subsequently for a research position at the University of Geneva. Prof. Prinz turned down an offer from the University of Vienna.
Research Projects

Metadata and Cooperative Knowledge Management

M. Jarke, C. Quix, M.A. Chatti, D. Kensche, M. Jeusfeld (Uni Tilburg, NL), R. Linde, A. Gasior, Z. Huma, X. Li, T. Novotny, E. Yaqub

ConceptBase is a multi-user deductive object manager mainly intended for conceptual modelling, metadata management and model management. The system implements the knowledge representation language Telos which amalgamates properties of deductive and object-oriented languages. In 2006, the group worked on the new release 7.0 of ConceptBase which includes several improvements of the user interface, query evaluator, query optimizer, and the active rule engine.

Research in model management focuses on the formal definition of structures and operators for the management of complex data models to support applications dealing with the integration, maintenance, and evolution of data models. The research group defined the generic role-based meta model GeRoMe which simplifies the development of model management applications as operators have to be implemented only once for the generic meta model. Operators for matching and integrating models have been developed and implemented in a holistic framework for generic model management.

Metadata in Community Information Systems


Community information systems are a combination of work practices, information, people, digital media theories organized in a way that they support the goals of the community. Metadata in community information systems stabilize the ongoing change management process in these systems. The research goal of the working group is a better understanding of the creation, use, and maintenance of metadata in the context of community systems. Metadata are based on international standards in different domains like Audio-visual Media, E-Learning, Cultural Heritage, Music Information Retrieval, and Geographical Information Systems. Central for our approach is the reflective conceptual architecture ATLAS which incorporates a set of (self-)monitoring
tools for the community members and the repository/community middleware. Communities can assess their community needs and evolve the community through the development and change of the community information systems. The monitoring tools allow the measurement, analysis and simulation of community aspects with methods from the semantic web, information retrieval & visualization, data/text/media mining, geospatial database querying, social network analysis, transcriptive algorithms etc.

On the database/repository level we use and develop further scalable state-of-art database technologies for the management of mass data and metadata for community systems. On the middleware level we realize scalable community hosting services like single-login, variable and fine-granular access control, mobility support, multimedia management, multimedia annotation, interoperable search and retrieval, matching, data/text/media mining etc. The following projects have been worked on in the year 2006:

**SFB 427: Media and Cultural Communication: Agency in Digital Social Networks by Visualization of Multidimensional Patterns of Disturbance**

In 2006 the field of research primarily was community and social software. Together with the Chair of Urban History (Prof. M. Jansen) we researched on a community driven information system called ACIS to preserve the cultural heritage in Afghanistan. In February, Mr. Muhamad zia Afshar from the National Museum of Afghanistan took a database technology training at our chair within the UNESCO program for the preservation of Afghan Cultural Heritage. In order to understand the impact of media on intercultural learning better, the non-linear multimedia story-telling environment called MIST has been developed. Again, this project was developed in transdisciplinary cooperation together with Prof. Nalin Sharda (Victoria University Melbourne, Australia) and Prof. Jörg Schönert (Forscherguppe Narratologie, University of Hamburg).

Recent research results were presented at international conferences such as I-Know, ICWL, ICALT, and EC-TEL. In parallel, we established an MPEG-7/21 community ([http://www.multimedia-metadata.info](http://www.multimedia-metadata.info)) that brings together leading researchers from across Europe and industry partners (e.g. T-Systems and Siemens). We hosted and co-organized the Workshop on Information Systems for Science, Cultural Heritage Management & e-Government in Afghanistan (WSAF '06) in February in Aachen and the 2nd International Symposium in Media Informatics “Cow Paths: Agency in Social Software” (MI2 ’06) in November in Bonn.

Further interdisciplinary research in the context of SFB 427 is dedicated to the effects of mobile communication technology and the internet on communicative behavior and interpersonal relationships. The research focuses on how wireless technology extends and reconfigures the individual peripersonal space and alters the patterns of personal interactions. In collaboration with linguists, neurolinguists and psychologists from the research project “Semiological agency” (A1) it explores media induced transformations of communication and social interaction order.

**SunSITE Central Europe ([http://sunsite.informatik.rwth-aachen.de](http://sunsite.informatik.rwth-aachen.de))**

Since 1995, Informatik 5 is active in the field of internet-based community support,
both in terms of research on community and web service tools and in terms of providing infrastructures for scientific communities worldwide. For example, Informatik 5 hosted the first website for the city of Aachen in 1995 and, since the same year, manages one of the most successful public-domain internet servers in the German science net, SunSITE Central Europe. Supported by Sun Microsystems with powerful hardware and base software, SunSITE Central Europe focuses on scientific community support, including mirrors of some of the most important research literature indexes, workspaces for internet cooperation, and about 1 TB of open source software. Typically, the SunSITE enjoys around 10 million accesses per month.

**AdMIRE: Advanced Music Information Retrieval Environment**
In this project we investigate the use of metadata technology for the development of intelligent music information retrieval systems. Our goal is the integration of retrieval approaches for different kinds of media (like e.g. text retrieval algorithms for lyrics databases and customized similarity functions for signal processing-based audio features) with a user-friendly interface.
In 2006 we primarily concentrated on the further development of an exploration environment for personal music collections that allows the user to walk through a virtual environment of sounding music where the pieces are placed according to a Self-Organizing-Map that represents their audio-based similarity.

**Mobile Web Service Provisioning**
Intelligent phones as web service provider is the topic of a doctoral thesis in cooperation with Ericsson Eurolabs done in the context of the Graduate College “Software for Mobile Communication Systems”. A number of results concerning aspects of service discovery, mediation, security and testing strategies for mobile web service providers were published.

**UMIC: Ultra High-Speed Mobile Information and Communication**

*M. Jarke, C. Quix, R. Klamma, Y. Cao, D. Kensche, E. Lapi, M.C. Pham, M. Jansen (Sbg), G. Toubekis (Sbg)*

The “Ultra High-Speed Mobile Information and Communication (UMIC)” is a research cluster under the German Excellence Initiative promoted by the German Federal and State Government at German Universities. UMIC is the only Excellence Cluster fully dedicated to the field of information and communication technology approved in the first excellence competition in 2006.

More than 20 institutions at RWTH Aachen participate in UMIC, aiming at interdisciplinary design of ultra high-speed mobile information and communication systems. Concepts and demonstrators for smart, mobile, broadband, low-cost systems will be developed with support the demanding applications of the next-decade mobile Internet.
Building on previous work in SFB 427 and in the GK “Software for Mobile Communication Systems”, Informatik 5 works closely together with many institutes of electrical engineering, mechanical engineering, architecture, and computer science in two subprojects in the research area of “Mobile Application and Services” which is coordinated by Prof. Jarke. This research area focuses on mobile multimedia processing and environmental information processing. Two sub projects have started in 2006.

**Future Mobile Internet Services**

The mobile communication and applications’ impacts in developing countries such as Afghanistan and Somalia will be paid special attention. The related scenarios as well as requirements will be analyzed.

The first scenario of Virtual Campfire as mobile social software has been proposed to bridge media and communities via mobile platforms. In Virtual Campfire cultural heritage information collected from developing countries is to be integrated into a multimedia non-linear digital storytelling system for communities. The concept was successfully demonstrated at the 5th UNESCO / ICOMOS Expert Working Group for the Preservation of the Bamiyan Site in Aachen in December. We also established a Bamiyan Community ([http://www.bamiyan-development.org](http://www.bamiyan-development.org)) that brings together international researchers and governmental and administrative officers who are involved in the conservation work in Bamiyan, Afghanistan. More activities of seminars and events are in plan, e.g. the UMIC will be presented at the CeBIT 2007.

In the UMIC project, a scenario of Virtual Campfire as Future Mobile Internet Services shows an interdisciplinary research field.
Mobile and Wearable P2P Information Management in Health Net Applications

Informatik 5 cooperates with the Institute for Textile Technology (ITA) and the Philips Chair for Medical Information Technology (MEDIT). The aim is to develop a P2P network in which patients, doctors, nursing staff, and emergency services have full access to information and services in their mobile work environment. Data about the health status of a patient is collected by a network of sensors integrated in the textile clothes. The data can be reviewed by doctors to consult the patients online, or by the emergency service to improve the diagnosis in an emergency situation. The task of Informatik 5 is to model the data which is exchanged in this setting; thereby enabling the automatic integration and exchange of the data. For this purpose, techniques developed in the context of model management have to be adapted to multidimensional data and data streams.

PROLEARN: EU Network of Excellence

M. Jarke, R. Klamma, Y. Cao, M.A. Chatti, M. Spaniol, M. Bachwerk, H. Haegert, X. Li, A. Martini, M. Moers, N.F. Muhammad, Z. Petrushyna, O. Yamcharoen, I. Ivanova, D. Senk (IEHK), H.W. Gudenu (IEHK), K. Mavromatis (IEHK), A. Babich (IEHK) and more than 200 other researchers

PROLEARN, started January 1, 2004, is dedicated to join research in the area of professional learning and training focusing on small and medium enterprises (SME). The NoE advances the state of the art in the key areas personalized adaptive learning and interactive media, with learning resources connected to real-world settings and reusable in different contexts. It investigates and advances issues especially relevant for professional training in SME's and larger companies, including brokerage platforms and services, business models for specific markets, and advanced eLearning and knowledge work management arrangements.

Recent research results were presented at international conferences such as I-Know, ICALT, ICWL, and EC-TEL. The concept “Learning as a Service” was successfully demonstrated on IST Conference & Exhibition in Helsinki in November, 2006. The PROLEARN Academy Portal (http://www.prolearn-academy.org/) employs Web 2.0 technologies and serves a large user communities.

As a major event the chair co-organised the PROLEARN summerschool 2006 in Bled, Slovenia, from June 5-9. The summerschool brought together PhD students, teachers, academics and industry people for PhD training, entrepreneurial activities, and network events. More than 45 PhD students have successfully attended the summerschool in 2006.
In the ProLearn project, the concept “Learning as a Service” (LAS) was successfully demonstrated on IST Conference & Exhibition in Helsinki in November, 2006.

**CUELC: EU Tempus Cairo University E-Learning Centre**

M. Jarke, R. Klamma, Y. Cao, M.A. Chatti, A. Jertila, D. Kensche, M. Spaniol, A. Moyano Sánchez, M. Obaid, M. Fayek (Cairo University), K. Maillet (INT Evry)

CUELC aims to bridge the currently existing gap between the advanced, technology enhanced teaching and learning methods in Europe and Egypt. These advanced teaching methods should enhance the Cairo University teaching staff skills, provide better feedback facilities on students’ performance, and afford continuous fruitful monitoring. Moreover, the WBT environment allows interaction between students and makes student-student and student-teacher synchronous and asynchronous communication possible. Offering learning on demand, and life long learning possibilities to everybody is also an advanced goal of the centre. Besides, we plan to use the proposed E-Learning centre with the already existing one in Aachen University of Technology to design an intercultural virtual campus, thus bringing together students from different cultures and giving them the opportunity to exchange their experiences in the area of technology enhanced learning.
ERASMUS MUNDUS European Master in Informatics (EuMI)

M. Jarke, G. Lakemeyer, R. Klamma, P. Selders

In winter term 2004/2005 the first students were enrolled in this pan-European master programme jointly executed with the universities of Trento and Edinburgh. In three different areas of specialisations, Net-Centric Computing, Embedded Systems, and Lifescience Informatics, students are trained at two of the universities to get a double degree in computer science. The programme is accompanied by a scholar programme to bring world class lecturers from different parts of the world to Aachen. First students finalized their studies in 2006, in some cases with excellent master theses with refereed publications resulting from them.

MErKoFer

Identification and Reuse of Experience Knowledge in Rubber Extrusion Processes

M. Jarke, M. Schlüter, M. Raddatz, S. Brandt, T. Namozova, I. Simsek, S. Witte

Building on basic research results achieved in SFB 476, MErKoFer is a collaborative project of Informatik 5 and aiXtrusion GmbH in cooperation with Meteor Gummiwerke K.H. Bädje GmbH & Co. KG. The project is supported by the Bundesministerium für Bildung und Forschung (BMBF). The project has been funded in its initial phase till September 2006, and has been extended until June 2007 to investigate additional aspects of integrated production process analyses.

In continuous production processes the effects of a modification of process parameters on the product can often only be observed after the entire production cycle has been completed. In case of disturbances this causes the waste of ecological and economical resources, if countermeasures do not directly lead back to a stable production within desired specifications.

After determining the most influential process parameters and applying explorative data mining methods to identify interrelations and temporal dependencies, we correlate product flaws and the according process states. By recording the operator’s actions and evaluating their efficiency, we are able to construct an experience knowledge base. When another problem occurs, we can provide decision support for operators by supplying a number of previously taken actions and an evaluation of their respective efficiency to correct anomalies in a similar context. Based on this additional information the chance to compensate interferences in the production process is significantly increased.
The collaborative research center (CRC) SFB 476 IMPROVE was funded from July 1997 until June 2006 by the Deutsche Forschungsgemeinschaft (DFG), and aimed at improving the early design phases in chemical and plastics engineering. During the last phase of the CRC in 2006, the research focused on the aspects of cooperative work and synergetic interleaving. In this context, Informatik 5 conducted research in the context of two subprojects.

In the subproject “experience-based support for cooperative engineering processes” (B1), the research concentrated on the direct, experience-based support of developers during creative design processes. The followed approach was based on the key idea of a-posteriori process integration of tools that offers the potential for integrated method guidance and traceability. Moreover, further research was conducted towards fine-grained cooperative and reuse aspects of the design.

In the subproject “goal-oriented management of information flows in engineering design processes” (C1), a process data warehouse was contributed as an ontology-oriented infrastructure for semantic access to product and process experience data. The research focused on supporting interdisciplinary design processes that involve inter-organizational cooperation between the domains of chemical and plastics engineering.

Inter-organizational networks of people, information and communication systems are often described by the interplay between individual goals and actions and the strategic dependencies among individuals and subgroups. The TROPOS project started in the context of the DFG Focused Research Programme on Socionics, jointly conducted with the KBS group of Prof. Lakemeyer and the network sociology group of Dr. Funken, and has been further expanded in the context of the DFG-funded Graduate School 643 “Software for mobile communication systems”. It aims at improving requirements engineering for such networks by not just representing their goals and dependencies.
statically, but also by studying the dynamic interactions between both (esp. trust) via agent-based simulation through our SNet prototype environment.

This work has been continued in the context of three diploma/master theses in 2006. Hakan Karanfil investigated the role of network rules and proposed modelling means to capture them explicitly in the i* formalism. Another important aspect, distrust-based monitoring, has been addressed by Andreas Kneifel and results in an extension of the modelling as well as an extension of the agents’ planning capabilities. Aristama Roesli has looked at the dynamic evolution of actors in such a network at run-time and proposed means to prescribe their paths of evolution in order to reflect real world behaviour. Further research compared similarities and differences of our approach to other i* related analysis formalisms.

The experiences and results that have been gathered within these activities, especially with the i* modelling framework and the simulation capabilities, are now transferred to a new project, ZAMOMO, located with the Fraunhofer FIT and addressing the integration of model-based software and control engineering in the construction of automotive engines. i*/TROPOS serves here as a common platform for capturing software and control requirements concerning an electronic engine control unit as the application example.

Zentrum für Softwarekonzepte

M. Jarke, A. Becks (Fraunhofer FIT), C. Quix, T. Knieps(Fraunhofer FIT),
A. Schneider(Fraunhofer FIT), W. Wirsam(Fraunhofer FIT), S. Rüsche

The “Zentrum für Softwarekonzepte (ZfS)” is an initiative of Microsoft in cooperation with several academic research institutions in Germany. The goal is to support small- and medium-sized enterprises (SMEs) in Germany by enhancing the knowledge transfer from research institutions to companies. The support is given in form of seminars related to .NET technologies as well as consulting activities for specific problems of a SME. In addition, the ZfS will cooperate with Microsoft Research in researching and developing new and innovative technologies in the area of cooperative information systems, user interfaces, and database technology.

Informatik 5 works closely together with Fraunhofer FIT in this project. The main activities in 2006 included presentations at several events such as CeBIT, “Tag der Innovationen” in Berlin, and “Tag der Informatik” in Aachen. A website with documents on .NET technologies has been created. The website contains also the “Informatiklandkarte” on which the computer science research institutions in Germany and the events of the “Informatikjahr 2006” are geographically displayed. Furthermore, an outline of a seminar about the new features for online collaboration of the new Office system has been defined. In addition, Informatik 5 offered a lab course for the development of web services based on .NET.
Other Activities

Service

Prof. Jarke’s major administrative and service activities in 2006 included:

• Executive Director, Fraunhofer FIT, Birlinghoven
• Deputy Chairman, Fraunhofer Group Information and Communication Technology
• Founding Director, Bonn-Aachen International Center for Information Technology (B-IT)
• Coordinator, BITGRAD Graduate School Proposal
• President, GI German Informatics Society (re-elected for 2006-2007)
• Scientific member, steering council Informatikjahr - Science Year 2006
• DFG elected reviewer for practical computer science
• member, Working Group “Hightech Strategy for the Information Society”, First Nationale IT Summit of Chancellor Merkel, Potsdam
• member, extended management board of FIR e.V. at RWTH Aachen
• Scientific advisory board, Faculty of Informatics, University of Vienna, Austria
• Scientific advisory board, Learning Lab Lower Saxony (L3S), Hannover
• Scientific Advisory board (Chairman-Elect), OFFIS, Oldenburg
• Scientific advisory board, Beta Research School, Eindhoven/Twente, Netherlands
• Scientific advisory board Computer Science, Free University of Bozen, Italy
• Scientific review board, CIS/IM Department, Tilburg University, Netherlands
• Scientific review board, Enterprise Software Initiative Baden-Württemberg
• Supervisory, curatory and scientific advisory board, IBFI, Schloss Dagstuhl
• Jury member, Wissenschaftspreis Stifterverband der Deutschen Wirtschaft
• External Reviewer, Habilitation Thesis Veronique Heiwy, Université Paris V René Descartes

Besides his role as scientific coordinator in the steering committee of Informatikjahr 2006, Prof. Jarke participated in about seventy public events and gave numerous interviews to TV and radio stations as well as almost all the leading newspapers and popular-science journals (iX, c’t, CHIP, Computer Zeitung, etc.) in the country.

Dr. Klamma is a substitute member of the PROLEARN executive board. Dr. Klamma served as advisor of the ERASMUS Mundus master programme European Master in Informatics (EuMI).

Y. Cao is member of DIN NI-32 “Data management and data exchange”.

Editorial Boards

M. Jarke served on the following editorial boards:
• Decision Support Systems
• Requirements Engineering Journal
• Organizational Computing and Electronic Commerce
· Intelligent Information Systems
· Group Decision and Negotiation
· International Journal of IT Standards and Standardization Research

W. Prinz served on editorial boards:
· CSCW Journal, Kluwer
· i-com Zeitschrift für Interaktive Medien, Oldenburg

Conference Organization


W. Prinz served as programme committee member for the following conferences and workshops: M&C 2006 - Mensch und Computer 2006; ICE 2006 - 12th International Conference on Concurrent Engineering; UMICS 2006 - Ubiquitous Mobile Information and Collaboration Systems; CollaborateCom 2006; CWE 07 - Collaborative Working Environments; COOP06 - 7th International Conference on the Design of Cooperative Systems; SemDesk 2006 - Semantic Desktop and Social Semantic Collaboration Workshop; Pragmatic Web 2006; MDM 2006 - The 7th International Conference on Mobile Data Management. He was also reviewer of CHI 2006 and CSCW 2006.

Y. Cao was co-organizer of the Workshop on “Information Systems for Science, Cultural Heritage Management & e-Government in Afghanistan”, Aachen, Germany, February 17, 2006.

R. Klamma was co-chair of the following events: workshop on “Information Systems for Science, Cultural Heritage Management & e-Government in Afghanistan”, Aachen, Germany, February 17, 2006; 2nd International Symposium in Media Informatics: “Cow Paths: Agency in Social Software”, B-IT, Bonn, Germany, November 16-17, 2006; 2nd PROLEARN Summer School 2006, Bled Slovenia, June 5-9, 2006; PROLEARN/ICAMP Workshop on Social Software for Professional Learning at the EDEN’06, Vienna, Austria, June 14, 2006; Future of e-learning track at PTF’06, Stuttgart, Germany, November 15, 2006; Doctoral Consortium of the First European
Conference on Technology Enhanced Learning (EC-TEL 2006), Crete, Greece, October 1-4, 2006. He serves as associate editor on IJASS, IJTEL, and IJHSC and for special issues of JUKM, JIME, IJSG, and IJCHB. He served as programme committee member / reviewer for the following conferences and journals: EC-TEL’06, WBC’06, KVD’06, I-Know MPEG-7 Community Workshop 2006, TenComptence Workshop 2006, MDSGEO’06, PCEL’06, ADALE’06, ICALT’06, CAMA’06, SITIS’06, Informatik’06 Workshop SNSSA, PTF’06, IMSA’07, WEBIST’07, C&T’07, BTW’07, BIT, CACM, IEEE Multimedia, IEEE TKDE, Electronic Markets, Electronic Commerce Journal, i-Com.

E. Linz was co-organizer of the 2nd International Symposium in Media Informatics: “Cow Paths: Agency in Social Software”, B-IT, Bonn, Germany, November 16-17, 2006. She co-chaired the international workshop “Free will and social cognition” hosted by the Kurt-Schumacher-Akademie, Friedrich-Ebert-Stiftung, Bad Münstereifel, Germany, June 12-14, 2006.

C. Quix was member of the programme committee of the International Conference on Artificial Intelligence: Methodology, Systems, Applications (AIMSA), Varna, Bulgaria.

M. Spaniol was co-organizer of the 2nd International Symposium in Media Informatics: “Cow Paths: Agency in Social Software”, B-IT, Bonn, Germany, November 16-17, 2006 and the Workshop on “Information Systems for Science, Cultural Heritage Management & e-Government in Afghanistan”, Aachen, Germany, February 17, 2006. He was member of the programme committee of the JUKM Special Issue of the Multimedia Metadata Community, the 5th International Conference on Web-based Learning (ICWL 2006), Penang, Malaysia, July 19-21, 2006, the I-Know’06 Special Track on “Advanced Semantic Technologies” (AST’06), Graz, Austria, September 6, 2006 and the I-Know’06 “Multimedia Metadata Community Workshop” (MMC’06), Graz, Austria, September 7-8, 2006.

S. Srirama was co-organizer of the First International Workshop on Mobile Services and Personalized Environments (IWMSPE “06), Aachen, November 16-17, 2006.

Software Demonstrations
· LAS Image Tagging, Berlin, Germany, March 2, 2006.
· LAS MPEG-7 Services in Community Engines, Graz, Austria, September 7, 2006.
· Virtual Campfire, IST Conference & Exhibition, Helsinki, Finland, November 21-23, 2006.
Talks and Publications

Talks


T. Berlage: *High Content Image Analysis*, High Content Analysis Europe, Vienna, Nov. 8, 2006

T. Berlage: *High Content Analysis for Systems Biology Research*, University Bonn, Life & Brain, Nov. 11, 2006


Y. Cao: *Spatiotemporal Thematic Maps for Sustainable Development of Heritage Site Tourism*, InterCarto - Inter GIS 12 International Conference on Geoinformation for Sustainable Development, Berlin, Germany, August 28-30, 2006


H. Janßen, D. Denev: *MPEG-7 Services in Community Engines provided by a Lightweight Application Server (LAS)*, 5th Multimedia Metadata Community Workshop, Graz, Austria, September 7, 2006


M. Jarke, P. Federer: Informatikjahr 2006, GI Fellows Meeting, Bonn, March 5, 2006


M. Jarke: Deutschland - Land der Ideen, Award Ceremony for Fraunhofer Center Birlinghoven Castle Open Day, March 17 and May 4, 2006


M. Jarke: Opening Address, Girls Day 2006, Birlinghoven Castle, April 27, 2006


M. Jarke: IT Research Perspectives in Germany, Colloquium “IT: From New Economy to Catalyst of Old Economy” on the Occasion of the retirement of Dennis Tsichritzis, Birlinghoven Castle, May 16, 2006


M. Jarke: Laudatio, Colloquium on the Occasion of the 60th Birthday of Armin B. Cremers, Bonn, June 7, 2006

M. Jarke(chair), R. Laleau, R. Wilton, J. Mylopoulos, A. Sutcliffe, V. Kritis, L. Constantin: The different facets of trust in information systems, Panel Discussion at CAiSE 2006, Luxembourg, June 7, 2006


M. Jarke: FIT - Overview Presentation, Fraunhofer FIT Curatory Board Meeting, Birlinghoven Castle, June 26, 2006

M. Jarke: Bonn-Aachen International Graduate School on Applied Informatics (BIT-GRAD), Proposal presentation in the German Excellence Initiative, Bad Honnef, June 28, 2006


M. Jarke: Informatikjahr 2006 - was, wie, warum?, Keynote Talk, Exhibition Expedition Informatik, Bremen, July 13, 2006

M. Jarke: Informationstechnologien und ihr Einfluss auf die Europäische Informationsgesellschaft, Opening Keynote, Deutsches Schülerparlament at Wissenschaftssommer/ESOF 2006, Bayerischer Landtag, Munich, July 16, 2006


M. Jarke: 15 Jahre Informatik 5, Information Systems Alumni Meeting, RWTH Aachen, September 8, 2006

M. Jarke: Girls Go Informatik, Opening Address, Girls Go Informatik, Mainz, September 9, 2006


M. Jarke: Laudatio Presentation, Retirement Colloquium Dr. Bernd Reuse, DFKI Saarbrücken, September 22, 2006

M. Jarke: JWS = 2**6 + 1 , Laudatio Presentation at Retirement Colloquium Joachim W. Schmidt, TU Hamburg-Harburg, September 27, 2006


M. Jarke: Bericht des Präsidenten, GI Member Assembly, Dresden, October 4, 2006

M. Jarke: Informatik in der Zukunft der Hochschule, GI-Symposium Aus- und Weiterbildung, Dresden, October 5, 2006

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M. Jarke: *Grusswort des GI-Präsidenten*, Symposium 10 Jahre FH Bonn-Rhein-Sieg, October 24, 2006


M. Jarke: *Informatik als Innovationsmotor*, Opening Keynote, Tag der Informatik, University of Passau, November 17, 2006


M. Jarke: *Das Informatikjahr 2006 - Outsourcing und Offshoring in Deutschland*, IBM Outsourcing Conference, IBM Training Center Herrenberg, November 22, 2006

M. Jarke, A.B. Cremers, K.-U. Witt: *Director’s Report Bonn-Aachen International Center for Information Technology (B-IT)*, Scientific Advisory Board Meeting and B-IT Endowment Board Meetings, B-IT Bonn, November 22-23, 2006

M. Jarke: *Das Fraunhofer-Institut für Angewandte Informationstechnik FIT*, Presentation to MIWFT, Birlinghoven Castle, December 5, 2006

M. Jarke: *Informatik im Alltag - Droht die digitale Spalung der Gesellschaft?*, Seniorenstudium, RWTH Aachen, December 6, 2006


M. Jarke et al.: *Working Group Hightech-Strategie für die Informationsgesellschaft*, German IT Summit, Potsdam, December 18, 2006


M. Jarke: *Research at Fraunhofer FIT*, Presentation to Research Subcommittee, City of Bonn, Birlinghoven Castle, December 20, 2006


D. Kensche: *Mobile Web Services for Collaborative Learning*, 4th International Workshop on Wireless, Mobile and Ubiquitous Technologies in Education (WMUTE 2006), November 16-17, Athens, Greece, 2006

R. Klamma: PROLEARN Academy, PROLEARN Annual Review, Hannover, Germany, March 22, 2006


R. Klamma: Community and Organizational Content Creation: Semantic Zapping and Story Telling, PROLEARN Summer School 2006, Bled, Slovenia, June 8, 2006

R. Klamma: Social Software for Professional Training: Research and Development Perspectives, Keynote at PROLEARN/ICAMP Workshop on Social Software for Professional Training, TU Vienna, Vienna, Austria June 14, 2006

R. Klamma: Social Software und Community Informationssysteme, Invited Talk at Vienna University of Economics and Business Administration, Vienna, Austria, June 16, 2006

R. Klamma: Technology Enhanced Learning: Outreach to Industry and Academia, National College of Ireland, Dublin, August 18, 2006

R. Klamma: Virtual Entrepreneurship Lab 2.0: Sharing Entrepreneurial Knowledge by Non-Linear Story-Telling, I-Know 2006, Graz, Austria, September 7, 2006

R. Klamma: PALADIN: A Pattern Based Approach to Cross-Media Analysis in Digital Social Networks, I-Know 2006, Graz, Austria, September 7, 2006


R. Klamma: Pattern-Based Cross Media Social Network Analysis for Technology Enhanced Learning in Europe, EC-TEL’06, Crete, Greece, October 3, 2006

R. Klamma: Community Aware Content Adaptation for Mobile Technology Enhanced Learning, EC-TEL’06, Crete, Greece, October 4, 2006

R. Klamma: Social Software in Professional Training, PROLEARN General Assembly, Crete, Greece, October 5, 2006

R. Klamma: What is happening in the long tail? Reliable technologies for communities, Sixth Internet Next Generation Workshop: Web 2.0, Internet 2.0, online, October 18, 2006


E. Linz: Intentionality, International Workshop “Free will and social cognition” hosted by the Kurt-Schumacher-Akademie, Friedrich-Ebert-Stiftung, Bad Münstereifel, Germany, June 12-14, 2006

E. Linz: Mobilkultur. Das Handy als Cyborg-Technologie, Kolloquium des SFB/FK 427, Cologne, November 14, 2006

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W. Prinz: Social Software - Eine neue Kategorie erobert das Internet, REGINA e.V. Management Treffen, Aachen, May 17, 2006


W. Prinz: Pervasive Games, IuK Summit “Mehr als Entertainment: Mit Technologie spielen”, Berlin, October 6, 2006


W. Prinz: Augmented Reality Anwendungen, Eröffnungsvortrag zur Innovationsausstellung der Bayer Business Services, Köln, November 9, 2006


C. Quix: Model Management using a Generic Metamodel, Invited Talk, Tilburg University, Netherlands, November 7, 2006

M. Raddatz: Identification and Reuse of Experience Knowledge in Continuous Production Processes, 9th IFAC Symposium on Automated Systems Based on Human Skill and Knowledge, Nancy, May 22-24, 2006


D. Schmitz: The TCD/SNet Approach: A Modeling and Simulation Environment for Trust-Based Inter-Organizational Networks, EXYSTENCE Topical Workshop: Trust-Based Networks and Robustness in Organisations, Zurich, Switzerland, March 15, 2006

D. Schmitz: Comparing TCD/SNet with two other formal analysis approaches based on i*: Formal Tropos and Secure Tropos, Workshop on Agent-Oriented Information Systems (AOIS), Luxembourg, June 6, 2006


M. Spaniol: **PALADIN: A Pattern Based Approach to Knowledge Discovery in Digital Social Networks**, Conference I-KNOW ’06, Graz, Austria, September 6, 2006

M. Spaniol: **Community Hypermedia in Collaborative and Self-reflective E-learning Applications**, Conference EC-TEL 2006, Hersonissou, Greece, October 1, 2006


S. Steinfels: **Cross Media Social Network Analysis for Innovation Management**, Informatik 2006 Workshop Social Networks in Social Software Applications, Dresden, Germany, October 6, 2006

**Publications**

**Books and Edited Volumes**


C. Valle: *Decision Follow Up Using Task Management and Semi-Structured Messages*, Dissertation, the Faculty of Mathematics, Informatics and Nature Science at RWTH Aachen University, Germany, 2006

**Journal Articles**


R. Klamma, M. Spaniol, Y. Cao: *MPEG-7 Compliant Community Hosting*, M. Lux, M. Jarke, H. Kosch (Eds.): MPEG and Multimedia Metadata Community Workshop Results 2005, J.UKM Special Issue (Journal of Universal Knowledge Management), Springer, Vol. 1, No. 1, 2006, pp. 36-44

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M. Spaniol, R. Klamma, L. Springer, M. Jarke: Aphasic Communities of Learning on the Web, International Journal of Distance Education Technologies (JDET), Vol. 4, No.1, 2006, R. Lau and F. Li (Eds.): Special Issue: Advances in Web-Based Learning, pp. 31-45


Conference and Book Contributions


M. A. Chatti, S. Srirama, D. Kensche, Y. Cao: Mobile Web Services for Collaborative Learning, in Proceedings of the 4th International Workshop on Wireless, Mobile and Ubiquitous Technologies in Education (WMUTE 2006), November 16-17, Athens, Greece, 2006


D. Schmitz, G. Lakemeyer, M. Jarke: Comparing TCD/SNet with two other formal analysis approaches based on i*: Formal Tropos and Secure Tropos, In Proceedings of the 8th Workshop on Agent-Oriented Information Systems, AOIS @ CAiSE, Luxembourg, June 2006


S. Srirama: Publishing and Discovery of Mobile Web Services in Peer to Peer Networks, Proceedings of First International Workshop on Mobile Services and Personalized Environments (MSPE’06), Aachen, November 16-17, 2006, GI, pp. 99-112

S. Srirama, M. Jarke, W. Prinz: *Mobile Host: A feasibility analysis of mobile Web Service provisioning*, 4th International Workshop on Ubiquitous Mobile Information and Collaboration Systems, UMICS 2006, a CAiSE’06 workshop, June 5-6, 2006


**Other Publications (Selection)**


M. Jarke: *Wir stehen am Anfang einer Innovationswelle (Interview)*, Der Spezialist, June 2006, pp.14-17


M. Jarke: *Informatik bleibt Innovationsmotor Nr. 1*, InnoVisions 4/2006, pp. 73

M. Jarke, R. Klamma, M. Spaniol: *Internet-Kooperation verändert die Kulturwissenschaften*, RWTH Themen, RWTH Aachen, Sommersemester, 2006, pp. 10-11

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Since 2000, each year has been dedicated by the German Federal Ministry of Education and Research (BMBF) to the public presentation and discussion of a particular field of science. In 2006, this so-called Science Year was dedicated to the field of Informatics.

Coordinated by the BMBF, the organization Science in Dialog, and the Gesellschaft für Informatik (GI), more than 430 partners organized about 1,500 events with roughly half a million participants in 150 German cities. Some of the events, such as the 10th RoboCup World Championship held in Bremen in parallel to the human soccer world championship, were also highly publicized in national TV and other media. Incidentally, Germany took the largest number of championship titles in this event, including the world championship in homecare robotics by the AllemaniACs team from RWTH Aachen’s Knowledge-Based Systems Group (Prof. Gerhard Lakemeyer).

The AllemaniACs team at RWTH Aachen’s Knowledge-Based Systems Group (Prof. Gerhard Lakemeyer) took the championship title at the world championship in homecare robotics.
As president of GI, Prof. Matthias Jarke (Information Systems) chaired the scientific steering committee of Informatikjahr 2006 and took active part in over seventy events during the year, including of course the opening ceremony on Jan. 17 in Berlin and the final ceremony on Dec. 18, which was held in conjunction with the first-ever National IT Strategy Summit called by Chancellor Angela Merkel in Potsdam with leaders from politics, business, and science.

Minister of Research Dr. Annette Schavan, Prof. Jarke, GI President, and Prof. Treusch, Director of FZ Jülich and of Science-in-Dialog, at the Informatikjahr Opening Ceremony in Berlin (photograph: C. Winter)

RWTH Aachen was one of the most active participants in Informatikjahr 2006. Many colleagues from the Department of Computer Science and from the Electrical Engineering/Information Technology Faculty contributed to the organization of major activities and events.

In May 2006, Prof. Stefan Kowalewski participated as scientific expert in one of the largest events of the Informatikjahr, explaining together with RTL moderator Köppel the role of software in advanced racing cars to almost 12,000 high school students invited by Informatikjahr 2006 to the Formula 1 Training at Nürburgring.

Later in May, the Computer Science Department hosted the Aachen Regional Event in the series “Zukunft entwickeln” (Develop the Future) organized by GI and Fraunhofer ICT Group in over 20 German cities. The program of this full-day event was organized by the organization team around Profs. Manfred Nagl and Otto Spaniol in three sections:
Prof. Stefan Kowalewski and Mr. Köppel explained to high school students the role of software in advanced racing cars.

The Aachen Regional Event in the series “Zukunft entwickeln” (Develop the Future)

- In the morning, over 500 young pupils attended with great enthusiasm lectures for children explaining the basic ideas of computing and computers.
- During the rest of the day technical demonstrations and popular technical presentations were given, partly directly in the Elisenbrunnen section of the shopping region of the city.
In the evening, a panel discussion with representatives from local industry and science as well as the union representative M. Jaekel from IG Metall discussed the impact of IT on the job market under the coordination of a journalist of the business journal “Handelsblatt”.

The RWTH Aachen Computer Science Department hosted the final round and award ceremony of the 24. Bundeswettbewerb Informatik (BWINF)

In September 2006, the RWTH Aachen Computer Science Department hosted the final round and award ceremony of the 24. Bundeswettbewerb Informatik (BWINF), the national German high school student Informatics competition, where the best 30 of about 800 participants competed for the top prizes which were handed out by GI President Jarke, BMBF Department Head Dr. W.-D. Lukas and Dr. S. Zahedani from the Management Board of sponsor Microsoft Germany.

In October 2006, the VDE/ITG Congress “Innovations in Europe” was held in Aachen, together with the final round and award ceremony of the competition “Invent a Chip” which was part of the Informatikjahr 2006. Awards were handed out by political and business leaders, including European Commissioner Günter Verheugen.

Throughout the year, Prof. Vöcking coordinated one of the most interesting internet-based initiatives of the Informatikjahr, namely the “Algorithm of the Week” initiative of Fakultätentag Informatik in which some of the most important basic algorithms in computer science were presented with attractive application example, in order to excite the interest of young people in the field.

More detailed information about the events and materials of Informatikjahr 2006 is still available from the website [http://www.informatikjahr.de](http://www.informatikjahr.de)
The mission of the Fraunhofer FIT Institute for Applied Information Technology in Birlinghoven Castle and Aachen is to support human-centered computing in the context of organizational processes. Researchers in FIT study lifecycle-wide methods for the design and evolution of adaptive, user-oriented information and cooperation systems in the interplay of human work practice with organizational processes.

Third-party funding of FIT grew by over 25% to 5.8 million Euros in 2006, fostered by very strong growth in European projects as well as solid increases in industry projects and national funding. There was a significant growth in personnel of ca. 20% such that now about 110 permanent employees and 60 students work with FIT.

FIT pursues its mission in three major research areas which are complemented by special business fields and competence centers (see www.fit.fraunhofer.de for details):

- **FIT.CSCW** (leader: Prof. Wolfgang Prinz, PhD) investigates the field of Cooperation Support Systems. In 2006 five EU-funded and two BMBF funded projects were started. ECOSPACE is an integrated project (IP) coordinated by FIT.CSCW. The project goal is the development of a reference architecture, a collaboration middleware and services, as well as new cooperation tools to
enable seamless and instant collaboration among knowledge workers, beyond organisational boundaries. CoSpaces, another IP, focuses on innovative collaborative work environments for individuals and teams in design and engineering. The third IP, C@R investigates collaboration technologies for rural areas. FIT also participates in DemoNet, a network of excellence with the objective to strengthen scientific, technological and social research excellence in eParticipation by integrating the research capacities of individuals and organisations spread across Europe. The vision of the IPCity project (another IP coordinated by FIT.CSCW) is to provide citizens, visitors, as well as professionals involved in city development or the organisation of events with a set of technologies that enable them to collaboratively envision, debate emerging developments, experience past and future views or happenings of their local urban environment, discovering new aspects of their city. The two BMBF funded projects focus in the development of a collaboration and task management platform for distributed development and engineering processes (SAGE) as well as on the development of methods and a toolbox for the development of service oriented applications for collaboration environments (MITSOA).

The following projects were successfully finished: Within the European CONNECT project we have developed and used leading edge information and communication technology to create an advanced learning environment, the virtual science thematic park. An application of CONNECT for facility management has been successfully demonstrated at an innovation exhibition of Bayer Business Services. Broadband for barefoot bankers was an ASIA@ITC project with the aim to bring cutting edge ICTs to underdeveloped markets in China for practical benefit for poor and low-income farmers and strengthening of microfinance operations in rural areas. With the Mobile Outdoor Training Assistant a new mobile application together with a community site was developed that enables users to exchange track and performance data of a jogging or cycling path with other users in a community. Our Pervasive Game Epidemic Menace that was played during a game event in summer demonstrated the vast opportunities of mobile augmented reality technologies for the development of a new generation of computer games.

- **FIT.LIFE** (leader: Prof. Dr. Thomas Berlage) investigates the field of Life Science Informatics, addressing navigational support for micro-surgery, systems environments for large-scale bioinformatics research, and assistive devices for users with special needs.

In the FUSION project on minimally-invasive liver therapy [http://www.somit-fusion.de](http://www.somit-fusion.de), new algorithms for registration of 3D ultrasound with preoperative data were developed and have been evaluated with patient data in cooperation with the University of Düsseldorf.

The development of user-trainable analysis software for cell-based high through-
put experiments that resulted in a first release that has been tested with several customers. This software is also used for supervised cell cultivation in the context of a Fraunhofer cooperation.

Together with Axiogenesis AG (Cologne), a microsystem and software have been developed to conduct cardiotoxicity analysis on purified mouse cell cultures derived from stem cells. The system is able to characterize the effects of toxic substances in detail.

- **FIT.ICON** (leader: Prof. Dr. Reinhard Oppermann) develops context-adaptive and mobile systems for eLearning and mobile work. Jointly with Informatik 5, they are main partners in the ProLearn European Network of Excellence in Professional Technology-Enhanced Learning; other large eLearning projects include the AILB project which develops novel tools to enhance the basic professional competencies for hearing-impaired young workers; the latter is a joint project with the DESIRE research team at RWTH Aachen University led by Prof. Dr. Ludwig Jäger; AILB was successfully demonstrated at CeBIT 2007, e.g., to Minister of Health Ulla Schmidt, and at the Science Summer 2006 in Munich to Federal President Horst Köhler and Research Minister Annette Schavan. Contextualisation in mobile work settings is also the main topic of the MICA project that demonstrates novel mobile user interface solutions in RFID-based warehouse worker scenarios, and was part of SAP’s lead exhibit “Future Factory” at CeBIT 2007 which was demonstrated, among others, to Chancellor Angela Merkel. A number of new European projects were started in 2006, addressing metadata for architectural learning (MACE), self-organizing photo collections (aceMedia), and middleware for mobile, networked device integration (HYDRA).

In the business process and decision support area (Prof. Dr. Thomas Rose), new European projects were started in the field of emergency management and engineering informatics. In cooperation with the group of Prof. Kowalewski at RWTH Aachen University, the new BMBF project ZAMOMO investigates the interplay of model-driven software engineering and model-based controller design for car engines. Moreover, the competence center on micro-economic modeling acquired the largest-ever research contract in the history of FIT, concerning the regular prediction of impacts proposed law changes would have on income taxes in Germany, for the Federal Ministry of Finance.

The FIT working group in Aachen is led by Dr. Andreas Becks and addresses information management aspects in business and engineering processes. Besides several contract research projects on information access and data exploration technologies for industrial customers, a major activity in 2006 was the launch of the “Zentrum für Softwarekonzepte - ZiS Aachen”, an initiative of Microsoft Germany in cooperation with Fraunhofer-FIT. In ZiS Aachen, researchers from FIT and Informatik work together
in transferring research and development knowledge related to .NET technologies to small and medium enterprises, e.g. in seminars on modern software concepts for senior developers, or envisionings on SharePoint technologies for IT decision makers.

Moreover, an international research consortium under participation of FIT Aachen started a new EU-funded research project, “AsIsKnown”, which aims at creating a semantic-based knowledge flow system for the European home textile industry. Bringing in its competence in explorative data analysis systems, FIT leads the development of the Trend Analyser - a software component that helps marketing specialists to detect trend indicators in such heterogeneous data sources like ordering data, click data in online catalogues, or fashion magazines.

FIT participated in the Informatikjahr 2006, e.g., through the co-organization of an Open Day in May 2006 for which the Institute Center Birlinghoven Castle was awarded the “Land der Ideen” label within the program of Federal President Köhler.
The Bonn-Aachen International Center for Information Technology (B-IT) is a pioneering activity of the German Federal government and the state of North-Rhine Westphalia in their effort to establish excellence clusters across universities and research institutes in Germany. B-IT is a joint institute of RWTH Aachen University and Bonn University in cooperation with the Fraunhofer Institute Center Birlinghoven Castle and the FH Bonn-Rhein-Sieg in Sankt Augustin. B-IT aims at the internationalization and acceleration of study programmes in Applied Informatics.

Supported by the B-IT Foundation and supplementary NRW state and federal funds, B-IT offers highly selective English-language master programmes in Media Informatics, Life Science Informatics, and Autonomous Systems. Moreover, B-IT offers summer and winter schools for qualified undergraduate students from Bonn and RWTH Aachen University. The B-IT programmes are distinguished by a deep integration of teaching and research through close cooperation with the participating Fraunhofer institutes of Applied Information Technology (FIT), Intelligent Analysis and Information Systems (IAIS), and Scientific Computing and Algorithms (SCAI).

From RWTH Aachen University, Prof. Dr. Matthias Jarke serves as Founding Director together with Prof. Dr. A.B. Cremers, Bonn, and Prof. Dr. K. Witt, FH Bonn-Rhein-Sieg, whereas Prof. Dr. Otto Spaniol is Study Coordinator of the Media Informatics programme and Dr. Jurgen Rapp serves as study advisor. Main highlights of the year 2006 include:

- the filling of the last of B-IT’s nine endowed professorships.
- the practical implementation of the Erasmus-Mundus programme awarded to the Media Informatics programme together with the Computer Science departments of the Universities of Trento (Italy) and Edinburgh (UK). This 2.5 million EUR programme, called the European Master of Informatics (EuMI), will enable us for the next five years to support top extra-European students with quite generous stipends.
- an extension of B-IT’s international cooperation network by the Japanese Waseda University, and mutual visits with the Chinese province of Jiangsu, a partner province of NRW which cooperates closely with B-IT.
- the hosting of national and international computer science events, including “Informatiktage 2006”, the annual national top student conference of Gesellschaft fr
Informatik, the Junior Academy 2006, and the Second International Conference on Media Informatics.

- participation in Beethovenfest 2006 with an exhibit “Personal Orchestra” presented by Prof. Jan Borchers and his team.

All study programs have now reached full capacity, despite a further strengthened emphasis on selection of highly qualified students. A major effort was dedicated to the preparation of a BITGRAD proposal within the Graduate School section of the German Excellence Initiative, aimed at augmenting B-IT with a doctoral programme. The proposal has reached the final round of decision making for a possible start in November, 2007.