Preface

This is the third in the series of Biennial reports of the Department of Informatics (IFI) at Clausthal University of Technology (TUC), covering the years 2008 and 2009. While the time from 2004 to 2007 was characterized by completely re-building the department and switching to the Bachelor-Master education system, the past two years were dominated by the consolidation and extension of the Bachelor / Master programmes; they were also heavily influenced by the establishment of the Niedersächsische Technische Hochschule (Institute of Technology Niedersachsen, ITN), and by the IT-Ökosysteme collaborative research project, a joint Computer Science research initiative by Clausthal University of Technology, Leibniz Universität Hannover and TU Braunschweig, which started in Spring 2008.

In the reporting period, the number of completed dissertations as well as the research funding of the department increased considerably; at the same time, our headcount grew to almost 70 (not including student members). Publication and scientific committee activity continues at a high level; the department’s heavy involvement in the IT-Ökosysteme project is showing first results and raises the hopes for successful continuation and extension. This success could not have been achieved without the high and persistent efforts of each individual person in our department, in teaching, research, and administration. It is my strong wish to express my appreciation and gratitude to them.

Composing a report like this involves long hours of tedious effort from a number of dedicated individuals. Although all research groups provided us with material for Chapter 3, it still was a lot of work to turn it into a coherent and homogeneous booklet. I would like to thank Barbara Hammer for writing Chapter 2. Our secretaries (Andrea Behfeld, Stefanie Cronjäger, Christine Kammann, Sandra Karpenstein, Annett Panterodt, and Anita Seiz-Uhlig) have put together most data about students (Diploma theses) and staff. Last but not least, Daniel Mohr has done a splendid job in putting all the individual contributions together, mastering the secrets of LaTeX with utter proficiency: Thank you very much indeed.

While we did our best to make sure that all data are sound and correct, we do not claim that this report is flawless. It goes without saying that I am solely responsible for any remaining faults.

As the world keeps on progressing rapidly, for more recent information we refer to our webpage http://www.in.tu-clausthal.de/ which is continually updated.

March 2010

Prof. Dr. Jörg P. Müller
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1 The Department of Informatics

1.1 Overview

Ever since the nineteen sixties, computer science has been changing our society and our daily lives like no other research discipline. The pace of this change is continually increasing, and computer systems are getting more complex and more difficult to understand, to design, and to control. In order to be able to master this complexity and to maintain Germany’s competitiveness in a global race for innovation and market shares, young computer scientists need to be educated with the techniques of professional computer science to understand, analyze, design, and build complex computer-based applications. To make an important contribution to this endeavor is the educational mission of the Department of Informatics at Clausthal University of Technology.

We offer young people high-quality courses in the core disciplines of computer science, such as business information technology, communication, and distributed systems, computer engineering, computer graphics, computer supported collaborative work, database systems, software engineering, theoretical computer science, and computational intelligence. Our research groups are fueled by the overarching research theme Interactive Intelligent Information Systems (3IS), acknowledging the key importance of models, methods, and architectures to understand, build and control next-generation human-centered, adaptive, and intelligent software artifacts; The 3IS research cluster carries out basic and applied research in six strategic areas of computer science with international visibility and reputation. In doing so, we exploit and deepen the synergies with engineering sciences and economics.

This biennial report documents the development of the department over the years 2008 and 2009, a period characterized by three developments: (i) the continuation of the stabilization of the department; (ii) the inception of the Institute of Technology Niedersachsen (ITN), which has had a specific impact on the area of Computer Science; and (iii) the first experiences with the Bologna educational regime after the transition to Bachelor/Master programmes in computer science was made in 2006/2007.
Excellent progress has been made during this period with respect to the department’s organizational development and the national and international visibility of our research. With respect to continuing the stabilization of the department, publication output and international visibility of the department continues to be excellent; funding has more than doubled compared to the previous reporting period, and the number of completed dissertations and habilitations increased from six in 2006/2007 to eleven in this reporting period. Also, with respect to ITN, we have been witness to the successful start of the ITN School of IT-Ökosysteme, a 2.5 mio € research project, in which the computer science departments of TU Braunschweig, LU Hannover and TU Clausthal collaborate on the attractive research area of next-generation large-scale software systems in order to improve our capability to compete with leading national and international research bodies in the quest for research funding.

On the staffing side of things, we are happy to report that Prof. Dr. Sven Hartmann (formerly Auckland University, New Zealand) was appointed Professor of Databases and Information Systems in our department in January 2008. Also, Junior Professor Dr. Kai Hormann was offered full professorships by the internationally renowned universities of KU Leuven, Belgium, and Lugano, Switzerland. In Summer 2009, Kai accepted the offer from Lugano where he is now associate professor in the faculty of informatics. We thank him for his dedicated and fruitful work in Clausthal over the past five years; our best wishes for the future are with him, and he’ll always be a very welcome guest in Clausthal. Kais example shows that the department offers young scientists an inspiring and fruitful work environment in which they can develop their skills and personalities and create research results at an internationally competitive level.

1.1.1 History

Founded in 1982, the Department of Informatics at Clausthal University of Technology is looking back to a twenty-five year tradition in education and research. From 1984 to 2006 the department ran a Diploma programme in computer science. Since the mid-nineties, this was supplemented by a Diploma programme in business information systems (Wirtschaftsinformatik). In 2006, the Diploma programme was replaced by Bachelor/Master programmes in computer science and Wirtschaftsinformatik.
The department went through a challenging period during the late nineties and early two-thousands: It was understaffed and had to serve a large number of students. Finally, a strategic decision was made in 2002/03 by the federal state of Lower Saxony and the executive management of our university to establish computer science as one of the core technological backbones of Clausthal University of Technology. This resulted in plans to increase the academic headcount to the size recommended by the German Association of Computer Science (Gesellschaft für Informatik).

As a consequence of this innovative decision, between 2003 and now, the department has undergone a period of fundamental change, characterized by the retirement of four colleagues, and the successful appointment of eight new professors. At the time of writing this report, two more professorial job openings have been advertised and the appointment process for these is underway.

1.1.2 Current Situation

In this section, we shall report on the most important developments within the department in the areas of research, education, and department organization. Details on the research groups of the department can be found in Section Chapter 3; for details on educational issues, we refer to Section Chapter 2.

Research

After the years 2004–2007 were characterized by an almost complete re-staffing of the department’s faculty, the focus in 2008 and 2009 was on establishing and stabilizing the new structures, and on positioning the department in the new context of the Institute of Technology Niedersachsen (ITN), which was founded in 2008.

Before we provide information about the most important developments related to ITN, we review the scientific performance of the department over the reviewing period.

An important indicator of the successful scientific development at the department are the number and quality of scientific publications as well as memberships of researchers of the department in international programme committees. Figure 1-1 illustrates the development of the scientific publication activities of members of the department between 2006 and 2009, categorized by type of publication (peer-reviewed publications only!). It reflects a lively and high-quality publication activity with an overall increase of the department’s publication rate from 215 in the 2006/2007 reporting period to 239 in 2008/2009. This includes 59 journal publications (compared to 53 in 2006/07).
In the current climate of industrializing universities and focusing resources to "elites", the acquisition of external funds is gaining importance as a key performance indicator for research. Figure 1-2 shows the development of funding income, broken down into two types of funds:

- Funding from national (e.g., BMBF, DFG) and international agencies (e.g., EC) as well as industry funding ("Drittmittel")
- Additional funding acquired from the federal government of Lower Saxony, e.g., for e-Learning activities and innovation projects ("Sondermittel").

The chart shows that the positive development witnessed in the last reporting period is continuing: There is an overall increase in funding by 16% compared to the 2006/2007 period. Funding from non-regional agencies and industry has even increased by 64% in the same period.

Another important indicator of scientific activity and excellence is the number of completed dissertations. Figure 1-3 shows a healthy increase in the number of dissertations compared to the previous period. As the Computer Science Department is still a young department with an average age of professors of 42 years, and most professors have been members of the department for less than five years, the dissertation rate still has potential to grow.
1.1 Overview

The Department of Informatics

Figure 1-2 Funding acquisition of the department (2006–2009).

Figure 1-3 Completed dissertations in the department (2006–2009).
Finally, it should be mentioned that the department has been active in numerous national and international cooperations in education and research, which led and will lead to new scientific results and funding prospects. In the area of scientific education, the collaboration with other universities within Lower Saxony in the ELAN programme has been worth mentioning (see also Chapter 2) as well as our comprehensive involvement in the ERASMUS programme.

In research, we would like to point out three collaboration activities that stand for many others.

- **ITN School für IT Ökosysteme**: In March 2009 we saw the kick-off for this collaboration project between the three ITN universities Clausthal, Braunschweig, and Hannover. With a planned five years horizon and 2.5 Mio € funding for the first two-and-a-half years, this research project unites 18 researchers from three universities to study and develop new approaches to design, management, and controlled evolution of future large-scale software-intensive systems. Prof. Dr. Andreas Rausch from Clausthal University of Technology is the speaker of this project. For more information, see [http://www.it-oekosysteme.org](http://www.it-oekosysteme.org).

- **Centre of Simulation Sciences**: In June 2008, a proposal for a Centre of Simulation Sciences (CSS), which has been in planning stage for a few years, was reviewed positively by the Wissenschaftliche Kommission Niedersachsen. CCS will be carried out jointly with Göttingen University. Five researchers of the Department of Informatics are involved in the successfully reviewed proposal.

- **Exzellenz-Initiative Profil und Kooperation**: After receiving a grant in the “Exzellenz-Initiative Profil und Kooperation” for small and medium-sized universities in 2007, the funded cooperation between the Department of Informatics and the University of Applied Sciences Nordhausen has started in 2008 to be continued until September 2010. The first result driven by our department (represented by Prof. Christian Siemers) is a novel approach towards observability of programmable software/hardware architectures.

**Education**

After the successful preparation and accreditation of the new Bachelor/Master programme in the previous reporting period, educational activities in the past two years were focused on establishing and finetuning the new Bachelor and Master programmes in the areas of computer science and business information technology (see Section 2.2 for details).
In undergraduate education, the B.Sc. Informatik/Wirtschaftsinformatik (computer science / business information systems) offers students a high quality foundation in computer science, mathematics, economy, and engineering. Based on this solid scientific underpinning, students can choose between two general directions:

- Computer Science and Engineering,
- Business Information Technology.

Within each direction, students can individually choose their specialization to prepare for different graduate programmes. This unique combination of computer science, computer engineering, and business information technology in a single programme allows students to choose their study direction only after one year; we are confident that having this possibility as well as the chance to switch between the directions easily in the first phase of studying improves the quality of decisions and reduces the number of students withdrawing early from university.

Two research-oriented Master programmes in computer science and business information systems build on these undergraduate courses. A unique feature of the Master programme Business Information Systems at Clausthal University of Technology is the possibility to specialize in the area of Energy Management. It focuses on IT-based scheduling, configuration, administration, and optimization of processes and systems for raw materials management, energy production, and distribution, addressing economic and technical aspects alike. Benefitting from both the professional and geographical proximity of the Energieforschungszentrum Niedersachsen (Research Centre for Energy of Lower Saxony) which is currently being established nearby in the town of Goslar, this Master Programme provides bright academic and industrial job prospects in a fascinating and essential future research area.

In addition, the department contributes to the interdisciplinary B.Sc. programmes in Applied Mathematics and Technical Economics and to the interdisciplinary Master programmes in Operations Research, Computer Science and Engineering, and Information Engineering (Informationstechnik).

To round out the overview of study programmes, we would like to mention two new Master programmes in preparation that are targeted towards specific user groups: A Master programme Internet Technologies and Information Systems which is held in English language attracts an international audience. This programme is conceived in cooperation with the universities of Braunschweig, Göttingen, and Hannover. Also, a planned Master programme in Embedded Software Engineering specifically targets the area of postgraduate education (Weiterbildung).
In education, a continuing challenge refers to keeping up and increasing the student base of our department, i.e., the number of students beginning their university education in computer science and business information systems. Starting with the introduction of B.Sc./M.Sc. programmes and the concurrent introduction of tuition fees in Lower Saxony, enrollment figures in Computer Science and Business Information Technology have been decreasing from 570 in 2006 to 423 in 2008. At the same time, the number of graduates has increased from 39 in 2006 to 53 in 2008. While the figures roughly reflect the trend for computer science in Germany, the department is taking this development very seriously and we are making every effort including a new Early Study programme (see below) for high school pupils, public information days and other marketing activities, and continuous quality assessment, monitoring, and improvement of our course programmes, to even increase our visibility and attractiveness to students. Increasing subscription rates while keeping up the other key performance indicators will be a key priority for the next two years.

**Department Organization**

The department structure consists of seven research units, reflecting the main research areas: Business Information Technology, Computational Intelligence, Computer Graphics, Computer Systems / Embedded Systems, Databases and Information Systems, and Software Systems Engineering.

In April 2008, the departmental management board was re-elected. Prof. Dr. Jörg P. Müller was elected director of the department, Prof. Dr. Barbara Hammer and Prof. Dr. Gabriel Zachmann are the other members of the management board.

Prof. Dr. Jürgen Dix, who was leading the department from 2005 to 2008, did not stand for re-election since he became Dean of the faculty of mathematics/computer science and engineering. The department thanks Prof. Dix for his dedicated and successful work in the management board.

**1.1.3 Future Directions: 3IS**

In order to position ourselves better in the context of the national and international research competition, our department will focus its research activities in the new research cluster “Interactive Intelligent Information Systems” (3IS). 3IS investigates models, architectures, methods and applications of future internet-based and embedded information systems. Such systems are characterized by the necessity

- to flexibly and robustly communicate across the boundaries of networks, systems, and organizations in order to coordinate their activities;
to continuously adopt their structure, their behaviour, and their control and regulation regimes to changing environmental conditions and new requirements;

- to consider the human as part of the 3IS, and to provide adequate and intuitive mechanisms for interaction, collaboration, and control.

Realizing 3IS requires leading competencies in several areas of computer science. In the ITN development plan of Computer Science, a number of challenging disciplines were identified that provide opportunities for TU Clausthal and the ITN. Figure 1-4 illustrates the main research topics of the 3IS and their interconnection.

Figure 1-4 3IS: Interactive Intelligent Information Systems.

The left side of Figure 1-4 identifies the three eponymous core research areas of 3IS:

**Man-Machine Interaction, Multimedia, and Computer Graphics**

The focus of investigation in this area is cooperation between humans and computers in future internet-based systems. It includes, among others, novel interaction techniques, algorithms for multimodal interactions and ergonomy in the context of future computer-supported systems and processes.

**Artificial Intelligence and Algorithms**

This area deals with the question how computer systems can behave in a situated, goal-directed, effective and flexible way in dynamic environments. This capability is a key prerequisite for further automation of processes, but also of more effective and flexible systems for decision support and user assistance.
Information Systems

Research in information systems studies models, methods, architectures, and tools for representing, processing, exchanging, and managing information in heterogeneous, possibly decentralized Systems. These systems often consist of large numbers of actors and components that may change over time.

Interleaved with the three core disciplines are three other important areas, which lay foundations for the Internet of the Future, from intelligent objects over flexible services to the intelligent adaptive process:

Intelligent Networked and Embedded Objects

Network enabling of smart physical objects has become a European research priority known as “Internet of Things” (IoT). Research topics include scalable communication, information and coordination architecture, integration models, energy efficiency, as well as the usage of IoT technologies in new application areas such as engineering or mining and steel industries.

Global Service Engineering

Intelligent business processes need to be based on a flexible software logistics, which provides software components as adaptive, self-describing services. This software logistics has to support flexible service configuration, adaptation, and integration into scalable software architectures. Verification and validation as well as IT service management are further important aspects in this research area.

Internet-based Business Processes and Systems

Here we research foundations of flexible, intelligent business processes and their automation. We develop models, methods, and tools for representing (modeling), automating, monitoring, and executing business processes, e.g. via multi-agent technologies. A related issue is the process-driven development and adaptation of business application systems.
1.2 Staff

By 31.12.2009, eight professors, one junior professor, and two adjunct professors have been members of the Department of Informatics. In 2008 and 2009, one new professor has been appointed: Prof. Dr. Sven Hartmann (Databases and Information Systems) has joined the department in January 2008. From 2002 to 2007, Sven was Associate / Full Professor at Massey University, New Zealand. In Summer 2009, Prof. Dr. Kai Hormann, who was a member of the department since 2004, accepted an offering for an associate professorship in the faculty of informatics at the University of Lugano. We are very much indebted to Kai for his dedicated and fruitful work in Clausthal over the past five years; our best wishes for the future are with him, and he will always be a very welcome guest in Clausthal. Kais example shows that the department offers young scientists an inspiring and fruitful work environment in which they can develop their skills and personalities and create research results at an internationally competitive level.

During the reporting period, the number of research staff (without professors) grew from 29 to 40, reflecting in particular the increase in research funding. Last but not least, the department also enjoys the dedicated support by three technicians and one trainee, as well as six secretaries. For more detailed and recent information, please visit http://www.in.tu-clausthal.de/personen/.
Professors

- Prof. Dr. Jürgen Dix
  *Theoretical Computer Science and Computational Intelligence*
- Prof. Dr. Barbara Hammer
  *Theoretical Foundations of Computer Science*
- Prof. Dr. Sven Hartmann (since 01/2008)
  *Databases and Information Systems*
- Junior-Prof. Dr. Kai Hormann (until 09/2009)
  *Computer Graphics*
- apl. Prof. Dr. Günter Kemnitz
  *Hardware-Design and Robotics*
- Prof. Dr. Jörg P. Müller
  *Business Information Technologies*
- Junior-Prof. Dr. Niels Pinkwart
  *Collaboration Systems and CSCW (Computer Supported Cooperative Work)*
- Prof. Dr. Andreas Rausch
  *Software Systems Engineering*
- apl. Prof. Dr. Matthias Reuter (CUTEC)
  *Modelling and Simulation*
- Prof. Dr. Harald Richter
  *Technical Informatics and Computer Systems*
- Prof. Dr. Christian Siemers (50%, since 04/2008)
  *Distributed Systems and Communication*
- Prof. Dr. Gabriel Zachmann
  *Computer graphics and Multimedia*

Lecturers

- PD Dr. Helmut Lessing (CUTEC)
  *Computer Science in Environmental Studies*

Former Professors

- Prof. Dr. Klaus Ecker (until 3/2005)
  *Applied Computer Science*
- Prof. Dr. Torsten Grust (2/2005—5/2005)
  *Databases*
- Prof. Dr. Gerhard Joubert (until 9/2003)
  *Practical Computer Science*
- Prof. Dr. Ingbert Kupka (until 3/2004)
  *Theoretical Computer Science*
1.3 Organization

- Prof. Dr. Wilfried Lex (until 9/2004)
  Mathematical Foundations of Computer Science

1.3 Organization

☐ Head of department (Institutsdirektor)
- Prof. Dr. Jörg P. Müller (since 04/2008)
- Prof. Dr. Jürgen Dix (until 03/2008)

☐ Board (Direktorium)
- Prof. Dr. Barbara Hammer, Prof. Dr. Jörg Müller, Prof. Dr. Gabriel Zachmann (since 04/2008)
- Prof. Dr. Jürgen Dix, Prof. Dr. Barbara Hammer, Prof. Dr. Jörg Müller (until 03/2008)

☐ Technical staff (permanent)
- Dipl.-Ing. (FH) Thomas Bravin
- Jörn Körner
- Peter Platzdasch (since 05/2009)
- Björn Drude (until 07/2008)

☐ Technical staff (trainees)
- Peter Platzdasch (until 05/2009)
- Adem-Deniz Yavuz

☐ Secretarial staff (permanent)
- Andrea Behfeld
- Stefanie Cronjäger
- Christine Kammann
- Sandra Karpenstein
- Annett Panterodt
- Anita Seiz-Uhlig

1.3.1 Mentoring Programme

The department provides a mentoring programme for first-year students in computer science that helps to get accustomed to the new environment. Divided into groups of 5 to 10 students, they meet regularly in order to discuss the pitfalls and problems of daily university life.
Each group is coordinated and led by an experienced sophomore student that not only helps by giving practical advice but also takes them on a tour to the local night life and cultural activities. In addition, each group is supervised by one of the professors to help build a familiar atmosphere and to act as a confidant in case of problems.

For more information, see
http://www.in.tu-clausthal.de/studium/mentorenprogramm/

1.3.2 Colloquium Series

The department's colloquium series has been running for six years now; it serves as a communication platform for interchanging ideas between the different fields of computer science and related areas. It is a forum for our graduate and postgraduate students to get into contact with internationally renowned scientists and to initiate short term stays abroad, e.g., within the scope of a Master’s thesis. Therefore, we invite speakers from all over the world to present their recent scientific advances and to discuss possible cooperations on future joint projects. In the reporting period, 40 guest researchers visited our department and presented their work in the colloquium series.

- **Summer 2008**
  - Prof. Dr. Holger Theisel (03.06.2008)
    *Shape Deformations by Constructing and Integrating Vector Fields*
  - Dr. Wolf Ketter (03.06.2008)
    *Flexible Decision Support in a Dynamic Business Network*
  - Dipl.-Ing. Thomas Knothe (10.06.2008)
    *Unternehmensmodellierung in der Praxis*
  - Dr. Dirk Werth (19.06.2008)
    *Betriebliche Informationssysteme - Spagat zwischen Zentralität und Dezentralität*
  - Prof. Dr. Wolfgang Straßer (24.06.2008)
    *Physikalische interaktive Formänderung von Körperrn*
  - Andreas Hess (01.07.2008)
    *Quasar Enterprise - Anwendungslandschaften serviceorientiert gestalten*
  - Prof. Dr. Heribert Vollmer (09.07.2008)
    *The Tractability of Model-Checking for LTL: The Good, the Bad and the Ugly Fragments*
  - Dr. Marco Tarini (14.07.2008)
    *Scientific Visualization of Molecular Structures*
1.3 Organization

- Prof. Marc Alexa (15.07.2008)
  *The mission video out - intuitive creation and modification of shapes*
- Dipl.-Inf. Petra Schneider (19.08.2008)
  *Relevance Matrices in LVQ*

**Winter 2008/2009**

- Prof. Dr. H. Ulrich Hoppe (08.12.2008)
  *Wissensmanagement und Electronic Communities*
- Dr. Berndt Farwer (09.12.2008)
  *Petri Nets and Logics for Mobile Agent Systems*
- Dr. Dirk Labudde (16.12.2008)
  *SMFS Hochdurchsatz-Messungen und die daraus folgenden Anforderungen an die BioInformatik - SMFS High-Throughput Experiments and subsequent Challenges in BioInformatics -*
- Dr. Luis Antunes (04.02.2009)
  *Exploring design landscapes for social simulation*
- Prof. Dr. Mario Botsch (06.02.2009)
  *Polyhedral Finite Elements*
- Prof. Dr. Heribert Vollmer (12.02.2009)
  *The Complexity of Reasoning for Fragments of Default Logic*
- Prof. Dr. Marc Stamminger (02.03.2009)
  *Parallele globale Lichtsimulation*

**Summer 2009**

- Prof. Dr. Arndt Poetzsch-Heffter (31.03.2009)
  *Modeling and Verification of Open Distributed Component Systems - Are we ready for IT Ecosystems?*
- Prof. Dr. Dirk Linowski (20.04.2009)
  *Algorithmische Ansätze zur Optimierung von Entwicklungshilfe- und Real-Estate-Portfolios*
- Prof. Dr. Wolf Zimmermann (28.04.2009)
  *Robuste Komponentensysteme durch Protokollprüfung*
- Dietlind Zühlke (19.05.2009)
  *Neural Computation in der industrienhahen Anwendung der Life Science Informatik*
- Associate Prof. Son Tran (16.06.2009)
  *Negotiation Using Logic Programming with Consistency Restoring Rules*
- Thomas Knothe (16.06.2009)
  *Unternehmensmodellierung in der Praxis*
• Silke Lehmann (30.06.2009)  
  **Business Modeling - Analyzing, Modeling and Optimizing our Clients business processes**

• Prof. Dr. Michael S. Floater (02.07.2009)  
  **Barycentric coordinates and interpolation**

• Prof. Dr. Sebastian Link (08.07.2009)  
  **Schlüssel und Funktionale Abhängigkeiten unter Multimengensemantik**

• Prof. Dr. Uwe Leck (09.07.2009)  
  **Restoration of Information in Distributed Databases**

• Prof. Dr. Wojciech Penczek (09.07.2009)  
  **Bounded Parametric Model Checking for Elementary Net Systems**

• Dr. Michael Kipp (11.08.2009)  
  **Natürliche Interaktion mit virtuellen Menschen: Probabilistische Modellierung und Synthese individueller Verhaltensmuster**

• Dr. Enrico Rukzio (11.08.2009)  
  **Mobile Interaction with Pervasive User Interfaces**

• PD Dr. Thomas Mandl (11.08.2009)  
  **Automatisierung und Prozessintegration bei der Evaluierung und Verbesserung der Nutzerfreundlichkeit von Anwendungssoftware**

• Jun.-Prof. Dr. Volkmar Pipek (11.08.2009)  
  **Benutzergetriebene Innovation in Unternehmensinfrastrukturen**

• Jun.-Prof. Dr. Niels Pinkwart (12.08.2009)  
  **IT-Unterstützung bei der Ausbildung von Argumentationsfähigkeiten - Informatische Konzepte und empirische Ergebnisse**

• Jun.-Prof. Dr. Monique Janneck (12.08.2009)  
  **What the customer really needed...**

• Martin Tröschel (18.08.2009)  
  **Aktive Einsatzplanung in holonischen Virtuellen Kraftwerken**

• Sascha Lange (28.09.2009)  
  **Tiefes Reinforcement Lernen auf Basis visueller Wahrnehmungen**

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**Winter 2009/2010**

• Dr. Wojtek Jamroga (30.10.2009)  
  **Description Logic Meets Coalition Logic - On Concepts, Agents, and Strategies**

• M.Sc. Collin Lynch (15.12.2009)  
  **Educational Datamining in Ill-Defined Domains: The case of argument diagrams**
1.3 Organization

- Prof. Dr. Cees Witteveen (29.01.2010)
  *Decomposition of constraint systems: Equivalences and computational properties*

- Dr.-Ing. Johannes Behr (03.02.2010)
  *DOM — A DOM-based HTML5/X3D Integration Model*

For more information, see [http://www.in.tu-clausthal.de/studium/informatik-kolloquium/](http://www.in.tu-clausthal.de/studium/informatik-kolloquium/).

1.3.3 Graduate and Postgraduate Seminar

In the Graduate and Postgraduate Seminar, our graduate and postgraduate students report on their recent scientific achievements. In the reporting period, we have had the following 57 talks:

- **Summer 2008**
  - Randolf Schärfig (06.05.08)
    *Berechnung von indirekter Beleuchtung innerhalb virtueller Szenen in Echtzeit*, supervised by Prof. Dr. Hormann.
  - Nils Bulling (06.05.08)
    *Modelling Coalitions: ATL + Argumentation (joint work with C. Chesnevar and J. Dix)*, supervised by Prof. Dr. Dix.
  - Martin M. Vogel (20.05.2008)
    *Sicherheitskonzept 3P — Methodische Analyse und Konzeption der Daten- und Anwendungssicherheit für das zentrale Berichterstattungstool 3P der Produktionsplanung Mercedes-Benz PKW, Daimler AG*, supervised by Prof. Dr. Rausch.
  - Yang Li (20.05.2008)
    *Toolprofiling für Software-Entwicklungswerkzeuge zur Identifikation von Performance-Defiziten*, supervised by Prof. Dr. Rausch.
  - Fabian Stäber (27.05.2008)
    *Service Layer Components for Decentralized Applications*, supervised by Prof. Dr. Müller.
  - Hong Lu-Schwerdtfeger (28.05.2008)
    *Prozessanalyse der China Sourcing und Entwicklung eines datenbankgestützten Anwendungssystems*, supervised by Prof. Dr. Pinkwart.
  - Tim Schumann (08.07.2008)
    *A Model Repository for Collaborative Modeling with the Jazz Development Platform*, supervised by Prof. Dr. Rausch.
• Helge Fahlbusch (21.08.2008)
  Konzeption eines Dokumentenservices im Rahmen eines Centers für Informationslogistik, supervised by Prof. Dr. Müller.

• Frank Loll (26.08.2008)
  Konzeption und Evaluierung von kollaborativen Filteralgorithmen im eLearning, supervised by Prof. Dr. Pinkwart.

• Jan-Frederik Tadge (15.09.2008)
  Konzeption einer internationalen Alumniarbeit an der, supervised by Prof. Dr. Müller.

• Dikton Haxhijaj (29.09.2008)
  Anforderungen an Roadmapping-Systeme im Innovationsmanagement, supervised by Prof. Dr. Pinkwart.

• Björn Kempf (30.09.2008)
  Test und Verlässlichkeit von Rechnern, supervised by Prof. Dr. Müller.

☐ Winter 2008/2009

• Eraste Waffo Wambou (08.10.2008)
  Identifikation und Optimierung von Komponentenstrukturen in UML-Modellen, supervised by Prof. Dr. Rausch.

• Klaas Schötten (16.10.2008)
  Refaktorierung einer heterogenen Anwendungslandschaft eines Mittelstandsunternehmens durch Einführung einer SOA, supervised by Prof. Dr. Pinkwart.

• Tobias Kuipers (06.11.2008)
  Design und Implementierung eines Tools zur tabellengestützten Bestimmung von Worst-Case Execution Times bei Mikrocontrollern, supervised by Prof. Dr. Siemers.

• Jens Drieseberg (24.11.2008)
  Keyframe animations based on mean value interpolation, supervised by Prof. Dr. Hormann.

• Thomas Ueberschaar (02.12.2008)
  Design einer Projektdatenbank und Konzeption eines Planungsprogramms im Gasleitungsbau, supervised by Prof. Dr. Pinkwart.

• Tim Winkler (02.12.2008)
  Thinning Mesh Animations, supervised by Prof. Dr. Hormann.

• Thomas Wehrspann (10.12.2008)
  Konzeption und Implementierung einer automatisierten Testumgebung, supervised by Prof. Dr. Rausch.
1.3 Organization

- Ying Bai (16.12.2008)
  *Design, Implementierung und Einsatzkonzeption einer Datenbank für das Qualitätsmanagement*, supervised by Prof. Dr. Hartmann.

- Ingmar Kossak (06.01.2009)
  *Transferability of Standard ERP Systems within International Companies*, supervised by Prof. Dr. Müller.

- Thomas Ternité (13.01.2009)
  *An Architectural Pattern for Software Process Lines*, supervised by Prof. Dr. Rausch.

- Juan C. A. Guadarrama (20.01.2009)
  *Updates of Knowledge Bases*, supervised by Prof. Dr. Dix.

- Daniel Mohr (20.01.2009)
  *Continuous Edge Gradient-Based Template Matching for Articulated Objects*, supervised by Prof. Dr. Zachmann.

- Sebastian Herold (12.02.2009)
  *Architekturmodelle und Design Contraints für die modellbasierte Entwicklung von Softwaresystemen*, supervised by Prof. Dr. Rausch.

- Udo Bartlang (10.03.2009)
  *Architecture and Methods for Flexible Content Management in Peer-to-Peer Systems*, supervised by Prof. Dr. Müller.

- Stefan Strauch (24.03.2009)
  *Bereitstellung eines Testsystems für Steuergeräte in den Domänen Chassism- und Energiemanagement - Konzeption und Umsetzung*, supervised by Prof. Dr. Pinkwart.

- Tobias Ronsdorf (25.03.2009)
  *Entwicklung einer plattformunabhängigen Ebene in einer dezentralen kollaborativen Produktentwicklungsumgebung*, supervised by Prof. Dr. Müller.

- Wang Wei (31.03.2009)
  *Entwicklung eines webbasierten Planungs- und Controllingkonzepts für eine betriebliche Anwendung*, supervised by Prof. Dr. Pinkwart.

- Hui Li (31.03.2009)
  *Entwicklung eines webbasierten Rechnungsmoduls mit Ruby on Rails unter Berücksichtigung der XBRL*, supervised by Prof. Dr. Pinkwart.

- Viet Long Pham (09.04.2009)
  *Der Software-Entwicklungsprozess am Beispiel eines offenen Deutsch/Vietnamischen Online-Sprachportals - Analyse, Entwurf, Implementierung und Betrachtung des Verhaltens der Benutzer*, supervised by Prof. Dr. Müller.

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**Summer 2009**

- Wang Wei (31.03.2009)
  *Entwicklung eines webbasierten Planungs- und Controllingkonzepts für eine betriebliche Anwendung*, supervised by Prof. Dr. Pinkwart.

- Hui Li (31.03.2009)
  *Entwicklung eines webbasierten Rechnungsmoduls mit Ruby on Rails unter Berücksichtigung der XBRL*, supervised by Prof. Dr. Pinkwart.

- Viet Long Pham (09.04.2009)
  *Der Software-Entwicklungsprozess am Beispiel eines offenen Deutsch/Vietnamischen Online-Sprachportals - Analyse, Entwurf, Implementierung und Betrachtung des Verhaltens der Benutzer*, supervised by Prof. Dr. Müller.
Abasin Gardiwal (14.04.2009)

Yan Li (14.04.2009)
Modellgetriebene Softwareentwicklung für Supply Chain Management Anwendungen, supervised by Prof. Dr. Müller.

Zhe Wang (28.04.2009)
Kostenbewertung und Simulation von Strategien der vorbeugenden Instandhaltung, supervised by Prof. Dr. Müller.

Philipp Stockhammer (20.05.2009)
Analyse und Optimierung der Umsetzung strategischer Erfolgspotentiale in Industrieforschungsprojekten und deren Management - anhand einer Fallstudie aus der Automobilindustrie, supervised by Prof. Dr. Müller.

Thorben Sparkuhle (26.05.2009)
Entwicklung mobiler IT-Lösungen für die Instandhaltung von Kraftwerken am Beispiel der RWE Power AG, supervised by Prof. Dr. Pinkwart.

Fei Wang (02.06.2009)
Implementierung des im Stoffmodell Hou/Lux eingebetteten Verheilungsansatzes in den kommerziellen FDM-Code FLAC3D, supervised by Prof. Dr. Rausch.

Katherina Ebel (11.06.2009)
Konzeption eines architekturunabhängigen Modells für die dezentrale kollaborative Produktentwicklung, supervised by Prof. Dr. Müller.

Olga Jaufmann (15.06.2009)
Emergent Process Design in Software Engineering, supervised by Prof. Dr. Rausch.

Ronny Bönisch (16.06.2009)
Rationale, templatebasierte PHP-Webentwicklung mittels RAD-IDE am Beispiel eines Individual Tourportals, supervised by Prof. Dr. Pinkwart.

Nico Bachmann (18.06.2009)
Eine serviceorientierte Architektur für eine dezentral organisierte Produktentwicklungsplattform, supervised by Prof. Dr. Müller.

Patrick Dohrmann (23.06.2009)
Konzeption und Realisierung eines logikbasierten Anfragewerkzeugs für UML-Modelle, supervised by Prof. Dr. Rausch.

Sven Strickroth (30.06.2009)
Unterstützungsverfahren für Tutoren bei der Online-Abgabe von Übungsaufgaben, supervised by Prof. Dr. Pinkwart.
1.3 Organization

- Christopher Mumme (30.06.2009)
  *Verkaufsagenten in Multiversen*, supervised by Prof. Dr. Pinkwart.

- Yue Shi (02.07.2009)
  *Auswirkungen von Schwankung der Kundenabrufe auf eine internationale Lieferkette am Beispiel Blaupunkt GmbH und Erarbeitung von Handlungsempfehlungen zur Optimierung der Lieferkette*, supervised by Prof. Dr. Müller.

- Stefan Wittek (28.07.2009)
  *Entwurf eines Code-Transformators für eine Komponenten-Ausführungs-umgebung*, supervised by Prof. Dr. Rausch.

- René Weller (30.07.2009)
  *A Unified Approach for Physically-Based Simulations and Haptic Rendering*, supervised by Prof. Dr. Zachmann.

- Michael Marten (10.08.2009)
  *Intra-Universitäre Kommunikationsprozesse und deren Unterstützungsmöglichkeiten am Beispiel der*, supervised by Prof. Dr. Pinkwart.

- Rainer Drees (19.08.2009)
  *Entwurf eines Konzepts zur Kontext-basierten Verschaltung von Komponenten in dynamisch-adaptiven Systemen*, supervised by Prof. Dr. Rausch and Prof. Dr. Müller.

- Marcel Ibe (26.08.2009)
  *Entwurf und prototypische Realisierung einer Konsistenzmanagementkomponente für die kollaborative Modellentwicklung*, supervised by Prof. Dr. Rausch.

- Stephan Wilde (14.09.2009)
  *Integration von XML-basierten Modellen in die Kollaborationsplattform Jazz zur verteilten nebenläufigen Entwicklung und Wartung*, supervised by Prof. Dr. Rausch.

- Joachim Schramm (23.09.2009)
  *Einigungsmechanismen als Metapher für Gleichgewichtszustände in IT-Ökosystemen*, supervised by Prof. Dr. Müller.

**Winter 2009/2010**

- Aycan Ceylan (20.10.2009)
  *Nonverbale Kommunikation in virtuellen 3D-Kooperationssystemen*, supervised by Prof. Dr. Pinkwart.

- Dietmar Sommerfeld (17.11.2009)
  *A Two-Tier Approach to Workflow Scheduling in MediGRID*, supervised by Prof. Dr. Richter.
• Janko Heilgeist (17.11.2009)  
  *Decision Making in a Distributed Metascheduler*, supervised by Prof. Dr. Richter.

• Mirco Schindler (10.12.2009)  
  *Anwendung von Spectral Clustering zur Identifikation und Optimierung von Komponentenstrukturen*, supervised by Prof. Dr. Rausch.

• Benjamin Warntjen (05.01.2010)  
  *Verarbeitung von Unigraphics NX 6.0 - Produktgeometrien für eine verteilte Produktentwicklung*, supervised by Prof. Dr. Müller.

For more information, see [http://www.in.tu-clausthal.de/studium/diplomanden-und-doktorandenseminar/](http://www.in.tu-clausthal.de/studium/diplomanden-und-doktorandenseminar/).

### 1.3.4 Technical Report Series

The department’s Technical Report Series (ISSN: 1860-8477) was started in 2005 and publishes recent scientific results, either as preliminary version of articles under submission or in print, or as extended versions of workshop proceedings papers. The papers are expected to be written in English and undergo an internal review process. The review board consists of the current and the retired professors of the department. The Editor-in-Chief of the series is Prof. Dr. J. Dix.

For more information, see [http://www.in.tu-clausthal.de/forschung/technical-reports/](http://www.in.tu-clausthal.de/forschung/technical-reports/).

Technical reports in 2008/2009:


- **[IfI-08-04]** K. Hormann. Efficient evaluation of interpolating cubic polynomials. Technical Report IfI-08-04, Department of Informatics, Clausthal University of Technology, August 2008.


1.4 Other Events and Activities

1.4.1 Informatiktage 2009

In June 2009, the department organized the Informatiktage 2009, comprising three events:

- The department’s yearly alumni meeting
- The department’s information days for high school students
- An open day directed towards the public.

The many visitors of this event participated in several activities related to the department’s ongoing research activities, among them:

- taking a dive in our full size virtual aquarium,
- playing football with real humanoid robots,
1.4 Other Events and Activities

☐ buying a DVD in our Second Live store with an intelligent 3D avatar salesperson
☐ interacting with our robots.

Figure 1-5 Impressions of Informatiktage 2009.

Besides these serious research presentations and demonstrations, we also organized an interactive game contest, a LAN party, and further entertained the visitors with live music, food, and drinks.

1.4.2 Junior Professorship Evaluation

In Autumn 2009, we were able to celebrate the successful mid-term evaluation of our colleague, Prof. Dr. Niels Pinkwart. After three years of a successful career both as a scientist and a university lecturer, Niels came out with excellent evaluation results in all respects: This was explicitly mentioned in his overall evaluation report.
He is also engaged in several management tasks of the Department and very popular among students and colleagues alike. In particular, he is responsible for setting up and running the department’s new and successful early study programme, which provides high school students with the opportunity to get to know daily life at university and, at the same time, while still at school, complete university courses and collect credit points for a later academic programme (for more details, see Section Chapter 2).

In January 2010, his contract was renewed for another three years, and we are all looking forward to our continued collaboration.

![Figure 1-6 The President of Clausthal University of Technology, Prof. Dr. Thomas Hanschke (right), congratulating Prof. Dr. Niels Pinkwart.](image)

**1.4.3 Early Study Program**

Since fall 2008, the Department of Informatics offers an *Early Study* program to students who are about to graduate from school and want to test whether studying Computer Science or Business Information Systems in Clausthal is an option for them. The program comprises up to four classes (Introduction to Programming, Programming, Computer Science 1 and Computer Science 2) in total.

In the winter term 2008/2009, ten students from Ratsgymnasium Goslar took part in the program with four of them completing the course and three passing the exam. The latter three candidates also continued their studies with a course on “programming” in the summer of 2009. In the winter term 2009/2010, twelve students from four schools enrolled - and ten of them completed the course successfully. Many of them are planning to continue in the summer of 2010.
Now that the first two iterations are completed, the Early Study program showed positive and encouraging results. The feedback from the students is very positive (both towards Computer Science and towards Clausthal University), and also the professors appreciate the engagement and performance of the students - many of them are among the top of the classes! So - many reasons to continue with this program . . .

Figure 1-7 Prof. Andreas Rausch (left), OStDir. Ernst Steinecke, and Prof. Niels Pinkwart hand over certificates to the first graduates from the Early Study Program.

1.5 Guests at our Department


- 24 January – 28 January 2008:
  Guillermo Simari, Universidad Nacional del Sur, Bahia Blanca, Argentina. Guest of the computational intelligence Group

- 3 February – 5 February 2008:
  Koen Hindriks, Delft University of Technology, The Netherlands. Guest of the computational intelligence Group

- 26 February – 1 March 2008:
  Martin Balaz, Comenius University, Bratislava. Guest of the computational intelligence Group
20 March – 23 March 2008:
Martin Moguillansky, Universidad Nacional del Sur, Bahia Blanca, Argentina. Guest of the computational intelligence Group

03 June – 03 June 2008:
Dr. Wolf Ketter, University of Rotterdam, The Netherlands. Guest of the business information systems Group.

10 June 2008 and 16 June 2009:
Thomas Knothe, Fraunhofer IPK, Germany. Guest of the business information systems Group.

19 June 2008 – 19 June 2008:
Dr. Dirk Werth, DFKI GmbH, Germany. Guest of the business information systems Group.

9 July 2008:
Heribert Vollmer, University of Hannover. Guest of the computational intelligence Group

31 August – 31 August 2008:
Dr. Michal Skubacz, Siemens AG Cororate Technology. Guest of the business information systems Group.

01 October 2007 – 30 September 2008 MSc. BSc. Ghulam Mustafa Khan, Information Technology Centre, Sindh Agriculture University, Tando Jam Pakistan. Guest of computer systems group.

8 December 2008:
Prof. Dr. H. Ulrich Hoppe, University of Duisburg-Essen. Guest of the business information systems Group.

8 December – 11 December 2008:
Berndt Farwer, Durham University, United Kingdom. Guest of the computational intelligence Group

8 July – 11 July 2009:
Wojciech Penczek, Institute of Computer Science, PAS, Warsaw, Poland. Guest of the computational intelligence Group

16 June 2009:
Tran Cao Son, New Mexico State University, Las Cruces, New Mexico. Guest of the computational intelligence Group

12. February 2009:
Heribert Vollmer, University of Hannover. Guest of the computational intelligence Group

6 February – 11 February 2009:
Luis Antunes, Lisbon University, Portugal. Guest of the computational intelligence Group
1.5 Guests at our Department

☐ 09 June – 18 June 2009:
Dr. Boyka Gradinarove, University of Varna, Bulgaria. Guest of the business information systems Group.

☐ 21 September – 25 September:
Thomas Villmann, University of Applied Sciences Mittweida. Guest of the computational intelligence Group.


☐ 28 September 2009:
Sascha Lange, University of Freiburg. Guest of the computational intelligence Group.

☐ 30 November – 4 December 2009:
Berndt Farwer, Durham University, United Kingdom. Guest of the computational intelligence Group.
2 Academic Programmes

2.1 Overview

Choosing to study at the Department of Informatics at Clausthal University of Technology means choosing to study off the beaten tracks offered by most of the major German universities. Overcrowded lecture halls and anonymous mass education are unknown to our students who benefit from an optimal 31:1 student/professor-ratio.

With more than 16% female students we have a remarkably high gender ratio in computer science compared to overall Germany. In addition the department has an international flair due to the large percentage of foreign students (48%) and due to the worldwide collaborations in terms of student exchange programmes (35 partner universities in Europe) and ongoing research activities. Our students further enjoy the beautiful landscape of the Harz mountains as a perfect setting for recreational and sports activities, or simply to counterbalance their intensive studies. All these aspects make Clausthal in general and the Department of Informatics in particular a distinguished place.

The Department of Informatics currently has about 400 students (more than 11% of the total number of students in Clausthal) inscribed in two Bachelor, two Master, and three Diploma programmes. Following the Bologna-process, the Bachelor programme has already replaced the Diploma programmes on the undergraduate level, and we have established two Master programmes that will eventually replace the Diploma programmes on the graduate level. In addition, the Department significantly contributes to other programmes, especially in the mathematical and engineering sciences, by offering introductory and programming courses on the Bachelor level as well as advanced courses on the Master level. Further, the institute plans to establish a Master program ‘Embedded Software Engineering’ for employees of IT companies in the frame of continued education. This will take place in cooperation with the University of Applied Sciences Nordhausen and it is funded by the Stifterverband für die Deutsche Wissenschaft and the Heinz Nixdorf Stiftung in the frame of an excellence initiative for small and medium sized universities.

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1 Here we also count the students inscribed in the Diploma Programme Informationstechnik and B.Sc. Programme Technische Informatik/Informationstechnik, which are joint programmes run by our department as well as the engineering department: Both belong to the same faculty and in official statistics, the number of students is divided and counted for both departments.
2.2 Study Programmes

2.2.1 B.Sc. Programme

From the beginning of the winter semester 2006/2007 on, our Bachelor programme B.Sc. Computer Science/Business Information Systems has replaced the existing Diploma programmes on the undergraduate level. With currently 93 students and the first B.Sc. students having successfully completed their studies, the Bachelor programme offers attractive courses for students who intend to work in the industry as well as those who continue their studies on a graduate or postgraduate level. The fact that almost half of the students are foreigners proves that the programme is internationally attractive. A further benefit is offered by the flexibility to start in either the winter or the summer semester.

In accordance with the European-wide Bologna process for harmonization of university education systems, this programme leads to the B.Sc. vocational qualification after a standard period of six semesters of study. Upon completion, it can be followed on by one of our two Master programmes, which require a further four semesters of study.

During the Bachelor programme the students are familiarized with the fundamentals of computer science, mathematics, and one chosen subject of application or main focus, for which there are three options:

- Computer Science,
- Business Information Systems,
- Computer Engineering.

The programme has a modular course structure. The first year of study consists of compulsory courses which provide the student with the necessary fundamental knowledge. In the second and third year, studies consist of different compulsory courses, depending on the chosen main focuses which communicate further fundamental knowledge and a specialization in specific areas is reached by an individual combination of elective courses. The programme is completed by writing a Bachelor's thesis.

A detailed list of compulsory and elective courses as well as other information can be found at [http://www.in.tu-clausthal.de/studium/studiengaenge/bsc-informatik](http://www.in.tu-clausthal.de/studium/studiengaenge/bsc-informatik) and [http://www.in.tu-clausthal.de/studium/studiengaenge/bsc-wirtschaftsinformatik](http://www.in.tu-clausthal.de/studium/studiengaenge/bsc-wirtschaftsinformatik).

2.2.2 M.Sc. Programmes

From the beginning of the winter semester 2007/08 on, two Master programmes in Computer Science and Business Information Systems are offered by the Department of Informatics.
The Master programmes require 4 semesters of study and build on our Bachelor programme in Computer Science/Business Information Systems. The M.Sc. is organized in modular form, enabling the students to choose a main focus that communicates an advanced and specialized knowledge in one of the following fields:

- Human-Centered Computing,
- Parallel and Networked Computation,
- Computer Engineering,
- Business Information Systems,
- Energy Management.

As well as participating in lectures, the students are guided towards producing scientific work within seminars and lab sessions. In the final stage of the programme the students are required to write a research oriented Master’s thesis.


### 2.2.3 Diploma Programmes

With currently almost 200 students students in our Diploma programmes Computer Science and Business Information Systems, they still constitute a major teaching focus of the Department.

The aim of both programmes is to educate young academics with a broad knowledge in computer science, a thorough mathematical background, and optionally with a solid background in economics. They shall not only learn the necessary tools (i.e., programming languages) for developing algorithmic solutions, but moreover have the ability to analyse problems in a structured way and to apply the solutions. Equipped with these abilities they are fit for the market with a wide range of job opportunities.

The first two years of this programme are characterized by a thorough introduction to the foundations of computer science as well as the essential background in mathematics. Next to the standard beginner’s courses the students attend courses that familiarize them with the most common programming languages (C/C++, Java, Prolog, assembler) as well as a lab course on electrical circuits. A seminar course and lectures in a self-chosen minor subject are also obligatory.
Starting with the third year, the students are then offered advanced courses on specialized subjects in attractive fields of computer science as well as modern information and communication technologies. Besides these lecture courses, we organize interesting seminars, project groups, and lab courses, and offer a wide selection of Diploma theses for the students to choose from. The programme is usually completed after four to five years. For students of the Diploma programme *Business Information Systems*, some of the courses are replaced by special lectures on business information systems and economics.

More information can be found at
http://www.in.tu-clausthal.de/studium/studiengaenge/informatik/
and
http://www.in.tu-clausthal.de/studium/studiengaenge/wirtschaftsinformatik/.

### 2.2.4 Ph.D. Programme

We currently have more than 40 young academics inscribed as Ph.D. students. Under the supervision of one of the department's professors, they perform innovative research and present their results at international conferences. In addition, they assist the teaching staff by organizing exercise courses and seminars and co-supervising study and Diploma theses.

The Ph.D. studies usually last three to five years and are completed by submitting and defending a dissertation. Within the last two years we had the pleasure to graduate ten students (cf. Section 4.7 on page 215):

- Dr. D. Jantz: *Eine Prozessorerweiterung im Hardware-Software-Interface zur Überwachung von Datenzugriffen.*
- Dr. F. Ponchio: *Multiresolution Structures for Interactive Visualization of Very Large 3D Datasets.*
- Dr. F. Stäber: *Service Layer Components for Decentralized Applications.*
- Dr. U. Bartlang: *Architecture and Methods for Flexible Content Management in Peer-to-Peer Systems.*
- Dr. J. C. Guadarrama: *On Updates of Epistemic States*
- Dr. A. Hasenfuss: *Topographic Mapping of Dissimilarly Datasets.*
- Dr. R. Kramer: *Entwurf und Evaluation einer kontext- und interessensteuerten mobilen Anwendung für den Tourismus.*
- Dr. P. Novak: *Behavioural State Machines - Agent Programming and Engineering.*
- Dr. D. Trinh: *XML Functional Dependencies based on Tree Homomorphisms.*
- Dr. M. Wille: *CarRing II: Entwurf und exemplarische Implementierung der Schichten 2 bis 6 des OSI-7-Schichtenmodells für ein zuverlässiges Echtzeit-Kommunikationsnetzwerk im Automobil.*
Apart from taking part in international conferences, our Ph.D. students have the opportunity to exchange and present their work at regular colloquia which take part within the research groups or the institute, respectively. In 2006, a local network DoKoSon² has been established initiated by Profs. Michael Breitner (Hannover), Dirk Mattfeld (Braunschweig) and Jörg P. Müller (TU Clausthal). In the frame of this colloquium series, Ph.D. students in the area of business information systems are provided a forum to meet, to exchange and discuss ideas in the context of their Ph.D. thesis, and to train and develop methodical skills. DoKoSon offers an interesting programme consisting of doctoral presentations and workshops e.g. on topics such as presenting, writing scientific papers, scientific reviewing, or creativity techniques. By 2009, the DoKoSon community has grown to comprise seven Wirtschaftsinformatik professors in, including all colleagues from the universities of Braunschweig, Clausthal, Göttingen, and Hannover.

2.3 eLearning

The Departments of Informatics at Clausthal University of Technology cooperates with the Universities of Göttingen, Hannover, and Braunschweig within the frame of the project “E-Learning in South Lower Saxony”. Clausthal University of Technology has a long experience on exporting and importing lectures between universities, using sophisticated multimedia-based technology that not only allows the students to watch and listen to the remote lecturer and see the slides but also to interactively ask questions. Within the project, also a data base of electronic lectures is built up which allows the students to follow the lectures anytime on demand.

The department also participates in another ELAN-funded project named ATLANTIS, a collaboration of the chairs for business information systems of the universities of Braunschweig, Clausthal, Göttingen, Hannover, Oldenburg, and Osnabrück. The objective of this project is to set common principles for the curricula of the introductory courses in business information technology and to exchange courses on the Bachelor level based on internet technology.

For more information, we refer to http://www.elan-niedersachsen.de/index.php?id=582.

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² Doktorandenkolloquium Wirtschaftsinformatik Südost-Niedersachsen
2.4 International Collaborations

At the Department of Informatics we encourage the students to experience the international character of computer science by participating in a foreign exchange study programme. In close collaboration with the International Office, we offer to study as part of the SOCRATES/ERASMUS programme at the following universities (see also Figure 2-1):

☑ Université de Metz, France
☑ Centro de Investigación Educación Superior de Ensenada, Baja California, Mexico
☑ University of Ljubljana, Slovenia
☑ University of Belgrad, Serbia
☑ Vysoká skola bánská - Technická Univerzita Ostrava, Czech Republic
☑ University "1 December 1918", Alba Julia, Romania
☑ Bergen University College, Norway
☑ Budapest University of Technology and Economics, Hungaria
☑ University of Durham, U.K.
☑ Università della Calabria, Cosenza, Italy
☑ Jan Długosz University Czestochowa, Poland
☑ Gdansk University of Technology, Poland
☑ Göteborg University, Schweden
☑ Rijksuniversiteit Groningen, The Netherlands
☑ Izmir University of Economics, Turkey
☑ Hogskolen I Buskerud, Kongsberg, Norway
☑ Universidade de Lisboa, Portugal
☑ Universidad Rey Juan Carlos, Madrid, Spain
☑ Universitat de les Illes Balears, Palma de Mallorca, Spain
☑ University of Cyprus, Nicosia, Cyprus
☑ Université Pierre et Marie Curie, Paris, France
☑ Technical University of Iceland, Reykjavic, Iceland
☑ Technicheski Universitet Varna, Bulgaria
☑ Delft University of Technology, The Netherlands
☑ Universitat Autònoma de Barcelona, Spain
☑ Linköpings Universität, Schweden
☑ Università Degli Studi Di Trento, Italy
2.4 International Collaborations

Figure 2-1 Overview of our SOCRATES/ERASMUS partner universities.
Further, an international study programme ‘Internet Technologies and Information Systems’ at graduate and postgraduate level is planned in collaboration with the Universities of Göttingen, Braunschweig, and Hannover.

2.5 Further Activities

Besides the academic activities for our current students we also regularly organize events targeting at our prospective students.

2.5.1 Summer Seminar

Every year during a summer weekend, the Department of Informatics invites high school students in their last or second-last year from all-over the country to Clausthal to participate in an informative two-day seminar.

In collaboration with the university’s Office for Public Relations (many thanks to Jochen Brinkmann for organizing this event) we offer an interesting programme to inform about and advertise our study programmes. After a general introduction that features the key facts on studying in Clausthal in general and at the Department of Informatics in particular, the professors give down-to-earth overviews of some of their special fields, the high school students get some insight into the daily work of Computer Scientists at the institute in presentations, and hands-on experiments, and invited alumni as well as advanced graduate students illustrate the students’ perspective.

The meeting is rounded off by a barbecue party on the evening of the first day.

For more information, we refer to http://www.in.tu-clausthal.de/en/fuer-schueler/schuelerseminar/.
2.5.2 School Information Days

Once a year in springtime, we also address the even younger prospective students from nearby high schools. Since 1981, the annual university-wide school information days are an inherent part of the university information programme. On two days, more than 1000 students from about 30 high schools in Lower Saxony and Saxony-Anhalt visit the university and its departments. It is a good chance for prospective students to familiarize themselves with the city of Clausthal, the university, study programmes, and future job prospects. The students visit the different departments in small groups of 20 to 25 students, each guided by a student of Clausthal University of Technology.

As part of the school information days, the Department of Informatics welcomes more than 10 groups on both days. Within one and a half hours, we provide general information about computer science in Clausthal and life at the university, and we answer questions regarding the university and our study programmes. After the general introduction we offer interesting talks, spectacular presentations, and hands-on experiments, e.g.,

- Robotics presentation,
- Development of a peer-to-peer chat,
- Database experiments,
- Research topics in Computer Graphics, and
- Virtual Reality.

Every year, some of the first-year students at Clausthal University of Technology are former participants of the school information days, underlining the success of this event.

For more information, we refer to http://www.wissenschaft-erleben.de/schuelerinfotage/.

2.5.3 Girl’s Day

Moreover, the department participates in an annual event organized by the Equal Opportunities Office since fall 1995 that particularly addresses female pupils and aims at getting them interested in studying engineering or sciences at Clausthal University of Technology. During one week, about 20 to 25 pupils from all-over Germany attend regular university lectures, take part in 2-hour practical exercises, get into contact with both students and lectures, and visit a number of institutes. Moreover, they participate in several leisure activities.

For more information, we refer to http://www.gb.tu-clausthal.de/schnupperstudium/.
2.5.4 Early Study - Secondary School Pupils

Further, highly skilled pupils have the opportunity to regularly visit selected courses in Computer Science at TU Clausthal. This allows them to get an impression of Computer Science at a deeper level already at a very early age. The Department of Informatics is currently cooperating with four local schools in this matter.

2.6 Lecturing

In this section we list all the lecture courses, seminars, and labs from summer term 2008 until winter term 2009/2010. For each course we denote by \((x, y, z)\) the weekly hours: \(x\) denotes lecture hours, \(y\) exercise hours, and \(z\) lab hours or seminar hours.

For more detailed information about all courses, we refer to the online university course catalogue at https://qis.tu-clausthal.de.

SS 08: Courses and Seminars

- Informatik II (4, 2, 0)
  Hartmann

- Rechnerarchitektur I (3, 1, 0)
  Richter and Wille

- Entwurf digitaler Schaltungen (3, 1, 0)
  Kemnitz and Giesemann

- Modellierung von Informationssystemen (3, 1, 0)
  Müller and Doktors

- Mensch-Maschine-Kommunikation / Ergonomie und Mensch-Maschine-Schnittstellen (3, 1, 0)
  Reuter

- Programmierkurs (2, 0, 2)
  Rausch, Klus and Schindler

- Programmierkurs II / Praktikum Mikrorechner (0, 0, 2)
  Kemnitz

- Praktikum Digitaler Schaltungsentwurf I (0, 0, 2)
  Kemnitz

- Einführung in die Künstliche Intelligenz (3, 1, 0)
  Dix, Bulling and Jamroga

- Verteilte Systeme I (3, 1, 0)
  Pinkwart and Olivier
2.6 Lecturing

- Geometrische Modellierung (3, 1, 0)
  Hormann and Winkler

- Virtuelle Realität und parallele physikalisch-basierte Simulation (3, 1, 0)
  Zachmann

- Softwaretechnik II (3, 1, 0)
  Rausch, Herold, Niebuhr and Niebuhr

- Rechnerarchitektur II (3, 1, 0)
  Richter

- Embedded Systems Engineering II (3, 1, 0)
  Siemers

- Computergraphik II (3, 1, 0)
  Zachmann

- Electronic Commerce / Electonic Business (3, 1, 0)
  Müller and Stiefel

- Data und Web-Mining (3, 1, 0)
  Hammer and Hasenfuß

- Mobilkommunikation I (2, 0, 0)
  Hogrefe and Asam (eLearning import)

- ATLANTIS: Anwendungssysteme in Industrieunternehmen (3, 1, 0)
  Müller (eLearning import)

- ATLANTIS: Business Intelligence (3, 1, 0)
  Müller (eLearning import)

- ATLANTIS: Mobile Business (3, 1, 0)
  Müller (eLearning import)

- ATLANTIS: Informationsverarbeitung in Dienstleistungsbetrieben (3, 1, 0)
  Müller (eLearning import)

- Projektseminar/Fortgeschrittenenprojekt Wirtschaftsinformatik (0, 0, 6)
  Müller, Pinkwart and Hornung

- Seminar Moderne, dynamische Programmier- und Spezifikationssprachen (0, 0, 2)
  Rausch, Appel and Bartelt

- Proseminar Computergraphik (0, 0, 2)
  Zachmann

- Seminar Wirtschaftsinformatik (0, 0, 2)
  Müller, Pinkwart and Olivier

- Seminar Geometry Processing (0, 0, 2)
  Hormann
Projektseminar Simulation komplexer Systeme (0, 0, 4)
Lessing

Fortgeschrittenenprojekt Concurrent Computing (0, 0, 4)
Rausch and Schindler

Seminar: Bioinformatik/Scheduling/Maschinelles Lernen (0, 0, 2)
Ecker and Hammer

Seminar Robotik (0, 0, 2)
Hammer

Oberseminar: Aktuelle Forschung in der KI (0,0,2)
Dix

Oberseminar: Aktuelle Forschung in der Computergraphik (0,0,2)
Zachmann

Oberseminar: Wirtschaftsinformatik (0,0,2)
Müller and Pinkwart

Oberseminar: Aktuelle Forschung im Software Systems Engineering (0,0,2)
Rausch

**WS 08/09:** Courses and Seminars

- Informatik I (4, 2, 0)
  Rausch, Appel, Deiters and Niehbuhr

- Informatik III (3, 1, 0)
  Hammer and Hasenfuß

- Werkzeuge der Informatik (2, 2, 0)
  Dix, Hammer, Hormann, Müller, Richter and Zachmann

- Werkzeuge der Informatik für Physiker(2, 1, 0)
  Zachmann

- Elektronik I (3, 1, 0)
  Kemnitz and Giesemann

- Einführung in die Wirtschaftsinformatik (3, 1, 0) Müller and Stiefel

- Einführung in die Wirtschaftsinformatik III: Integrierte Anwendungssysteme (3, 1, 0)
  Müller and Hornung

- Grundlagen der Programmierung (2, 2, 0) Pinkwart and Olivier

- Rechnernetze I (3, 1, 0)
  Richter and Foalem

- Rechnernetze II (3, 1, 0)
  Richter and Hu
2.6 Lecturing

- Datenbanken I (3, 1, 0)
  Hartmann, Arnhold and Trinh
- Modellbildung und Simulation (3, 1, 0)
  Reuter
- Embedded Systems I (3, 1, 0)
  Siemers
- Modallogiken: Grundlagen und Erweiterungen (3, 1, 0)
  Dix, Bulling and Köster
- Umweltinformatik (2, 2, 0)
  Lessing
- Computergraphik (3, 1, 0)
  Hormann and Winkler
- Multi-Agenten-Systeme I (3, 1, 0)
  Dix, Behrens and Köster
- XML Datenbanken und Semantic Web (3, 1, 0)
  Hartmann and Trinh
- Mobilkommunikation II (1, 1, 0)
  Hogrefe and Hu (eLearning import)
- ATLANTIS: Anwendungssysteme in Industrieunternehmen (3, 1, 0)
  Hahn, Müller and Foalem (eLearning import)
- ATLANTIS: Business Intelligence (3, 1, 0)
  Mattfeld, Müller and Foalem (eLearning import)
- ATLANTIS: Mobile Business (3, 1, 0)
  Breitner, Müller and Foalem (eLearning import)
- ATLANTIS: Informationsverarbeitung in Dienstleistungsbetrieben (3, 1, 0)
  Schumann, Müller and Foalem (eLearning import)
- Seminar Moderne Programmier- und Spezifikationssprachen (0, 0, 2)
  Rausch, Appel, Bartelt, Deynet, Niebuhr and Schindler
- Seminar Game Physics (0, 0, 2)
  Zachmann
- Proseminar: Ausgewählte Kapitel der KI (0, 0, 2)
  Dix, Bulling, Jamroga and Novak
- Seminar Wirtschaftsinformatik (0, 0, 2)
  Müller
- Seminar Moderne Datenbanktechnologien (0, 0, 2)
  Hartmann and Arnhold
- Praktikum Digitaler Schaltungsentwurf II (0, 0, 2)  
  Kemnitz
- Praktikum Mikrorechner (0,0,4)  
  Kemnitz
- Praktikum Elektronik I (0, 0, 2)  
  Kemnitz
- Projektseminar/Fortgeschrittenenprojekt Wirtschaftsinformatik (0, 0, 4)  
  Pinkwart
- Programming Modular Agent and Multi-Agent Systems (0, 0, 2)  
  Dix and Novak
- Multi-agent Systems: Modeling, Reasoning, and Verification (0, 0, 2)  
  Dix and Bulling
- Multi-agent Systems in Real-Time Applications (0, 0, 2)  
  Dix and Behrens
- Computational Intelligence in der Medizin und Biologie (0, 0, 2)  
  Hammer and Hasenfuß
- Fortgeschrittenenprojekt Datenbanken und Informationssysteme (0, 0, 6)  
  Hartmann, Arnhold and Trinh
- Hauptseminar: Ausgewählte Kapitel der KI (0, 0, 2)  
  Dix, Bulling, Jamroga and Novak
- Hauptseminar: Database as a Service (0, 0, 2)  
  Hartmann, Arnhold and Trinh
- Oberseminar: Datenbanken und Informationssysteme (0, 0, 0)  
  Hartmann
- Oberseminar: Aktuelle Forschung im Software Systems Engineering (0, 0, 2)  
  Rausch, Appel, Deynet, Niebuhr and Schindler
- Oberseminar: Wirtschaftsinformatik (0, 0, 2)  
  Müller and Pinkwart
- Oberseminar: Aktuelle Forschung in der KI (0, 0, 2)  
  Dix
- Datenbank-Praktikum (0, 0, 6)  
  Hartmann, Arnhold and Trinh
- Softwaretechnikpraktikum Informationstechnik (0, 0, 4)  
  Kemnitz and Giesemann
- Fortgeschrittenenprojekt 3D Game Programmierung (0, 0, 6)  
  Hormann and Winkler
2.6 Lecturing

SS09 Courses and Seminars

- Fortgeschrittenenprojekt Concurrent Computing (0, 0, 6)
  Rausch and Richter

- Informatik II (4, 2, 0)
  Hartmann

- Entwurf digitaler Schaltungen (3, 1, 0)
  Kemnitz and Giesemann

- Modellierung von Informationssystemen (3, 1, 0)
  Müller, Doktors and Foalem

- Mensch-Maschine-Kommunikation / Ergonomie und Mensch-Maschine-Schnittstellen (3, 1, 0)
  Reuter

- Programmierkurs (2, 0, 2)
  Rausch, Klus, Niebuhr and Schindler

- Programmierkurs II / Praktikum Mikrorechner (0, 0, 2)
  Kemnitz

- Rechnerarchitektur I (3, 1, 0)
  Richter and Wang

- Einführung in die Künstliche Intelligenz (3, 1, 0)
  Dix, Bulling and Jamroga

- Verteilte Systeme I (3, 1, 0)
  Siemers and Fritzsche

- Geometrische Modellierung (3, 1, 0)
  Hormann and Winkler

- Programmierpraktikum (0, 0, 4)
  Rausch, Appel and Deiters

- Softwaretechnik II (3, 1, 0)
  Rausch, Deynet and Niebuhr

- Rechnerarchitektur II (3, 1, 0)
  Richter

- Embedded Systems Engineering II (3, 1, 0)
  Siemers, Fritzsche and Lützel

- Computergraphik II (3, 1, 0)
  Hormann and Schärfig

- Geometrische Datenstrukturen für die Computergraphik (3, 1, 0)
  Zachmann
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<td>Technologien von Kooperationssystemen (3, 1, 0)</td>
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<td>Multi-agent Systems: Modeling, Reasoning, and Verification (0, 0, 2)</td>
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<td>Dix and Bulling</td>
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<td>Multi-agent Systems in Real-Time Applications (0, 0, 2)</td>
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<td>Dix and Behrens</td>
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<td>Simulation komplexer Systeme (3, 1, 0)</td>
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<td>Umweltinformatik (2, 0, 0)</td>
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<td>Hahn, Müller and Foalem (eLearning import)</td>
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<td>ATLANTIS: Business Intelligence (3, 1, 0)</td>
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<td>ATLANTIS: Mobile Business (3, 1, 0)</td>
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<td>Breitner, Müller and Foalem (eLearning import)</td>
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<td>ATLANTIS: Informationsverarbeitung in Dienstleistungsbetrieben (3, 1, 0)</td>
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<td>Schumann, Müller and Foalem (eLearning import)</td>
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<td>Pinkwart and Olivier</td>
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<td>Praktikum Digitaler Schaltungsentwurf I (0, 0, 2)</td>
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<td>Seminar Ausgewählte Kapitel der KI (0, 0, 2)</td>
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2.6 Lecturing

- Seminar Computergraphik (0, 0, 2)
  Zachmann

- Seminar Zeitreihenverarbeitung und -prognose (0, 0, 2)
  Hammer

- Seminar Konfigurierbare Hardware und Mikro-Echtzeitsysteme (0, 0, 2)
  Siemers, Fritzsche and Lützel

- Programming Modular Agent and Multi-Agent Systems (0, 0, 2)
  Dix and Novak

- Projektseminar/Fortgeschrittenenprojekt Wirtschaftsinformatik (0, 0, 6)
  Pinkwart and Olivier

- Hauptseminar: Entwicklung von Enterprise-Anwendungen mit Java: Frameworks, Technologien und Standards (0, 0, 2)
  Rausch, Deynet and Herold

- Hauptseminar: Datenbanksicherheit (0, 0, 2)
  Hartmann, Arnhold and Trinh

- Seminar Bioinformatik/Scheduling/Maschinelles Lernen (0, 0, 2)
  Hammer and Hasenfuß

- Softwaretechnikpraktikum Informationstechnik (0, 0, 4)
  Kemnitz and Giesemann

- Datenbank-Praktikum (0, 0, 4)
  Hartmann, Arnhold and Trinh

- Fortgeschrittenenprojekt Datenbanken und Informationssysteme (0, 0, 6)
  Hartmann, Arnhold and Trinh

- Oberseminar: Aktuelle Forschung in der Computergraphik (0, 0, 2)
  Zachmann

- Oberseminar: Aktuelle Forschung in der KI (0, 0, 2)
  Dix

- Oberseminar: Datenbanken und Informationssysteme (0, 0, 2)
  Hartmann

- Oberseminar: Wirtschaftsinformatik (0, 0, 2)
  Müller and Pinkwart

- Oberseminar: Aktuelle Forschung im Software Systems Engineering (0, 0, 2)
  Rausch, Appel, Deynet, Fischer and Niebuhr

- Fortgeschrittenenprojekt Concurrent Computing (0, 0, 6)
  Rausch and Schindler
WS 09/10 Courses and Seminars

- Informatik I (4, 2, 0)
  Rausch, Bartelt and Fischer
- Informatik III (3, 1, 0)
  Dix and Bulling
- Werkzeuge der Informatik (2, 2, 0)
  Hammer, Hartmann, Müller, Richter and Zachmann
- Werkzeuge der Informatik für Energietechnologien (2, 1, 0)
  Zachmann
- Elektronik I (3, 1, 0)
  Kemnitz and Giesemann
- Einführung in die Wirtschaftsinformatik (3, 1, 0)
  Müller and Stiefel
- Grundlagen der Programmierung (2, 2, 0)
  Pinkwart and Olivier
- Rechnernetze I (3, 1, 0)
  Richter and Wang
- Rechnernetze II (3, 1, 0)
  Richter and Aust
- Mobilkommunikation II (1, 1, 0)
  Hogrefe and Hu (eLearning import)
- Modellbildung und Simulation (3, 1, 0)
  Reuter
- Embedded Systems I (3, 1, 0)
  Siemers and Fritzsche
- Multi-Agenten-Systeme (3, 0, 1)
  Dix, Behrens and Köster
- Softwaretechnik I (3, 1, 0)
  Rausch, Niebuhr and Lange
- Umweltinformatik (2, 0, 0)
  Lessing
- Computergraphik I (3, 1, 0)
  Zachmann
- Datenbanken I (3, 1, 0)
  Hartmann, Arnhold and Trinh
- Web Information Systems (3, 1, 0)
  Hartmann and Trinh
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<td>Virtuelle Realität und parallele physikalisch-basierte Simulation</td>
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<td>Hahn, Müller and Foalem (eLearning import)</td>
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<td>ATLANTIS: Business Intelligence</td>
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<td>Mattfeld, Müller and Foalem (eLearning import)</td>
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<td>ATLANTIS: Mobile Business</td>
<td>3, 1, 0</td>
<td>Breitner, Müller and Foalem (eLearning import)</td>
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<td>3, 1, 0</td>
<td>Schumann, Müller and Foalem (eLearning import)</td>
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<td>Multi-agent Systems: Modeling, Reasoning, and Verification</td>
<td>0, 0, 2</td>
<td>Dix and Bulling</td>
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<td>Multi-agent Systems in Real-Time Applications</td>
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<td>Dix and Behrens</td>
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<td>Fortgeschrittenenprojekt Computergraphik / Praktikum im Schwerpunkt</td>
<td>0, 0, 6</td>
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<td>Hammer</td>
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<td>0, 0, 2</td>
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<td></td>
<td>- Frameworks, Technologien und Standards</td>
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Hauptseminar: Database as a Service (0, 0, 2)
Hartmann, Arnhold and Trinh

Datenbank-Praktikum (0, 0, 6)
Hartmann, Arnhold and Trinh

Softwaretechnikpraktikum Informationstechnik (0, 0, 4)
Kemnitz and Giesemann

Praktikum Softprozessor (0, 0, 6)
Richter and Hu

Fortgeschrittenenprojekt Concurrent Computing (0, 0, 6)
Rausch and Richter

Seminar Moderne Datenbanktechnologien (0, 0, 2)
Hartmann and Arnhold

Seminar: Game Physics (0, 0, 2)
Zachmann

Seminar Konfigurierbare Hardware und Mikro-Echtzeitsysteme (0, 0, 2)
Siemers, Fritzsche and Lützel

Praktikum Digitaler Schaltungsentwurf II (0, 0, 2)
Kemnitz

Praktikum Mikrorechner (0, 0, 4)
Kemnitz

Praktikum Elektronik I (0, 0, 2)
Kemnitz

Projekteinsem/Fortgeschrittenenprojekt Wirtschaftsinformatik (0, 0, 6)
Müller

Seminar Wirtschaftsinformatik (0, 0, 2)
Pinkwart and Loll

Oberseminar: Datenbanken und Informationssysteme (0, 0, 2)
Hartmann

Oberseminar: Aktuelle Forschung in der Computergraphik (0, 0, 2)
Zachmann

Oberseminar: Aktuelle Forschung in Software Systems Engineering (0, 0, 2)
Rausch, Appel, Deynet, Niebuhr and Schindler

Oberseminar: Wirtschaftsinformatik (0, 0, 2)
Müller and Pinkwart

Oberseminar: Aktuelle Forschung in der KI (0, 0, 2)
Dix, Bulling, Behrens and Köster
3 Research Groups

In this section we present all 6 research groups that are currently active in our department. Each group consists of one or two professors, a number of scientific employees and, in some cases, additional scholars or associated members. Currently, the chairs for Distributed Systems and Human Centred Information systems are vacant but we expect them to be filled in 2010/2011.

Currently we have 76 active projects in our department. In this section, we define a project as a particular line of research that is either funded or has at least two refereed publications in the period 2008-2010. In most cases, however, our projects are both funded and have (at least) two publications.

3.1 Business Information Technology

3.1.1 Overview

Leaders
Prof. Dr. Jörg P. Müller
Prof. Dr. Niels Pinkwart

Secretary
Stefanie Cronjäger

Scientific Employees
Dipl.-Wirt.-Inf. Thomas Dokters
Dr. Maksims Fiosins (since 11/2009)
Dipl.-Wirt.-Inf. Olivier Foalem (since 01/2008)
Dipl.-Wirt.-Inf. Jana Görmer (since 10/2009)
Dipl.-Wirt.-Inf. Alexander Hornung (until 12/2008)
Dipl.-Wirt.-Inf. Christopher Mumme (since 06/2009)
Dipl.-Wirt.-Inf. Patrick Stiefel

External Ph.D. students
Dr. rer. nat. Udo Bartlang (until 06/2009)
Dipl.-Inf. (FH) Matthias Born, SAP AG Research, Karlsruhe
Dipl.-Inf. Christoph Gerdes, Siemens Corporate Technology, München
Dipl.-Inf. Julia Hecking, Sympatec GmbH, Clausthal-Zellerfeld
Dr. rer. nat. Ronny Kramer (until 12/2009)
Dipl.-Inf. Simon Paradies, Siemens Corporate Technology, München
Dr. rer. nat. Fabian Stäber (until 11/2008)

3.1.2 Research Agenda

The business information technology unit consists of two research groups.
The research group **Collaboration Systems and CSCW** (Computer Supported Cooperative Work), led by Niels Pinkwart, focuses on the design of digital media and technologies to support human co-operation, communication, and social interaction. We investigate collaborative systems from a variety of perspectives, including their conceptual design, software architectures, user interfaces, and (last not least) usage by humans in their work, learning or leisure context. In our research, we adopt an interdisciplinary approach which is rooted in Computer Science and Information Technology, but also includes methods from Cognitive and Social Sciences. A specific focus of our research is set on applications in the domain of educational technology, particularly on distributed and collaborative software systems which provide intelligent support to students in order to help them learning.

The main research focus of the **Mobile and Enterprise Computing** research group, led by Jörg P. Müller, is on developing models, architectures, and methods for distributed and decentralized management and coordination of business IT systems. Our overall objective is to advance Enterprise interoperability by developing, extending and combining research results and technologies in areas such as Enterprise modelling, service-oriented architecture, Peer-to-Peer computing, autonomous agents and multiagent systems, the Internet of Things, and Semantic Web, and to validate these research results and technologies in business domains such as Enterprise collaboration, supply network management, and product lifecycle management.

The homepage of the business information technology unit is [http://winf.in.tu-clausthal.de](http://winf.in.tu-clausthal.de)

The homepage of the **Collaboration Systems and CSCW** research group is [http://cscw.in.tu-clausthal.de/](http://cscw.in.tu-clausthal.de/)

The homepage of the **Mobile and Enterprise Computing** research group is [http://winf.in.tu-clausthal.de/meclab/](http://winf.in.tu-clausthal.de/meclab/)

### 3.1.3 Supervised Theses


3.1.4 Projects

Project 1: Auto-ID technologies for material tracking in a steel supply chain

Project Members
- Prof. Dr. Jörg P. Müller (Leader)
- Alexander Hornung (Project Staff)

Partners
- Prof. Dr. Martin Vossiek, (Main Leader)
- Prof. Dr. Andreas Rausch,
- Prof. Dr. Christoph Schwindt,
- Prof. Dr. Heinz Palkowski,

Funding
- Benteler Stahl/Rohr
- 6,600€ (of 33,000€ total)

Duration
- 09/2008 – 02/2009

Project Description
The goal of this project was to identify the potential for improving the efficiency and robustness of material flow in a segment of a steel supply chain by using innovative Auto-ID technologies including, but not restricted to RFID, for object identification and tracking. The part of the supply chain under investigation was between the shipping zone of a steel mill to the start of production in a cold rolling mill. The results of the project were an as-is analysis of business processes, a concept proposal enhancing the current processes by Auto-ID based identification and tracking of steel slabs, and the identification of process modifications and improvements induced by the new concept.

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joerg.mueller@tu-clausthal.de

Project 2: Adaptive Interaction Mechanisms (AIM)

Project Members
- Prof. Dr. Jörg P. Müller (Leader)
- Jana Görmer (Project Staff)
- Christopher Mumme (Project Staff)
**Partners**

Prof. Dr. Christian Müller-Schloer, (Main Leader)
Prof. Dr. Bernardo Wagner,
Prof. Dr. Ursula Goltz,
Prof. Dr. Barbara Hammer,

**Funding**

Federal government of Lower Saxony
153,100€ (of 2,500,000€ total)

**Duration**

03/2009 – 08/2011

**Project Description**

In the project AIM (Adaptive Interaction Mechanisms), part of the NTH School of IT-Ecosystems, we are developing concepts, architecture, solution ideas in form of a special group Metamodel and Architecture for Autonomous Agents in Organized Localities. In particular, a demonstrator will be built to address the complex structure of an artificial future airport scenario consisting of several IT components and subsystems where transport agents will act autonomously including interactions within the locality. We explore potential improvements for adaptive coordination mechanisms with conflict resolution techniques and benefits of dynamic agent group forming and interactions. In this given complex context we research for the optimal solution of coordination, organization and regulations which find a balance between central and decentral approaches with focus on self-organizing systems. This research work is carried out in cooperation with partners of NTH IT-Ecosystems.

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joerg.mueller@tu-clausthal.de
Project Homepage
http://www.it-oekosysteme.org

Project 3: Planning and Decision-making in Next-generation Traffic Systems (PLANETS)

Project Members
Prof. Dr. Jörg P. Müller (Leader)
Dr. Maxims Fiosins (Project Staff)
Jana Görmer (Project Staff)

Partners
Prof. Dr. Bernhard Friedrich,
Prof. Dr. Dirk Mattfeld,
Prof. Dr. Markus Fidler,

Funding
Federal government of Lower Saxony
116,200€ (of 415,000€ total)

Duration

Project Description
We study the application of multiagent systems for decentralized decision making and recommendation provision to traffic system participants. Each traffic participant has a set of goals to achieve. In order to improve the decision making process, we propose models based on Markov decision processes and their variants. Also, traffic participants may form groups for acting together towards achieving their goals. Our research goal is to combine decentralized decision making and group formation process at the level of individual participants with centralized traffic control methods. Agent communication is performed through Car-To-Car (C2C) and Car-To-Infrastructure (C2I) communication protocols. Then, information about participants is collected in centralized traffic management center. The current system state and forecasts are estimated by using data mining methods, and then used for the traffic management. To illustrate and validate our approach, we describe an agent-based simulation based on the AimSun traffic simulation system.
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Project 4: ATLANTIS: Academic Teaching and LeArning NeTwork in Information Systems

Project Members
Prof. Dr. Jörg P. Müller (Leader)
Dipl.-Winf. Olivier Foalem (Project Staff)

Partners
Prof. Dr. Uwe Hoppe, Universität Oldenburg, DE (Main Leader)
Prof. Dr. Jürgen Dix, TU Clausthal, DE
Prof. Dr. Dirk Mattfeld, TU Braunschweig, DE
Prof. Dr. Michael Breitner, Universität Hannover, DE
Prof. Dr. Matthias Schumann, Universität Göttingen, DE

Funding
Federal government of Lower Saxony
54.000€ (of 440.000€ total)

Duration
04/2007 – 03/2009

Project Description
The goal of ATLANTIS is to create collaborative eLearning portal and to produce high-quality eLearning content to enhance the Bachelor-level course offerings in and across the partners providing study programmes in the area of business information systems across the federal state of Lower Saxony.
Contact E-Mail
joerg.mueller@tu-clausthal.de

Project Homepage
http://elan-niedersachsen.de/index.php?id=581

Project 5: Architecture and Methods for Flexible Content Management in Peer-to-Peer Systems

Project Member
Prof. Dr. Jörg P. Müller (Leader)

Partner
Dipl. Inf. Udo Bartlang, Siemens AG Corporate Technology, Information and Communications, München, DE

Duration
01/2006 – 06/2009

Project Description
The operation of dedicated content repositories is a change in perspective of content lifecycle management: their application largely promises both technical and financial benefits. Today, centrally managed static client/server architectures are the prevailing design approach for content repositories. However, systems built according to this paradigm inherently lack flexibility regarding the support of different content models and functional properties (for example, dynamic reconfiguration) as well as non-functional aspects (for instance, scalability). We pursue a decentralised approach based on the peer-to-peer architecture paradigm to overcome these drawbacks. Peer-to-peer architectures promise a more flexible architecture pattern migrating into more and more application domains. In spite of the fact it has been nearly a decade that popular peer-to-peer systems appeared as an auspicious paradigm for distributed computing, successful operation is still associated with basic file sharing applications; most of these (monolithic) systems miss sophisticated data management features for concurrent usage – as required by content repository systems.
In this project, the applicability of the peer-to-peer paradigm for the implementation of content repository functions is investigated, and an architecture and methods to enable flexible content management in peer-to-peer systems are presented. Research challenges originate in terms of (i) reflecting different characteristics and relationships of content, (ii) supporting an adequate content repository model—both at functional and non-functional level, for example, to ensure reliability and consistency properties, and (iii) coping with peculiarities of a heterogeneous, dynamic peer-to-peer environment. See also the PhD thesis of Udo Bartlang at Page 214

References
[Bartlang and Müller, 2008] (Page 196),
[Bartlang and Müller, 2009] (Page 196)

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joerg.mueller@tu-clausthal.de

Project Homepages
http://winf.in.tu-clausthal.de
http://www.ct.siemens.com

Project 6: Methodology and Service Layer Components for Decentralized Applications

Project Member
Prof. Dr. Jörg P. Müller (Leader)
Partners

Dipl.-Inf. Fabian Stäber, Siemens AG Corporate Technology, Information and Communications, München

Gerald Kunzmann, TU München, München, DE

Duration

01/2006 – 11/2008

Project Description

While the concept of decentralization in distributed systems is relatively old, it has been drawing increased attention since the rise of peer-to-peer systems in 2000. A significant number of research results has been published, enabling self-organization, scalability, and resilience. However, the adoption of these results in industry is still limited. One reason is that there is no methodology available that helps industrial application developers to transfer these results to their domains.

The objectives of this work are twofold: Firstly, an architecture for decentralized applications is introduced. Based on this architecture, a methodology is presented that supports application developers in benefiting from state-of-the-art decentralization in their fields of application, and in identifying requirements that have not yet been addressed in related work. Secondly, the architecture and methodology are applied to three industrial application scenarios; for each of these scenarios, the open requirements are identified and new service components are developed, extending the state of the art and enabling the use of decentralized infrastructures. See also the PhD thesis of Fabian Stäber at Page 214

References

[Stäber et al., 2009] (Page 194)
Project 7: A Data-Centric Information and Communication Architecture for Large-Scale Industrial Systems

Project Member
Prof. Dr. Jörg P. Müller (Leader)

Partner
Dipl.-Inf. Christoph Gerdes, Siemens AG Corporate Technology, Information and Communications, München, DE

Duration
since 01/2007

Project Description
There exist more than 360 information and communication standards for control and monitoring of electrical transmission and distribution networks. Correspondingly automation equipment of current power infrastructures is highly heterogeneous and exchange of data between devices is rarely possible. Moreover, since equipment is often in operation for multiple decades a unified architecture for all equipment is not feasible. Rather an integration approach is required to achieve seamless inter-device data exchange. This project develops a data-centric information and communication (IC) architecture for energy automation systems that addresses the integration challenge. The architecture describes conceptual building blocks that can be implemented on various device hardware platforms to ease integration.

The challenges emerging in order to create, operate and maintain large-scale industrial systems are addressed by the design of an open architecture called: Ecosystem for Energy Services. As lowest common denominator for all interacting entities, it builds upon unstructured data augmented with quality attributes. The architecture enables all actors to interact, provide and consume services thereby achieving their individual quality requirements and business goals. Supporting a continuous, decentralised and agile design process, the ecosystem can be adapted by its users to meet new regulatory and individual business requirements.
References

[Gerdes et al., 2008a] (Page 200),
[Stäber et al., 2008] (Page 210),
[Gerdes et al., 2008b] (Page 200),
[Gerdes et al., 2009a] (Page 191),
[Gerdes et al., 2009c] (Page 200),
[Gerdes et al., 2009b] (Page 200)

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Project Homepage


Project Member
Prof. Dr. Jörg P. Müller (Leader)

Partners
Prof. Dr. Bernhard Bauer, Universität Augsburg, DE
Dr. Stephan Roser, Software Design & Management AG, München, DE

Duration
01/2005 – 05/2008
Project Description

Under the pressure of globalization, companies are urged to constantly adapt to new market situations and competitors innovations. Focusing on their core business and core competencies, they engage in Cross-organisational Business Processes (CBPs) with new partners all over the world in ever changing constellations. These developments create new challenges for enterprise Information and Communication Technology (ICT), requiring ICT systems to support constantly changing enterprise collaboration relationships and to create application systems that support or automate business process enactment starting from business level descriptions and models of CBPs. Model Driven Software Development (MDSD) provides techniques to realize and automate the propagation of changes at the business level to the technical level. MDSD can be used to provide end-to-end support for the realization of business processes, from the business level (users’ view) down to deployed applications (ICT view) on specific platforms via well-defined, largely automated model transformations and refinements. However, there still exist several problems that prevent MDSD from being practically applicable for efficient and effective CBP enactment. This project provides contributions that enable MDSD projects to improve their possible impact on software development and the way ICT systems support business. It develops solutions to three main problems, namely for the areas of CBP modelling and enactment infrastructure, ICT architecture selection, and model and transformation evolution.

References

[Bauer et al., 2008] (Page 196),
[Hornung and Müller, 2008] (Page 203),
[Fischer et al., 2009] (Page 187)
Contact E-Mail
joerg.mueller@tu-clausthal.de

Project Homepage
http://winf.in.tu-clausthal.de

Project 9: Architecture, Methods and Tools for Decentral and Collaborative Product Development

Project Members
Dipl.-Winf. Patrick Stiefel (Leader)
Christian Hausknecht (Project Staff)

Partners
Prof. Dr. Jörg P. Müller, TU Clausthal, Germany (Main Leader)
J.Prof. Dr. Thomas Barth, Universität Siegen, Germany

Duration
since 07/2005

Project Description
In the context of model-driven software development (MDSD) we investigate new models, methods and tools for evaluating and using the concept of a peer to peer (P2P) based software architecture for integrated and collaborative product engineering.

We argue that distributed and cross-enterprise product lifecycle management can benefit from the availability of decentrally managed product model repositories. Our work, while driven by business level issues such as supporting the emergence of organizations, partnerships, and processes for collaborative and cross-enterprise PLM, focuses on aspects of ICT level interoperability. It aims at enabling loosely coupled interaction between changing partners in a decentral environment, where traditional hierarchical client-server based architecture may not be applicable.
Project 10: Effective User Guidance in Business Process Modeling

Project Member
Dipl.-Winf. Jörg P. Müller (Leader)

Partner
Dipl.-Inf. (FH) Mathias Born, SAP AG Research, Karlsruhe, Germany

Duration
since 07/2005

Project Description
Although numerous of business process modelling methodologies and guidelines exist, the act of modelling business processes is still a cumbersome, time and cost expensive task. Our motivation is to provide a direction towards the simplification of business process modelling approaches. Therefore, we define and investigate three research questions which are elaborated within our research work: (1) What are the major problems perceived by modellers in modelling business processes and why is it often a cumbersome task? (2) How can business process modelling activities be better supported? (3) To what extent are modellers willing to use mechanisms that support the act of modelling?
The main contributions of this work are: (1) A Requirements analysis of perceived problems in business process modelling; (2) The design of a flexible context-driver principle for business process modelling; (3) A recommendation system for business process modelling; (4) The development of a web-based business process modelling prototype that integrates context awareness and recommendation functionalities; (5) An evaluation methodology for testing the usability of the proposed methods, execution of a controlled experiment and analysis of the evaluation results.

References
[Born et al., 2009] (Page 197),
[Li et al., 2008] (Page 205)

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Project Homepage
http://winf.in.tu-clausthal.de

Project 11: Hypothesis Formation and Testing in an Interpretive Domain

Project Member
Prof. Dr. Niels Pinkwart

Partners
Prof. Dr. Kevin Ashley, University of Pittsburgh, USA (Main Leader)
Dr. Vincent Aleven, Carnegie Mellon University, USA (Leader)
Collin Lynch, University of Pittsburgh, USA

Funding
NSF
5.000€ (of 486.348€ total)
**Duration**

09/2004 – 08/2008

**Project Description**

The aims of this project are to (1) design and evaluate an Artificial Intelligence (AI) cognitive model of framing and testing hypotheses in an interpretive domain, legal reasoning, and (2) incorporate the model in an intelligent tutoring system (ITS) to teach law students the process. The project builds upon two recent developments: a newly invented means to frame and evaluate hypotheses predicting the outcomes of new cases based on an AI database of existing precedents, and a convenient, on-line corpus of U.S. Supreme Court oral arguments in aural and written form, including many concrete examples of legal hypothesis framing and testing.

**References**

[Pinkwart et al., 2009a] (Page 193),
[Lynch et al., 2009a] (Page 206),
[Pinkwart et al., 2008a] (Page 208)

**Contact E-Mail**

niels.pinkwart@tu-clausthal.de

**Project 12: Learning to Argue: Generalized Support Across domains**

**Project Members**

Prof. Dr. Niels Pinkwart (Leader)
Frank Loll (Project Staff)

**Partners**

Dr. Bruce McLaren, German Research Center for Artificial Intelligence, Germany (Leader)
Oliver Scheuer, German Research Center for Artificial Intelligence, Germany

**Funding**

DFG
164.000 € (of 344.000 € total)

**Duration**

11/2008 – 10/2010
**Project Description**

The aim of this project is to create a generalized framework and methodology for the construction of argumentation support systems to help students learn argumentation in different domains. The realization of this goal will involve the research of a reusable ontology of argumentation learning objects, a large set of visual, analytic, and pedagogic components that can be combined in different fashions to create different domain-specific argumentation tutoring systems, and the research of an interoperable software system architecture, not specific to a particular domain, that allows the flexible integration of the different researched methods and components.

**References**

[Loll et al., 2009b] (Page 205)

**Contact E-Mail**

niels.pinkwart@tu-clausthal.de

**Project 13: Engaging students in learning argumentation through intelligent collaboration technologies**

**Project Member**

Prof. Dr. Niels Pinkwart (Leader)

**Partners**

Prof. Dr. Kevin Ashley, University of Pittsburgh, USA
Prof. Dr. Vincent Aleven, Carnegie Mellon University, USA
Collin Lynch, University of Pittsburgh, USA

**Funding**

DAAD
8.000€ (of 8.000€ total)

**Duration**

01/2009 – 12/2009

**Project Description**

Within this project, we will extend the intelligent tutoring system for legal argumentation "LARGO" so that it engages students more actively. Previous studies have suggested that engagement is a key factor for effectively teaching argumentative skills through educational technology. The new software will increase student engagement by allowing them to interactively make arguments, discuss these via peer collaboration, and compete in a game-like environment. In the project, the system will be designed and implemented, and pilot-tests with the system and its impact on engagement and learning argumentation skills will be conducted.

**Contact E-Mail**

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**Project 14: Virtual Worlds as CSCW Tools**

**Project Members**
- Prof. Dr. Niels Pinkwart (Leader)
- Hannes Olivier (Project Staff)

**Duration**
- 02/2007 – 01/2012

**Project Description**
Internet technology is rapidly developing and people are continuously looking for new ways of using these technologies. Currently, collaborative Virtual Environments (CVEs) are frequently used for gaming (e.g., World of Warcraft) and leisure (like Second Life). In our research, we are looking at the usefulness of CVE technologies for serious work. One focus is the use of 3d CVEs for collaborative writing processes. A first study revealed different phases in the writing process, and current work is focused on supporting these phases via 3d CVEs.

**References**
- [Pinkwart and Olivier, 2009] (Page 192),
- [Olivier and Pinkwart, 2009] (Page 208),
- [Mumme et al., 2008] (Page 207)

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**Project 15: Virtual Sales Agents**

**Project Members**
- Prof. Dr. Niels Pinkwart (Leader)
- Christopher Mumme (Project Staff)

**Duration**

**Project Description**
We designed and implemented a virtual agent that is capable of providing customers in a 3D online shop with advice. Based on a product knowledge base, a conversation model and a model of the shop, the agent communicates with the customer through text based dialogues and leads the customer through the virtual world, using gestures to show products. A controlled empirical evaluation study showed that customers in this shop generally followed the counseling of the agent and bought more suitable products.
Also, a considerable number of the participants in the study expressed that they liked the principle of sales agents in virtual 3D online shops and considered our agent helpful. These results suggest that shops in virtual worlds have a large potential for eBusiness applications - they enable a detailed representation and arrangement of products and a rich interaction in the environment.

References
[Mumme et al., 2009] (Page 207),
[Mumme et al., 2008] (Page 207)

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Project 16: Using Collaborative Filtering Algorithms in eLearning Applications

Project Members
Prof. Dr. Niels Pinkwart (Leader)
Frank Loll (Project Staff)

Duration
01/2008 – 10/2008

Project Description
Today, collaborative filtering techniques play a key role in many Web 2.0 applications. Currently, they are mainly used for business purposes such as product recommendation. Collaborative filtering also has potential for usage in Social Semantic Web e-learning applications in that the quality of a student provided solution can be heuristically determined by peers who review the solution, thus effectively disburdening the workload of teachers and tutors. We developed a collaborative filtering algorithm which is specifically adapted for the requirements of e-learning applications. An empirical evaluation of the algorithm showed that the results of the collaborative filtering were more accurate than the self-assessment of the participants and that already four peer evaluations were generally enough to reach a satisfying accuracy. Based on these results, we developed a web based e-learning system (CITUC) that implements the algorithm.

References
[Loll and Pinkwart, 2009c] (Page 189),
[Pinkwart and Loll, 2009] (Page 208),
[Loll and Pinkwart, 2009a] (Page 205),
[Loll and Pinkwart, 2009d] (Page 205)

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niels.pinkwart@tu-clausthal.de
3.1.5 Scientific Activities

**Person** Prof. Dr. Jörg P. Müller

- **Editorial Board Memberships**

- **Organization of Conferences and Workshops**
  - Track Co-Chair (with Michael Berger, Stefan Kirn, Kai Fischbach, Stefan Staab) *MKWI 2008: Conference Track Dezentralität als Entwurfsprinzip at Multikonferenz Wirtschaftsinformatik 2008*, München, Germany, February 2008. See [http://winf.in.tu-clausthal.de/mkwi08/](http://winf.in.tu-clausthal.de/mkwi08/)
• Co-Chair (with Klaus Fischer, Arne Berre, James Odell)  
  See http://www-ags.dfki.uni-sb.de/~kuf/atop

• Session Co-Chair (with Wolf Ketter)  
  See http://www.som.buffalo.edu/isinterface/Web09/

• Track Co-Chair (with Lars Braubach, Birgit Burmeister, Alexander Pokahr, Ingo Timm)  
  See http://winf.in.tu-clausthal.de/mkwi10/

• Co-Chair (with Paolo Petta)  
  AT2AI-7: 7th International Symposium From Agent Theory to Agent Implementation, Wien, Austria, April 2010.  
  See http://www.ofai.at/~paolo.petta/conf/at2ai7/

☐ PC-member of Conferences and Workshops

  See http://srvmatthes6.in.tum.de/grid_computing_in_and_for_business_applications.html

  See http://www.iccbss.org/2008/

• MAS2: Conference Track Multi-Agent Systems as Middleware and Architectures for Business Systems at Multikonferenz Wirtschaftsinformatik (MKWI 2008), München, Germany, February 2008.  
  See http://vsis-www.informatik.uni-hamburg.de/events/mas2/

• EPLM: Conference Track Entwicklungsprozesse und Product Lifecycle Management at Multikonferenz Wirtschaftsinformatik (MKWI 2008), München, Germany, February 2008.  
  See http://srvmatthes6.in.tum.de/entwicklungsprozesse_und_product_lifecycle_management.html

  See http://www.aidima.es/iesa2008/
• **AT2AI-6: Sixth International Workshop "From Agent Theory to Agent Implementation",** Estoril, Portugal, May 2008.  

  See [http://www.cs.uu.nl/ProMAS/2008/](http://www.cs.uu.nl/ProMAS/2008/)

  See [http://www.icec08.org/](http://www.icec08.org/)

  See [http://www.wi2.uni-trier.de/mates08/](http://www.wi2.uni-trier.de/mates08/)

  See [http://www.cs.manchester.ac.uk/ruleML/](http://www.cs.manchester.ac.uk/ruleML/)


• **CoopIS 2008: 16th International Conference on Cooperative Information Systems**, Monterrey, Mexico, November 2008.  


• **OTMADC-08: 5th OTM Academy Doctoral Consortium**, Monterrey, Mexico, November 2008.  


• PAAMS: 7th International Conference on Practical Applications of Agents and Multi-Agent Systems, Salamanca, Spain, March 2009. See http://paams.usal.es/


• INCOM 2009: 13th Triennial IFAC Symposium on Information Control Problems in Manufacturing, Moskau, Russia, June 2009. See http://incom.org


• MATES 2009: German Conference on Multiagent System Technologies, Hamburg, Germany, September 2009. See http://jadex.informatik.uni-hamburg.de/mates/


• **PAAMS 2010: 8th International Conference on Practical Applications of Agents and Multi-Agent Systems**, Salamanca, Spain, April 2010. See http://www.paams.net/


**Steering Committees**

• **ATAL: International Workshop on Agent Theories, Architectures, and Languages** (since 1999). See http://www.atal.org

• **MATES: German Conference on Multiagent Systems Technologies** (since 2001). See http://www-ag.s.fki.uni-sb.de/~klusch/mates-series/index.html
• **CEEMAS:** *Central and Eastern European Conference on Multiagent Systems* (since 2003).
  See [http://www.ceemas.org](http://www.ceemas.org)

• **AOSE:** *International Workshop on Agent-Oriented Software Engineering* (since 2005).

  See [http://www.ifaamas.org](http://www.ifaamas.org)

• Advisory Board of **EUMAS:** *European Workshop on Multi-Agent Systems* (2006–2009).
  See [http://www.eumas.org](http://www.eumas.org)

• **Agents and Data Mining Integration and Interaction SIG** (since 2009).
  See [http://www.agentmining.org](http://www.agentmining.org)

### Evaluator

• Expert evaluator.

• Project evaluator.

• NWO JACQUARD research proposal evaluator.
  *Netherlands Organization for Scientific Research,* Amsterdam, NL, 2008.
  See [http://www.nwo.nl](http://www.nwo.nl)

• External Ph.D. thesis evaluator.
  – **Dean Ho Mok Cheong.** *Hermes: Goal-Oriented Interactions for Intelligent Agents,* RMIT University, Melbourne, AU, December 2008.
    See [http://www.rmit.biz/browse;ID=3vmk5vgp0s15](http://www.rmit.biz/browse;ID=3vmk5vgp0s15)
  
  – **Fernando Koch.** *An agent-based model for the development of intelligent mobile services,* Utrecht University, Utrecht, NL, October 2009.
    See [www.cs.uu.nl](http://www.cs.uu.nl)

    See [http://www.informatik.uni-augsburg.de/lehrstuhle.swt/](http://www.informatik.uni-augsburg.de/lehrstuhle.swt/)

  – **Sebastian Stein.** *Flexible service provisioning in multi-agent systems,* University of Southampton, Southampton, UK, April 2008.
    See [http://www.ecs.soton.ac.uk](http://www.ecs.soton.ac.uk)
Person  Prof Dr. Niels Pinkwart

☐ Organization of Conferences and Workshops

- Co-Chair (with Vincent Aleven, Kevin Ashley and Collin Lynch)

- Co-Chair (with Frank Loll, Oliver Scheuer and Bruce McLaren)

- Co-Chair (with Darina Dicheva and Riichiro Mizoguchi)
  *Workshop on Ontologies and Social Semantic Web for Intelligent Educational Systems within AIED2009*, Brighton, United Kingdom, July 2009.
  See [http://compsci.wssu.edu/iis/swel/SWEL09/index.html](http://compsci.wssu.edu/iis/swel/SWEL09/index.html)

- Workshop and Tutorial Co-Chair (with Joe Beck)
  *10th International Conference on Intelligent Tutoring Systems*, Pittsburgh, USA, June 2010.
  See [http://www.cmu.edu/its2010/](http://www.cmu.edu/its2010/)

☐ PC-member of Conferences and Workshops

  See [http://compsci.wssu.edu/iis/swel/SWEL08/](http://compsci.wssu.edu/iis/swel/SWEL08/)

  See [http://www.apsce.net/ICCE2008](http://www.apsce.net/ICCE2008)


  See [http://www.isp.pitt.edu/~artward/Flairs09_ITS_Track.html](http://www.isp.pitt.edu/~artward/Flairs09_ITS_Track.html)

- ISEE@AIED'09: *Workshop on Intelligent Support for Exploratory Environments*, Brighton, United Kingdom, July 2009.
  See [https://sites.google.com/a/lkl.ac.uk/isee/](https://sites.google.com/a/lkl.ac.uk/isee/)
3.1 Business Information Technology


3.1.6 Highlights

- In 2008

  - Jörg P. Müller is the General Chair of the 7th International Conference on Autonomous Agents and Multiagent Systems (AAMAS’2008) held in Estoril, Portugal in May 2008. AAMAS is the leading conference in the agent and multiagent research with over 800 attendees, 720 submitted papers and an acceptance rate of 22%. General Co-Chair is Simon Parsons from Brooklyn University, Programme Chairs are David Parkes (Harvard University) and Lin Padgham (RMIT, Melbourne).


  - The DFG supports the research group of Niels Pinkwart with approximately 164 KEUR. The grant is awarded for the research project “Learning to Argue: Generalized Support Across domains (LASAD)” which was proposed jointly by Bruce McLaren (DFKI) and Niels Pinkwart.
• The DAAD awards a grant of approx. 8 KEUR to the research group of Niels Pinkwart. Within the project “Engaging students in learning argumentation through intelligent collaboration technologies”, Prof. Pinkwart and his colleagues at CMU (Vincent Aleven) and at the University of Pittsburgh (Kevin Ashley, Collin Lynch) modified the existing LARGO program so that it engages students more actively.

In 2009


• The diploma thesis of Frank Loll on collaborative filtering algorithms applied to eLearning (supervised by Niels Pinkwart) was elected to win a sponsorship award by the association of friends of Clausthal University of Technology.

• Niels Pinkwart was elected as a steering committee member of the special interest group on CSCW within the German Computer Science Association.

• Led by Patrick Stiefel and Thomas Dokters, the team of Prof. Müller successfully presented results of their research at the CeBIT 2009 computer fair. The Product Collaboration Platform is an experimental software framework that provides methods and tools for decentralized resource sharing and collaboration in distributed developer teams. Its goal is to enable the decentralized organization and management of skills, resources and product models for cross-organizational product development processes.
3.2  Computational Intelligence

3.2.1  Overview

Leaders

Prof. Dr. Jürgen Dix
Prof. Dr. Barbara Hammer

Associated Member

apl. Prof. Dr. Matthias Reuter (CUTEC)

Secretary
Anita Seiz-Uhlig

Scientific Employees

Dipl.-Inf. Tristan Behrens
Dipl.-Inf. Nils Bulling
Dipl.-Inf. Andrej Gisbrecht (since 08/2009)
Dipl.-Inf. Alexander Hasenfuss (until 6/2009)
PD Dr. habil. Wojciech Jamroga
Dipl.-Inf. Michael Köster (since 05/2008)
Mgr. Peter Novák (until 09/2009)
Dipl.-Inf. Bassam Mokbel (since 05/2009)

Associated Members

Dipl.-Päd. Sabine Berens (CUTEC)
Dipl.-Inf. Sven Birkenfeld (CUTEC)
Dipl.-Päd. Sabine Bohlmann (CUTEC, since 04/2008)
Dipl.-Inf. Jana Görmer (CUTEC)
Dipl.-Inf. Steffen Harneit (CUTEC)
Dipl.-Inf. Alexander Landa (CUTEC)

Scholars

M.Sc. Banchar Arnonkijpanich
M.Sc. Juan Carlos Acosta Guadarrama
M.Sc. Olufunke Rebecca Vincent (08/2008 - 04/2009)

3.2.2  Research Agenda

Our research focuses mainly on computational logic (deductive databases, answer set programming, nonmonotonic reasoning), multi-agent reasoning (logics in agency, rational agents, programming agents), artificial intelligence (automated theorem proving, verification, data mining, planning), softcomputing (neural networks, ant algorithms, evolutionary algorithms), machine learning and pattern recognition (neural networks, hybrid systems for structured data, industrial applications), and data mining (self organizing maps, clustering, unsupervised and semi-supervised data processing).

See the group’s homepage at:  http://cig.in.tu-clausthal.de/
3.2.3 Supervised Theses


### 3.2.4 Projects

**Project 17: Verifying Abilities of Resource-Bounded Agents**

*Project Members*
- Prof. Dr. Jürgen Dix (Leader)
- Dipl.-Inf. Nils Bulling (Leader)

*Partner*
- Dr. Berndt Farwer, Durham University, UK

*Project Description*

The verification and modelling of multi-agent systems is an important topic that has attracted much attention in recent years. Resources, however, have only recently entered the picture. We analyse whether it is possible to verify properties of resource-bounded agents. Therefore, appropriate models and logics are introduced and the complexity and decidability, respectively, of model checking is considered.

*References*
- [Bulling and Farwer, 2009a] (Page 197),
- [Bulling and Farwer, 2009b] (Page 197)

*Contact E-Mail*
- bulling@in.tu-clausthal.de

*Project Homepage*
- http://www.in.tu-clausthal.de/index.php?id=cigproject_verrba

**Project 18: Verification of Communicating Rational Agents**

*Project Members*
- Prof. Dr. Jürgen Dix (Leader)
- Dipl.-Inf. Nils Bulling (Leader)

*Partner*
- Prof. Koen V. Hindriks, Technical University Delft, The Netherlands
**Project Description**

The project is on a multi-agent verification logic based on a computational semantics that facilitates reasoning about communicative actions. The multi-agent logic is embedded into a more expressive modal logic over a run-based semantics. This allows to relate both logics and prove expressivity results and use standard verification techniques. Finally, we would like to identify tractable fragments of the specification language that are still useful for reasoning about and verifying communicating rational agents.

**References**

[Bulling and Hindriks, 2009b] (Page 197),
[Bulling and Hindriks, 2009a] (Page 213)

**Contact E-Mail**

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**Project Homepage**

http://www.in.tu-clausthal.de/index.php?id=cigproject_vercra

---

**Project 19: A Language for Beliefs and Knowledge Representation**

**Project Members**

- Prof. Dr. Jürgen Dix (Leader)
- Mag.-Inf. Juan Guadarrama
- PD Dr. habil. Wojciech Jamroga

**Partner**

- Prof. Dr. Mauricio Osorio, University of Puebla, Mexico

**Funding**

- PhD project, Conacyt (Mexican Government)
- 30.000€ (of 30.000€ total)

**Duration**

- 01/2005 – 04/2008

**Project Description**

In this project, preliminary specifications of a formal logic programming language for beliefs and knowledge representation are studied by means of a society of intelligent agents, based on the strong theoretical basis of epistemology and intuitionistic logic. We describe its general structure and propose how one can update beliefs so that they become knowledge as new pieces of information appear. Possible future applications towards a conscious autonomous agent are also discussed. See also the PhD thesis of Juan C. Guadarrama at Page 214

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dix@tu-clausthal.de
Project Homepage
http://www.in.tu-clausthal.de/index.php?id=cigproject_langbelknow

Project 20: Modular BDI Architecture and Agent Oriented Programming

Project Members
Prof. Dr. Jürgen Dix (Leader)
Mag.-Inf. Peter Novák

Funding
AAMAS and ERASMUS
1.400€ (of 1.400€ total)

Duration
since 11/2004

Project Description
One of the main challenges in agent-oriented programming is the design of specialized programming languages for single agent development. They should provide transparent interfaces to existing mainstream programming languages for easy integration with external code and legacy software. In this project we work towards a practical programming language with underlying architecture which suits the requirements mentioned above. Our previously developed architecture will serve us as a basis for the development of an experimental programming language and implementation of an interpreter for it, based on a plug-in design. See also the PhD thesis of Peter Novak at Page 214

Agent program:
when believes goals{Obj} {{find(Obj)}} and believes brain{Obj, Dir} {{see(Obj, Dir)}} and query map{Object, Dir, Dist} {{Dist get distance of(Obj, Dir)}} then act body{Dist} {{move forward Dist}}

References
[Novák, 2008d] (Page 208)

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Project 21: A Simulation Platform for Multi-Agent Systems

Project Members
Prof. Dr. Jürgen Dix (Leader)
Dipl.-Inf. Tristan Behrens (Leader)
Dipl.-Inf. Michael Köster (Leader)
Mag. Inf. Peter Novák (Leader)

Partner
Dr. Mehdi Dastani, Utrecht University, The Netherlands

Duration
since 01/2005

Project Description
Since 2005, we are organising a yearly agent contest. This competition is an attempt to stimulate research in the area of multi-agent programming by (1) identifying key problems, and (2) collecting suitable benchmarks. These can serve as milestones for testing agent-oriented programming languages, platforms and tools. The simulation platform we have developed and which is constantly improved, makes it possible to test agent systems in a fair way.

References
[Dastani et al., 2008b] (Page 198),
[Behrens et al., 2009a] (Page 196),
[Dastani et al., 2008a] (Page 198)

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Project Homepage
http://www.multiagentcontest.org
Project 22: **IPMasAr: Modelling Inference and Preferences in Multiagent Systems through Argumentation**

**Project Members**
- Prof. Dr. Jürgen Dix (Leader)
- Dipl.-Inf. Nils Bulling
- PD Dr. habil. Wojciech Jamroga

**Partners**
- Prof. Dr. Carlos Chesnevar, University of Bahia Blanca, Argentina (Leader)
- Prof. Dr. Frieder Stolzenburg, Fachhochschule Wernigerode, Germany

**Funding**
DAAD (PPP, PROALAR 415-proalar/po-D/06/33815)
7.500€ (of 15.000€ total)

**Duration**
01/2007 – 12/2008

**Project Description**
The main goal of this project is computational modelling of inference processes and preference handling in multiagent systems, captured through different extensions of Defeasible Logic Programming (DeLP), a logic programming language that allows to model argumentative reasoning. DeLP has been successfully used in real-world applications, but its applicability is limited in a multiagent setting. The proposed model would allow to solve new problems in distributed settings by coordinating autonomous intelligent agents which would reason by means of argument-based inference.

![The P-DeLP approach](image)

**References**
- [Bulling et al., 2009a] (Page 198),
- [Bulling and Dix, 2008] (Page 197),
- [Bulling et al., 2008a] (Page 198)

**Contact E-Mail**
dix@tu-clausthal.de

**Project Homepage**
http://www.in.tu-clausthal.de/index.php?id=cigproject_ipmasar
**Project 23: Programming Multiagent Systems**

**Project Members**
- Prof. Dr. Jürgen Dix (Leader)
- Mag.-Inf. Peter Novák

**Partners**
- Prof. Dr. Amal El Fallah Seghrouchni, Universite Paris 6, France
- Dr. Rafael Bordini, University of Durham, UK
- Dr. Mehdi Dastani, Utrecht University, The Netherlands

**Duration**
- since 2002

**Project Description**
After setting up a workshop series on programming Multi-Agent Systems (ProMAS), we are actively engaged in developing, comparing and applying theoretical frameworks for agent systems. We started a ProMAS working group within Agentlink III, and have put together a book about the most promising approaches. A second book is on its way. We have also organised a Dagstuhl seminar in 2001 and another one in 2008.

**References**
- [Bordini et al., 2009] (Page 187),
- [Behrens et al., 2009a] (Page 196)

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- dix@tu-clausthal.de

**Project Homepages**
- [http://cig.in.tu-clausthal.de/projects/programming](http://cig.in.tu-clausthal.de/projects/programming)
- [http://www.cs.uu.nl/ProMAS/](http://www.cs.uu.nl/ProMAS/)

**Project 24: A General Framework for Reasoning about Plausible Behavior and Rational Agents**

**Project Members**
- Prof. Dr. Jürgen Dix (Leader)
- PD Dr. habil. Wojciech Jamroga (Leader)
- Dipl.-Inf. Nils Bulling

**Funding**
- DFG and IFAAMAS
- 1.600€ (of 1.600€ total)
**Project Description**

We aim at a logic that allows to study strategies, time, knowledge, and plausible/rational behavior under both perfect and imperfect information. To this end, we study extensions of temporal and strategic logics with the notion of plausibility and/or rationality, and various logical characterizations of these notions.

![Diagram](image)

**References**

[Bulling *et al.*, 2009b] (Page 190)

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wjamroga@in.tu-clausthal.de

**Project Homepage**

[http://www.in.tu-clausthal.de/index.php?id=cigproject_gfrpbra](http://www.in.tu-clausthal.de/index.php?id=cigproject_gfrpbra)

**Project 25: LocCom – Local Communities in Information Cities**

**Project Members**

Prof. Dr. Jürgen Dix (Leader)
Dipl.-Inf. Michael Köster

**Partners**

Prof. Dr. Heribert Vollmer, LU Hannover
Prof. Dr.-Ing. Michael Beigl, TU Braunschweig
Prof. Dr.-Ing. Lars Wolf, TU Braunschweig
Prof. Dr. techn. Dipl.-Ing. Wolfgang Nejdl, LU Hannover
Prof. Dr. Christian Siemers, TU Clausthal
Prof. Dr. Mark Vollrath, TU Braunschweig
Funding
Cooperation Project, TU Braunschweig, TU Clausthal, Leibniz Universität Hannover (Lower Saxony state government)
56,442, 46€ (of 366,876€ total)

Duration
03/2009 – 09/2011

Project Description
In this project we develop methods, concepts, and tools for decentralized IT Ecosystems. Important outcomes will be the development of new services and techniques to guarantee certain quality characteristics. In order to do so, we investigate adaptive techniques on all layers ranging from reconfigurable hardware via protocols up to modelling and inference methods. An important aspect will be the application of context in generalized form.

In particular, a principal objective is the modeling and implementation of generalized social networks based on mobile devices. Using services and information offered by these devices on one hand, and the needs and duties of users on the other hand, peers will be brought together. Further, recommendations concerning activities and usages will be generated automatically and tailored for the users, by taking into account the autonomy of users and devices.

To achieve these goals, techniques and methods of several heterogenous research areas must be combined. The work to be carried out includes:

- Extending temporal logics (LTL, CTL, CTL*) to model local communities and social networks.
- Mechanisms to detect, describe, and use context.
- Scalable networking and communication of mobile devices considering availability of devices and network services.
- Provable characteristics of social networks (privacy and availability).
- Recommender Systems, User-centric Media, Integration with heterogenous mobile devices.
- Adaptive hardware architectures designed for network scalability, optimization of energy consumption vs. computing power.

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Project Homepage
http://www2.in.tu-clausthal.de/~it-ecosystems/
Project 26:  Relevance Learning for Temporal Neural Maps

Project Members
Prof. Dr. Barbara Hammer
Dipl.-Inf. Andrej Gisbrecht

Partner
Dr. Frank-Michael Schleif, University of Leipzig

Funding
DFG (01/2010-12/2012, 1 position and overhead)
195.438€ (of 195.438€ total)

Duration
06/2008 – 12/2012

Project Description
A vast amount of data that engineers and scientists are facing today is of temporal nature, and the sheer volume means that only a small fraction can ever be inspected manually. Thus, automated tools for exploration and visualization of temporal data are strongly required. Popular highly sensitive technologies from chemistry, medical science, and biology such as mass spectrometry lead to extremely high-dimensional and often nonlinear time-series. These are, at the same time, extremely short due to the necessity of human intervention during measurements such as the collection of blood probes. Today’s underlying state-of-the-art processing methods working in the background of the practitioners’ toolboxes are not well suited to fully cope with high dimensional and extremely short temporal sequences, and there is a need for new data mining tools being able to handle those data sets. The aim of this project is the development of data mining methods for unsupervised and partially supervised scenarios for short, high-dimensional, nonlinear temporal sequences which allow relevance determination, visualization, and inspection of data as occur in biomedical applications.
3.2 Computational Intelligence

References

[Schleif et al., 2009] (Page 193),
[Schleif et al., 2008a] (Page 189),
[Schleif et al., 2008d] (Page 189),
[Schleif et al., 2008b] (Page 193),
[Schleif et al., 2008c] (Page 193)

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Project 27: Biases of data visualization

Project Members

Prof. Dr. Barbara Hammer
M.Sc. Banchar Arnonkijpanich

Partner

Dr. Michael Biehl, University of Groningen, The Netherlands

Duration

since 01/2009

Project Description

Electronic data available today increase rapidly in size as well as dimensionality. One of the challenges of modern data analysis is to design efficient algorithms which visualize data and, thus, help humans to inspect the data in an intuitive way. One problem of mapping high dimensional data to low dimensions is given by the accumulation of noise present in the data and, very likely, projected to low dimensions by an unsupervised projection methods. The aim of the project is to design efficient data projection methods which take into account auxiliary information in form of local statistical characteristics or explicit class labels and, thus, provide a more flexible or meaningful data visualization also in the presence of high dimensionality.
References

[Bunte et al., 2009b] (Page 198),
[Bunte et al., 2009a] (Page 198),
[Schneider et al., 2009a] (Page 193),
[Schneider et al., 2009b] (Page 193),
[Biehl et al., 2009c] (Page 189),
[Arnonkijpanich et al., 2008c] (Page 195)

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Project 28: Topographic mapping large dissimilarity data sets

Project Members

Prof. Dr. Barbara Hammer
Dr. Alexander Hasenfuss
Dipl.-Inf. Bassam Mokbel

Funding

since 2009: MWK in the frame of IT-Ecosystems (1 position + overhead)
152.865€ (of 2.541.218€ total)

Duration

since 01/2007
Project Description

Clustering and visualization constitute key issues in computer-supported data inspection, and a variety of promising tools exist for such tasks such as the self-organizing map (SOM) and variations thereof. Real life data, however, pose severe problems to standard data inspection: on the one hand, data are often represented by complex non-vectorial objects and standard methods for finite dimensional vectors in Euclidean space cannot be applied. On the other hand, very large data sets have to be dealt with, such that data do neither fit into main memory, nor more than one pass over the data is still affordable, i.e. standard methods can simply not be applied due to the sheer amount of data. We developed two extensions of topographic mappings to cope with these issues: relational clustering, which can deal with general proximity data given by pairwise distances, and patch processing, which can process streaming data of arbitrary size in patches. Together, an efficient linear time data inspection method for general dissimilarity data structures results.

References

[Alex et al., 2009] (Page 190),
[Mokbel et al., 2009] (Page 206),
[Geweniger et al., 2008] (Page 200),
[Hasenfuss et al., 2008a] (Page 202),
[Hasenfuss et al., 2008b] (Page 202),
[Hasenfuss and Hammer, 2008] (Page 202),
[Hasenfuss et al., 2008c] (Page 202)

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Project 29: Strategic Abilities under Imperfect Information: Modeling, Reasoning and Verification

Project Member
PD Dr. habil. Wojciech Jamroga (Leader)

Partner
Dr. Thomas Ågotnes, Bergen University College, Norway

Funding
DFG
750€ (of 750€ total)

Duration
since 07/2005

Project Description
We propose a non-standard interpretation of Alternating-time Temporal Logic with imperfect information, for which no commonly accepted semantics has been proposed yet. Rather than changing the semantic structures, we generalize the usual interpretation of formulae in single states to sets of states. We propose a new epistemic operator for “practical” or “constructive” knowledge, and we show that the new logic (which we call Constructive Strategic Logic) is strictly more expressive than most existing solutions, while it retains the same model checking complexity.

We also propose a new class of representations that can be used for modeling (and model checking) temporal, strategic and epistemic properties of agents and their teams. Our representations borrow the main ideas from interpreted systems of Halpern, Fagin et al.; however, they are also modular and compact. Surprisingly, our complexity results suggest that model checking strategic abilities under imperfect information can be computationally cheaper than checking the perfect information case.
Project 30: Jazzbot

Project Members
- Prof. Dr. Jürgen Dix (leader)
- Dr. Peter Novák (leader)
- Dipl.-Inf. David Mainzer
- Dipl.-Inf. Michael Köster

Duration
01/2008 – 12/2008 (approx.)

Project Description
Jazzbot is a virtual agent embodied in a simulated 3D environment of the first-person shooter computer game Nexuiz 2. It is a goal-driven BDI inspired cognitive agent developed with the Jazzyk language. The Nexuiz death-match game takes place in a virtual building containing various objects (e.g. weapons, flags or armor kits), is capable of simulating diverse terrains like solid floor, or liquid and provides a basic means for inter-player interaction. Because of its accessibility (Nexuiz is published under the open source GNU GPL licence), we chose the Nexuiz game server as the simulator for Jazzbot case-study, the first larger proof-of-concept application for the Jazzyk BSM framework. See also the PhD thesis of Peter Novak at Page 214.
References

[Köster et al., 2009] (Page 204)

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Project Homepage
http://jazzyk.sourceforge.net/projects/jazzbot.html

Project 31: Predictive Control of Waste Incinerator

Project Members
apl. Prof. Dr. Matthias Reuter (Leader)
Dipl.-Inf. Sven Birkenfeld (Project Staff)

Partner
Dr.-Ing. Stefan Vodegel, CUTEC-Institut GmbH, Clausthal, Germany

Funding
AIF (Arbeitsgemeinschaft industrieller Forschungsvereinigungen "Otto von Guericke" e.V.)
174,000€ (of 360,000€ total)

Duration
01/2006 – 12/2008
Project Description
With help of neural nets, a waste incinerator is controlled in a predictive way. As the implicit model of the waste incinerator we use a closed SOM, whose activities are decoded by a downstream feed-forward net. In consequence, the predictive values of the control can be calculated. This is a new approach in the area modelling and simulation; in particular, it is the first industrial application of the theory of Computing with Activities.

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Project 32: Detection

Project Members
apl. Prof. Dr. Matthias Reuter (Leader)
Dipl.-Inf. Steffen Harneit (Project Staff)

Partners
Dr. Thomas Wonik, Institut für Geowissenschaftliche Gemeinschaftsaufgaben (GGA), Hannover, Germany
Dirk Bettels, Infrastrukturbau, Hannover, Germany
Markus Lämmerhirt, Prokasso, Karlsruhe, Germany

Funding
N-Bank, VHG Versicherungen
479.000€ (of 1.400.000€ total)

Duration
01/2007 – 12/2009
**Project Description**

Project Detectino includes the development of a robotic system which will search pipes and cables automatically in urban and non-urban areas. Empowered by neural nets and new kinds of image processing methods the system DETECTINO will by able to plot the subgrade by making it “diaphanous”.

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### 3.2.5 Scientific Activities

**Person** Dipl.-Inf Tristan Behrens

- **Organization of Conferences and Workshops**
  - Co-Organizer (with Peter Novak and Jürgen Dix and Mehdi Dastani)
  - Co-Organizer (with Jürgen Dix, Mehdi Dastani, Michael Köster and Peter Novák)
    See [http://www.multiagentcontest.org/](http://www.multiagentcontest.org/)

- **Visit**

- **Invited**
    See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361).
    See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08461](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08461).
3.2 Computational Intelligence

**Person** Dipl.-Inf Nils Bulling

- **Visit**
  - Prof. Dr. Guillermo Simari and Prof. Dr. Carlos Chesñevar, Department of Computer Science and Engineering, Universidad Nacional del Sur, Bahia Blanca, Argentina, 2008.
  
  
  - Dr. Berndt Farwer, School of Engineering and Computing Science, Durham University, Durham, GB, 2009.
  
  See [http://www.dur.ac.uk/berndt.farwer/](http://www.dur.ac.uk/berndt.farwer/).

- **Invited**
  
  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361).
  
  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08461](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08461).

**Person** Prof. Dr. Jürgen Dix

- **Editorial Board Memberships**
  
  See [http://www.springerlink.com/content/1573-7470/](http://www.springerlink.com/content/1573-7470/).
  - Editorial Board of *Journal of Applied Logic*, Elsevier (since 2003).
  
  - Editor-in-Chief of *IfI Technical Report Series*, Department of Informatics, TU Clausthal (since 2005).
  
  See [http://www.in.tu-clausthal.de/forschung/technical-reports/](http://www.in.tu-clausthal.de/forschung/technical-reports/).
  
  
  See [http://www.jair.org/](http://www.jair.org/)

• Advisory Board of *International Journal of Pattern*, Springer (since 2007).
  See [http://www.ijop.org/](http://www.ijop.org/)

• Editorial Board of *IEEE Transactions of Knowledge and Data Engineering*, AAAI Press (since 2008).
  See [http://www.computer.org/tkde/](http://www.computer.org/tkde/)

  See [www.elsevier.com/wps/locate/jalgor](http://www.elsevier.com/wps/locate/jalgor)

• Associate Editor of *Annals of Mathematics and Artificial Intelligence*, Springer (since 2008).
  See [http://www.springerlink.com/content/1573-7470/](http://www.springerlink.com/content/1573-7470/)

• Member of Review Board of *Journal of Knowledge-Based and Intelligent Engineering Systems*, IOS Press (since 2008).

### Organization of Conferences and Workshops

• Co-Chair (with Simon Parsons, Henry Prakken and Guillermo Simari)
  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semid=34294](http://www.dagstuhl.de/de/programm/kalender/semhp/?semid=34294)

• Co-Organizer (with Tristan Behrens, Mehdi Dastani and Peter Novák)

• Co-Chair (with Rafael Bordini, Mehdi Dastani and Amal El Fallah Segrouchni)
  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=2008361](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=2008361)

• Co-Chair (with Ed Durfee and Cees Witteveen)
  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=2008461](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=2008461)
• Co-Organizer (with Tristan Behrens, Mehdi Dastani, Michael Köster and Peter Novák)
  Agent Contest: Multiagent Programming Contest, Hamburg, Germany, September 2009.
  See http://www.multiagentcontest.org/

• Co-Chair (with Michael Fisher and Peter Novak)
  CLIMA X: Tenth International Workshop on Computational Logic in Multi-Agent Systems, Hamburg, Germany, September 2009.
  See http://jadex.informatik.uni-hamburg.de/mates/bin/view/CLIMA/Home

☐ PC-member of Conferences and Workshops

  See http://foiks.massey.ac.nz/foiks08/

  See http://www.aamas2008.org/

  See http://www.webist.org

• CORE-7: 9th Conference on Computing, Mexico City, Mexico, May 2008.
  See http://www.cic.ipn.mx/core/2008

• EASSS 2008: 10th European Agent Systems Summer School, Student session, Lisbon, Portugal, May 2008.
  See http://centria.di.fct.unl.pt/events/easss08/student.html

  See http://www.aaai.org/Conferences/AAAI/aaai08.php


• JELIA ’08: 11th European Conference on Logics in Artificial Intelligence, Dresden, Germany, September 2008.
  See http://www.jelia.eu

  See http://www.cse.unsw.edu.au/~kr2008/
  See http://nirvana.informatik.uni-halle.de/~schwarz/wlp2008/

• CLIMA 2008: Ninth Workshop on Computational Logic in Multi-Agent Systems, Dresden, Germany, September 2008.
  See http://www.csc.liv.ac.uk/~michael/clima08.html

• MATES ’08: Sixth German Conference on Multiagent System Technologies, Kaiserslautern, Germany, September 2008.
  See http://www.wi2.uni-trier.de/mates08/

• SBIA ’08: 19th Brazilian Symposium on Artificial Intelligence, Salvador, Bahia, Brazil, October 2008.
  See http://www.sbia2008.ufba.br

  See http://www.cs.manchester.ac.uk/ruleML/

  See http://www.umiacs.umd.edu/conferences/sum2008/

  See http://www.rr-conference.org/RR2008/

• CITII ’08: 6th International Conference on Intelligent and Information Technologies, APIZACO, TLAXCALA, Mexico, October 2008.
  See http://sistemas.itapizaco.edu.mx/~citii08

• CIC ’08: 17th International Conference on Computing, Mexico City, Mexico, December 2008.
  See http://magno-congreso.cic.ipn.mx/CIC-2008/

• CIS ’08: International Conference on Computational Intelligence and Security, Suzhou, China, December 2008.
  See http://www.ieee-cis.cn/cis/cis/

• EUMAS ’08: Sixth European Workshop on Multi-Agent Systems, Bath, United Kingdom, December 2008.
  See http://eumas08.cs.bath.ac.uk/

• ICAART ’09: International Conference on Agents and Artificial Intelligence, Porto, Portugal, January 2009.
  See http://www.icaart.org

• WEBIST ’09: 5th International Conference on Web Information Systems and Technologies, Lisbon, Portugal, March 2009.
  See http://www.webist.org
• Workshop on Logics for Agents and Mobility, Logic in Computer Science (LICS '09), Los Angeles, USA, April 2009. See http://www2.informatik.hu-berlin.de/lics/lics09/


• Workshop on Logic and Agent Programming, 21st European Summer School in Logic, Language and Information (ESSLLI '09), Bordeaux, France, July 2009. See http://esslli2009.labri.fr/

• International Joint Conference on Artificial Intelligence, Pasadena (CA), USA, July 2009. See http://www.ijcai.org

• EASSS 2009: 11th European Agent Systems Summer School, Student session, Torino, Italy, August 2009. See http://agents009.di.unito.it/EASSS.html


• KI2009: 32nd German Conference on Artificial Intelligence, WS on Relational approaches to knowledge representation and learning, Paderborn, Germany, September 2009. See http://www.fernuni-hagen.de/wbs/rakrl09.html


• MATES '09: Seventh German Conference on Multiagent System Technologies, Hamburg, Germany, September 2009. See http://jadex.informatik.uni-hamburg.de/mates/bin/view/MATES/Home
• KEOD '09: International Conference on Knowledge Engineering and Ontology Development, Madeira, Portugal, October 2009. See http://www.keod.ic3k.org/cfp.htm


• CIC '09: 18th International Conference on Computing, Mexico City, Mexico, December 2009. See http://magno-congreso.cic.ipn.mx/CIC-2009/

☐ Steering Committees

• Founding Member of MAPContest: Multi Agent Contest (since 2000). See http://www.multiagentcontest.org/steering-committee

• Founding Member of CLIMA: Computational Logic in Multi-Agent Systems (since 2002). See http://centria.di.fc.tudelft.nl/~clima/

• Founding Member of ProMAS: International Workshop on Programming Multiagent Systems Languages and Tools (since 2003). See http://www.cs.uu.nl/ProMAS/

• Member of NMR: International Workshops on Nonmonotonic Reasoning (since 2008). See http://kr.org/NMR/

• Founding Member of Multi-Agent Programming Contest (since 2009). See http://www.multiagentcontest.org/

☐ Invited

• Agents and Their Abilities, Invited Talk (Conference), FOIKS ’08, Pisa, IT, February 2008. See http://foiks.massey.ac.nz/foiks08.

• Logic, Games and Argumentation, Invited Talk (Symposium), ICR Symposium on Games, Argumentation and Logic Programming, Luxemburg, LU, April 2009.

See http://eventseer.net/e/9593/.

☐ Visit

• Prof. Dr. VS Subrahmanian, Dept of CS, University of Oxford, GB, 2008.

See www.comlab.ox.ac.uk/.

• Prof. Dr. Pavlos Moraitis, Dept of CS, University of Paris 6, FR, 2008.

See www.math-info.univ-paris6.fr/~moraitis/.

• Prof. Dr. Amal El Fallah Segrouchni, Dept of CS, University of Paris 7, FR, 2008.

See www-poleia.lip6.fr/~elfallah/.

• Prof. Dr. Cees Witteveen, Dept of CT, Delft University of Technology, L, 2009.

See http://www.st.ewi.tudelft.nl/~witt/.

• Prof. Dr. Leendert van der Torre, Dept of CS, University of Luxemburg, L, 2009.

See http://agamemnon.uni.lu/ILIAS/vandertorre/.

☐ Member

• Institut für Informationssysteme, TU Wien, Favoritenstrasse, 1040 Wien, AT, since 1996.

See http://www.tuwien.ac.at.

• IEEE, 2001 L Street, NW. Suite 700, Washington, DC 20036-4910, USA, since 2004.

See http://www.ieee.org/.

• ACM, USA, since 2004.

See http://www.acm.org.

☐ Lead Function

• Director of Institute for Informatics, Institut für Informatik, Clausthal University of Technology, DE, 2004–2008.

See http://www.in.tu-clausthal.de/.

• Chairman of the committee for W2-Professorship on Combinatorial Optimization, Clausthal University of Technology, DE, 2007–2008.

See http://www.in.tu-clausthal.de/.
• Dean of Faculty for Mathematics/Computer Science and Engineering, Faculty 3, Clausthal University of Technology, DE, since 2008. 
See http://www.fakultaeten.tu-clausthal.de/math-inf-maschinenbau/.

• Vertrauensdozent der Studienstiftung an der TU Clausthal, Clausthal University of Technology, DE, since 2008. 
See http://www.studienstiftung.de.

• Member of Lenkungskreis NTH, Area Computer Science, Clausthal University of Technology, DE, since 2008. 
See http://www.in.tu-clausthal.de/.

☐ Evaluator

See https://cofin.cineca.it/.

See https://cofin.cineca.it/.

• EPSRC Research Council, Expert Evaluator, The Engineering and Physical Sciences Research Council, Polaris House, North Star Avenue, Swindon SN2 1ET, UK, since 2006. 
See http://www.epsrc.ac.uk/.

• Cost Action IC0801, Management Committee Member (nominated by German Government), Brussels, Belgium, since June 2008. 

• IVWT: Research funding and innovation stimulation agency of the Flanders government, Expert Evaluator, BE, April 2008. 
See http://www.iwt.be.

• Netherlands Organisation for Scientific Research, Expert Evaluator, NE, April 2009. 
See http://www.iris.nwo.nl.

See http://www.nwo.nl.

• NSF: National Science Foundation, Expert Evaluator, Robust Intelligence (RI) Division of Information and Intelligent Systems (IIS), July 2009. 
• **Marie Curie individual fellowship**, 7th Framework Program Electronic Proposal Submission Service (EPSS), Brussels, BE, August 2009.


- **External Evaluator (Habilitation)**
  
  See [http://www.jku.at/content](http://www.jku.at/content).

  See [http://www.uni-hamburg.de/](http://www.uni-hamburg.de/).

- **Evaluator (Promotion Committee)**
  
  • **Promotion to Reader**, Expert Referee, Imperial College, UK, March 2008.
  See [http://www.imperial.ac.uk](http://www.imperial.ac.uk).

  • **Promotion to Senior Lecturer**, Expert Referee, University of Bath, UK, March 2008.
  See [http://www.bath.ac.uk/](http://www.bath.ac.uk/).

  See [http://www.abdn.ac.uk/](http://www.abdn.ac.uk/).

  • **Promotion to Teaching Fellow**, Expert Referee, University of Durham, UK, October 2008.
  See [http://www.dur.ac.uk/](http://www.dur.ac.uk/).

  • **Promotion to Full Professor**, Expert Referee, University of Aberdeen, UK, June 2009.
  See [http://www.abdn.ac.uk/](http://www.abdn.ac.uk/).

  • **Promotion to Full Professor**, Expert Referee, New Mexico State University, Texas, US, September 2009.
External Evaluator (PhD)

- Juan Carlos Nieves Sanchez: Modeling arguments and uncertain information – A non-monotonic reasoning approach, External Reviewer (Erstgutachter), Universitat Politècnica de Catalunya, ES, April 2008.
  See http://www.upc.es/.

Person  Prof. Dr. Barbara Hammer

Editorial Board Memberships

- Editorial Board of Neurocomputing, Elsevier (since 2003).
  See http://www.elsevier.com/wps/product/cws_home/505628
- Editorial Board of Neural Processing Letters, Springer (since 2007).
  See http://http://www.springerlink.com/content/100321/
- Editorial Board of IEEE Transactions on Neural Networks, IEEE Computational Intelligence Society (since 2008).
  See http://ieeecomputing.org/pubs/tnn/

Organization of Conferences and Workshops

- Co-Chair (with Luc DeRaedt, Pascal Hitzler, Wolfgang Maass)
  See http://www.dagstuhl.de/en/program/calendar/semhp/?semid=2008041
- Co-Chair (with Michael Biehl, Stefan Kremer, Sepp Hochreiter, Thomas Villmann)
  Dagstuhl-Seminar: Similarity based learning on structures, Wadern, Germany, February 2009.
  See http://www.dagstuhl.de/en/program/calendar/semhp/?semid=2009081

PC-member of Conferences and Workshops

  See http://www.dice.ucl.ac.be/esann/
  See http://www.neural-symbolic.org/NeSy08/
  See http://www.congres.upmc.fr/ANNPR2008/
  See http://www.icann2008.org/
  See http://www.iasted.org/conferences/home-628.htm
3.2 Computational Intelligence

- **NatReS 2008**, Karlsruhe, Germany, October 2008. See [http://natures.few.vu.nl/organizers](http://natures.few.vu.nl/organizers)
- **Computational Intelligence 2009**, Honolulu, Hawaii, USA, August 2009. See [http://www.iasted.org/conferences/home-657.html](http://www.iasted.org/conferences/home-657.html)
- **ICAIS 2009**, Klagenfurt, Austria, September 2009. See [http://icais09.uni-klu.ac.at/](http://icais09.uni-klu.ac.at/)

**Person**  PD Dr. habil. Wojciech Jamroga

- **PC-member of Conferences and Workshops**


• **DALT 2009:** *Declarative Agent Languages and Technologies*, Budapest, Hungary, May 2009.

- **Invited Talks/Invited Lectures**
  
  • Invited Talk.
  *Markov Temporal Logic.*
  Human Media Interaction, University of Twente, Netherlands, January 2008.

  • Invited Talk.
  *A Logic for Reasoning about Rational Agents.*
  Institute of Theoretical Computer Science, University of Hannover, Germany, January 2008.

  • Invited Lecture.
  *What Coalitions Can Achieve.*

  • Invited Talk.
  *Markov Temporal Logic.*
  Institute of Computer Science, Polish Academy of Sciences, Warsaw, Poland, June 2008.

  • Invited Talk.
  *Markov Temporal Logic.*
  Department of Artificial Intelligence, University of Groningen, Netherlands, July 2008.

  • Invited Talk.
  *Markov Temporal Logic.*
  Department of Computer Science, University of Lund, Sweden, July 2008.

  • Invited Lecture.
  *Modal Logics for Games and Multi-Agent Systems.*
  ESSLLI ’08: European Summer School on Logic, Language and Information, Hamburg, Germany, August 2008.
• Invited Talk.
  *Programming Emergent Agents with Multi-Valued Logics.*
  Dagstuhl Seminar on Programming Multi-Agent Systems (08361),
  Dagstuhl Center, Germany, September 2008.

• Invited Talk.
  *Easy yet Hard. Model Checking Abilities of Agents: Complexity Results.*
  Dagstuhl Seminar on Specification, Verification and Test of Open Sys-
  tems (06411), Dagstuhl Center, Germany, November 2008.

• Invited Talk.
  *Markov Temporal Logic.*
  Computer Science and Communication, University of Luxembourg,
  March 2009.

• Invited Talk.
  *Rational Play and Rational Beliefs Under Uncertainty.*
  Wiebe Fest: Workshop in Honour of the 50th Birthday of Wiebe van der
  Hoek, University of Liverpool, UK, March 2009.

• Invited Talk.
  University of Manchester, UK, March 2009.

• Invited Talk.
  *Easy Yet Hard. Model Checking Strategies of Agents.*
  Institute of Theoretical Computer Science, University of Hannover, Ger-
  many, April 2009.

• Invited Talk.
  *What Agents Can Probably Enforce.*
  Instituto Superior Tecnico, Lisbon Technical University, June 2009.

• Invited Talk.
  *Code Patterns for Agent-Oriented Programming.*
  Department of Informatics, University of Lisbon, June 2009.

• Invited Talk.
  *Markov Temporal Logic.*
  CENTRIA, New University of Lisbon, June 2009.

• Invited Lecture.
  *Coalitional Games.*
  EASSS ’09: European Agent Systems Summer School, Torino, Italy,
  September 2009.

• Invited Talk.
  *Reasoning about Code Patterns in Agent-Oriented Programming.*
  Institute of Computer Science, Polish Academy of Sciences, Warsaw,
  Poland, November 2009.
Person Dipl.-Inf Michael Köster

Organization of Conferences and Workshops

- Co-Organizer (with Tristan Behrens, Mehdi Dastani, Jürgen Dix and Peter Novák)
  
  **Agent Contest: Multi-Agent Programming Contest**, Hamburg, Germany, September 2009.
  See [http://www.multiagentcontest.org/](http://www.multiagentcontest.org/)

Invited

  See [http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361](http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=08361).

Person Dr. Peter Novák

Organization of Conferences and Workshops

- Co-Organizer (with Tristan M. Behrens and Jürgen Dix and Mehdi Dastani)
  

- Organizer (with Jürgen Dix and Michael Fisher)
  
  **10th International Workshop on Computational Logic in Multi-Agent Systems**, Hamburg, Germany, September 2009.
  See [http://jadex.informatik.uni-hamburg.de/mates/bin/view/CLIMA/Home](http://jadex.informatik.uni-hamburg.de/mates/bin/view/CLIMA/Home)

PC-member of Conferences and Workshops

  See [http://vsis-www.informatik.uni-hamburg.de/events/mas2/](http://vsis-www.informatik.uni-hamburg.de/events/mas2/)


3.2 Computational Intelligence


**Person** apl. Prof. Dr. Matthias Reuter

- **Organization of Conferences and Workshops**
  - Chair

- **PC-member of Conferences and Workshops**

**3.2.6 Highlights**

- **In 2008**
  - Barbara Hammer (co-)organizes a Dagstuhl seminar on *Recurrent Neural Networks: Models, Capacities, and Applications*.
  - Tristan Behrens, Jürgen Dix and Peter Novák organize the *Multi-Agent Programming Contest 2008* together with Mehdi Dastani (Utrecht University, NL).
  - Jürgen Dix attends the *Perspective Workshop: Theory and Practice of Argumentation Systems*, which was organized by S. Parsons (Brooklyn College, USA), E. Prakken (Utrecht University, NL), G. Simari (Universidad Nacional del Sur - Bahia Blanca, RA) and himself.
  - Jürgen Dix and Wojciech Jamroga give a course on *What Coalitions Can Achieve* at EASSS’08 in Estoril, Portugal.
  - Jürgen Dix acts as Associate Editor for the *Annals of Math and AI*. For the past 10 years, he acted on the Editorial Board of this journal.
  - Matthias Reuter receives the *Technologiepreis der wehrtechnischen Industrie* for the application of CI-methods on the detection of landmines.
  - Barbara Hammer got grants from the DFG for a 3 years’s project entitled *Relevance Learning in Temporal Neural Maps*. 

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*page 117 of 223*
Barbara Hammer coorganizes a session on *Frontiers of Bioinformatics at the 5th Japanese-German Frontiers of Science Symposium* of the Alexander von Humboldt foundation and the Japan Society for the Promotion of Science in Mainz.

Within an Erasmus cooperation, Barbara visits the Computational Intelligence Group of the University of Groningen, the Netherlands.

**In 2009**

- Tristan Behrens, Jürgen Dix, Michael Köster and Peter Novák organize the *Multi-Agent Programming Contest 2009* together with Mehdi Dastani (Utrecht University).
- Jürgen Dix and Peter Novák organize the CLIMA Workshop together with Michael Fisher.
- Our NTH project begins. Jürgen Dix participates in LoCom and Barbara Hammer participates in AIM.
- Jürgen Dix gives an invited talk at the *ICR International Symposium: Games, Argumentation and Logic Programming* (April in Luxemburg).
- Together with Michael Biehl, Sepp Hochreiter, Stefan C. Kremer, and Thomas Villmann, Barbara Hammer organizes a Dagstuhl seminar on *Similarity-based learning on structures*.
- Barbara Hammer coorganizes a session on *Frontiers of Virtual Reality at the 6th Japanese-German Frontiers of Science Symposium* of the Alexander von Humboldt foundation and the Japan Society for the Promotion of Science in Tokyo. (link)
- Matthias Reuter earned two prizes with Detectino. *Land der Ideen* and *Bauma Innovationspreis*.

**Visitors:**

- 26 February – 1 March 2008: Martin Balaz, Comenius University, Bratislava.
- 9 July 2008: Heribert Vollmer, University of Hannover.
• 8 December – 11 December 2008:
Berndt Farwer, Durham University, United Kingdom.

• 8 July – 11 July 2009:
Wojciech Penczek, Institute of Computer Science, PAS, Warsaw, Poland

• 16 June 2009:
Tran Cao Son, New Mexico State University, Las Cruces, New Mexico

• 12. February 2009:
Heribert Vollmer, University of Hannover

• 6 February – 11 February 2009:
Luis Antunes, Lisbon University, Portugal

• 21 September – 25 September:
Thomas Villmann, University of Applied Sciences Mittweida

• 28 September 2009:
Sascha Lange, University of Freiburg

• 30 November – 4 December 2009:
Berndt Farwer, Durham University, United Kingdom
3.3 Computer Graphics

3.3.1 Overview

Leaders
Prof. Dr. Kai Hormann (until 08/2009)
Prof. Dr. Gabriel Zachmann

Secretary
Christine Kammann

Scientific Employees
Dipl.-Inf. David Mainzer (since 05/2008)
Dipl.-Inf. Daniel Mohr
Dipl.-Inf. René Weller
Dipl.-Inf. Tim Winkler (until 09/2009)

3.3.2 Research Agenda

Computer Graphics deals with all aspects of three-dimensional graphical objects drawing from computer science, mathematics, and other sciences. Graphical objects can represent anything from real-world objects, hypothetical objects, data, etc. Computer Graphics is the science of modelling, simulating, visualizing, and interacting with these objects and complete virtual environments built from them.

The Computer Graphics Group focuses mainly on geometric modelling (parameterization, reconstruction), virtual reality (natural interaction), rendering (real-time rendering of complex scenes), acceleration data structures (bounding volume hierarchies, collision detection), and scientific visualization (immersive visualization). The graphics lab is equipped with modern devices that support our research activities (3D scanner, cyberglove, head-mounted display, tracking system, cameras, etc.).

For more information, please visit the group’s homepage at: http://cg.in.tu-clausthal.de.

3.3.3 Supervised Theses


3.3 Computer Graphics


3.3.4 Projects

**Project 33: Free-Viewpoint Video using Depth Cameras**

*Project Members*
- Prof. Dr. Kai Hormann (Leader)
- Dipl.-Inf. Tim Winkler (Project Staff)
- Jens Drieseberg

*Partners*
- Prof. Dr. Craig Gotsman, Technion, Haifa, Israel (Leader)
- Alexander Bogomjakov, Technion, Haifa, Israel

*Funding*
- Volkswagen Foundation (Niedersächsisches Vorab)
  - 103,000€ (of 225,000€ total)

*Duration*
- 01/2006 – 09/2009
Project Description
The main objective of this project is to build an end-to-end software system that will take the output of a small number of static depth cameras, and use this to enable the user to roam the scene with a virtual camera. The user will see high-quality images corresponding to the virtual camera position. This technology has many applications in the entertainment, gaming and medical industries.

References
[Winkler et al., 2008b] (Page 194),
[Winkler et al., 2008a] (Page 212)

Contact E-Mail
kai.hormann@tu-clausthal.de

Project 34: Subdivision of Curves and Surfaces

Project Member
Prof. Dr. Kai Hormann

Partners
Prof. Dr. Nira Dyn, Tel Aviv University, Israel
Prof. Dr. Michael S. Floater, University of Oslo, Norway
Dr. Malcolm Sabin, University of Cambridge, UK

Duration
since 08/2006
3.3 Computer Graphics

Project Description

Subdivision is the process of iteratively refining an initial control polygon or a control mesh into finer and finer polygons or meshes, such that the limit is a smooth curve or surface. One of the most famous schemes for curves is the interpolating 4-point scheme that is based on local cubic interpolants. We combined the idea of local cubic sampling with a local parameterization of the data to create a parametric 4-point scheme which yields nicer limit curves, in particular if the initial data is non-uniformly distributed. In this project we further investigate the reproduction properties of linear subdivision schemes.

References

[Hormann and Sabin, 2008] (Page 192),
[Dyn et al., 2008] (Page 191),
[Dyn et al., 2009] (Page 191)

Contact E-Mail

kai.hormann@tu-clausthal.de

Project 35: Hardware-assisted Rendering

Project Member

Prof. Dr. Kai Hormann

Partners

Dr. Federico Ponchio, ISTI/CNR, Pisa, Italy
Prof. Dr. Rüdiger Westermann, Technische Universität München

Duration

since 01/2008
**Project Description**

Modern graphics cards allow to perform complex visualization task directly on the GPU, which often is much faster and also takes load off the CPU. In this project we have used the GPU features to interactively render 4-dimensional (time-dependent) data that is used to describe physical simulations and to implement an improved algorithm for computing alias-free shadows in high-resolution.

![Image](image.jpg)

**References**

[Ponchio and Hormann, 2008] (Page 193), [Hertel et al., 2009] (Page 203)

**Contact E-Mail**

kai.hormann@tu-clausthal.de

**Project 36: Natural Interaction in Virtual Environments**

**Project Members**

Prof. Dr. Gabriel Zachmann (Leader)
Dipl.-Inf. Rene Weller (Project Staff)

**Funding**

BMBF grant Avilus
28,000€ (of 210,000€ total)

**Duration**

03/2008 – 03/2011

**Project Description**

Virtual reality promised to allow users to experience and work with three-dimensional computer-simulated environments just like with the real world. Currently, VR offers a lot of efficient and more or less intuitive interaction paradigms.
However, users still cannot interact with virtual environments in a way they are used to in the real world. In particular, the human hand, which is our most versatile tool, is still only very crudely represented in the virtual world. Natural manual operations, such as grasping, pinching, pushing, etc., cannot be performed with the virtual hand in a plausible and efficient way in real-time.

Therefore, the goal of this project is to simulate the real human hand by a virtual hand model that is controlled by the user via hand tracking technologies, such as a CyberGlove or camera-based hand tracking (see our companion project).

The interaction between such a virtual human hand model and the graphical objects in the virtual environment is to be modelled and simulated, such that the afore mentioned natural hand operations can be performed efficiently. Note that our approach is not to try to achieve physical correctness of the interactions but to achieve real-time under all circumstances while maintaining physical plausibility.

In order to achieve our goal, we focus our research on deformable collision detection, physically-based simulation, and realistic animation of the virtual hand.

This technology will have a number of very useful applications, which can, until now, not be performed effectively and satisfactorily. Some of them are virtual assembly simulation, 3D sketching, medical surgery training, or simulation games.

Contact E-Mail
zach@tu-clausthal.de
Project 37: Inner Sphere Trees

Project Members
Prof. Dr. Gabriel Zachmann (Leader)
Dipl.-Inf. Rene Weller (Project Staff)

Funding
BMBF grant Avilus
110,000€ (of 210,000€ total)

Duration
03/2008 – 03/2011

Project Description
Collision detection between rigid objects is an essential task in many fields of computer science, e.g. in path-planning, physically-based simulations, and medical applications. Today, there exist a wide variety collision detection libraries that are able to work at interactive rates. Unfortunately, most of them fail, when continuous forces and torques or extremely high frequencies in complex environments are required. Haptic rendering for example needs update rates of at least 1 kHz to guarantee a stable force feedback.

In this project, we developed a new geometric data structure, called Inner Sphere Trees, that not only allows to compute both separation distance and penetration volume in a unified algorithm, but it also lends itself very well to multi-threaded time-critical variants.

The main idea is that we do not build an (outer) hierarchy based on the polygons on the boundary of an object. Instead, we fill the interior of the model with a set of non-overlapping simple volumes that approximate the object’s volume closely. On top of these inner bounding volumes, we build a hierarchy that allows for fast computation of the approximate proximity and the penetration volume.

The penetration volume corresponds to the water displacement of the overlapping parts of the objects and, thus, leads to a physically motivated and continuous repulsion force. The results show that our data structure can answer both kinds of queries at haptic rates with a negligible loss of accuracy.
References
[Weller and Zachmann, 2009a] (Page 212),
[Weller and Zachmann, 2009c] (Page 212),
[Weller and Zachmann, 2009b] (Page 212)

Contact E-Mail
zach@tu-clausthal.de

Project 38: Real-time camera-based 3D hand tracking

Project Members
Prof. Dr. Gabriel Zachmann (Leader)
Dipl.-Inf. Daniel Mohr (Project Staff)

Funding
DFG grant ZA292/1-1
18.000€ (of 300.000€ total)

Duration
07/2003 – 07/2009

Project Description
Hand tracking is a powerful technique for interaction in many applications, for example for navigation in virtual environments, virtual assembly simulation, gesture recognition, and motion capture. The goal of this project is the markerless tracking of the global position and all finger joint angles of a human hand in real-time.

Due to measurement noise, occlusion, cluttered background, inappropriate illumination, high dimensionality (about 27 Degrees of freedom), and real-time constraints, hand-tracking is a very important and interesting scientific challenge.

Our approach is model-based, utilizing multiple cameras and multiple features e.g. edge gradients and skin color to reduce uncertainty. In order to achieve real-time hand-tracking, we use a hierarchical matching approach and dimension reduction techniques. We will combine both and additionally exploit time coherence to achieve reliable prediction of the hand state in each frame.
References

[Mohr and Zachmann, 2009a] (Page 206)

Contact E-Mail

zach@tu-clausthal.de

Project 39: Open-Source Collision Detection Library

Project Members

Prof. Dr. Gabriel Zachmann (Leader)
Dipl.-Inf. Rene Weller (Project Staff)

Funding

Volkswagen AG. Projekt: Untersuchung schneller Algorithmen für haptisches Rendering
16.000€ (of 16.000€ total)

Project Description

Fast and exact collision detection between a pair of graphical objects undergoing rigid motions is at the core of many simulation and planning algorithms in computer graphics and related areas (for instance, automatic path finding, or tolerance checking). In particular, virtual reality applications such as virtual prototyping or haptic rendering need exact collision detection at interactive speed for very complex, arbitrary “polygon soups”. It is also a fundamental problem of dynamic simulations of rigid bodies, simulation of natural interaction with objects, haptic rendering, path planning, and CAD/CAM.

In order to provide an easy-to-use library for other researchers and open-source projects, we have implemented our algorithms in an object-oriented library. Originally based on OpenSG, the library is now completely platform-independent, including support for multithreading. It is structured as a pipeline and contains algorithms for both the broad phase (grid, convex hull test, separating planes) and the narrow phase (Dop-Tree, Box-Tree, etc.).
**Project 40: Benchmarking Suite for Static Collision Detection Algorithms**

**Project Members**
- Prof. Dr. Gabriel Zachmann (Leader)
- Dipl.-Inf. David Mainzer (Project Staff)

**Funding**
- BMBF grant Avilus
- 82,000€ (of 210,000€ total)

**Project Description**
There are a number of algorithms for collision detection between rigid objects. Unfortunately, it is extremely difficult to evaluate and compare collision detection algorithms, because in general they are very sensitive to specific scenarios, i.e. to the relative size of the two objects, the relative position to each other, the distance or intersection volume, etc. As a result, it is nontrivial to compare two algorithms and their implementations.

A standardized benchmarking suite for collision detection should make fair comparisons between algorithms much easier. Such a benchmark must be designed with care, so that it includes a broad spectrum of different and representative contact scenarios.

In this project, we propose a simple benchmark procedure which eliminates these effects. Our benchmarking suite has been kept very simple so that other researchers can easily reproduce the results and compare their algorithms.
Our benchmarking suite is flexible, robust, and it is easy to integrate other collision detection libraries. Moreover, the benchmarking suite is freely available and can be downloaded together with a set of objects in different resolutions that cover a wide range of possible scenarios for collision detection algorithms, and a set of precomputed test points for these objects. To compute those test points, the benchmarking suite used 5600 CPU days to computed all configurations.

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zach@tu-clausthal.de

3.3.5 Scientific Activities

Person Prof. Dr. Kai Hormann

- Organization of Conferences and Workshops
  - Co-Organizer (with Alla Sheffer and Konrad Polthier)
  
  

- PC-member of Conferences and Workshops
  
  See [http://www.cs.sunysb.edu/smi08/](http://www.cs.sunysb.edu/smi08/)

  
  See [http://3dpvt.org/](http://3dpvt.org/)

  
  See [http://www2.imm.dtu.dk/SGP08/](http://www2.imm.dtu.dk/SGP08/)
3.3 Computer Graphics


  See [http://www.inf.uni-konstanz.de/vmv/](http://www.inf.uni-konstanz.de/vmv/)

- SMI '09: *IEEE International Conference on Shape Modeling and Applications*, Beijing, China, June 2009.


  See [http://sgp09.mi.fu-berlin.de/](http://sgp09.mi.fu-berlin.de/)

- Thirteenth IMA Conference on the Mathematics of Surfaces, York, United Kingdom, September 2009.
  See [http://ralph.cs.cf.ac.uk/MOSXIIIcall.html](http://ralph.cs.cf.ac.uk/MOSXIIIcall.html)

  See [http://www.siam.org/meetings/gdspm09/](http://www.siam.org/meetings/gdspm09/)

- VMV 2009: *14th International Fall Workshop Vision, Modeling, and Visualization*, Braunschweig, Germany, November 2009.
  See [http://vmv09.tu-bs.de/](http://vmv09.tu-bs.de/)

Evaluator

- Expert Evaluator for Österreichische Forschungsförderungsgesellschaft (FFG), 7th Call of BRIDGE, Austria, May 2008.
  See [http://www.ffg.at](http://www.ffg.at).

Invitations/Visiting Professorships

  See [http://www.dmmm.uniroma1.it/subdivision/](http://www.dmmm.uniroma1.it/subdivision/)

  See [http://www.dmmm.uniroma1.it/subdiv09/](http://www.dmmm.uniroma1.it/subdiv09/)

- Visiting BMS Professor, Department of Mathematics and Computer Science, Freie Universität Berlin, Germany, November 2007 – March 2008.
  See [http://www.math-berlin.de/faculty/bms-substitute-professors.htm](http://www.math-berlin.de/faculty/bms-substitute-professors.htm).
Person  Prof. Dr. Gabriel Zachmann

- **Organization of Conferences and Workshops**
  - Panels Chair
  - Tutorials Chair and Program Committee
    See [http://conferences.computer.org/vr/](http://conferences.computer.org/vr/)

- **PC-member of Conferences and Workshops**
    See [http://www.grapp.org/](http://www.grapp.org/)
    See [http://www.kyb.tuebingen.mpg.de/EGVE/](http://www.kyb.tuebingen.mpg.de/EGVE/)
    See [http://3dpvt.org/](http://3dpvt.org/)
  - *IEEE Visualization Conference*, Columbus, Ohio, USA, October 2008.
    See [http://vis.computer.org/VisWeek2008/](http://vis.computer.org/VisWeek2008/)
• *IEEE Information Visualization Conference*, Columbus, Ohio, USA, October 2008.  
  See [http://vis.computer.org/VisWeek2008/](http://vis.computer.org/VisWeek2008/)

• *IEEE Symposium on Visual Analytics Science and Technology*, Columbus, Ohio, USA, October 2008.  
  See [http://vis.computer.org/VisWeek2008/](http://vis.computer.org/VisWeek2008/)

  See [http://www.isvc.net/](http://www.isvc.net/)


• *XI Symposium on Virtual and Augmented Reality (SVR)*, Porto Alegre, Brazil, May 2009.  


• *Workshop on Virtual Reality, Interaction, and Physical Simulation (VRI-PHYS)*, Karlsruhe, Germany, November 2009.  
  See [http://www.vriphys.org/workshops/vriphys09/](http://www.vriphys.org/workshops/vriphys09/)

• *Vision, Modeling, and Visualization (VMV)*, Braunschweig, Germany, November 2009.  
  See [http://vmv09.tu-bs.de/](http://vmv09.tu-bs.de/)

• *5th International Symposium on Visual Computing (ISVC)*, Las Vegas, NV, USA, November 2009.  
  See [http://www.isvc.net/](http://www.isvc.net/)

Evaluator

• Expert reviewer for the monitoring of EU STREP project 034691 Net-WMS within FP6 ([http://net-wms.ercim.org/](http://net-wms.ercim.org/)).

• Member of the “Kuratorium der Innovationsallianz Virtuelle Techniken” ([http://www.avilus.de/](http://www.avilus.de/)).

• Member of the review panel "Information and Communication Technologies" for the Cyprus Research Promotion Foundation (RPF).

• External examiner and referee for PhD candidates and theses at Koblenz-Landau University, Bonn University, and the mechanical engineering department of Clausthal University.
Invitations


3.3.6 Highlights

In 2009

- March 2009: Kai Hormann received a call from the Katholieke Universiteit Leuven for the position of an Associate Professor in Numerical Analysis.
- September 2009: Kai Hormann accepted a call from the Università della Svizzera italiana to become an Associate Professor at the Faculty of Informatics in Lugano.
- 17 September 2009 – 18 September 2009: Status meeting of the Innovation Alliance Virtual Technology, where the first results of the AVILUS project were presented.
- 7 December 2009 – 9 December 2009: Gabriel Zachmann joined EuroVR as a founding member; EuroVR is the European Association for Virtual Reality and Augmented Reality: an international non-profit Association designed to bring together all those interested in VR/AR Technologies and to pursue the development and further deployment of such technologies.

Visitors

- 3 April 2008 – 10 April 2008: Dr. Johannes Zimmer from Bath visited us for a week to perform some joint research on transformation paths in multiphase materials.
3.4 Computer Systems / Embedded Systems

3.4.1 Overview

Leaders
Prof. Dr.-Ing. Dr. rer. nat. habil. Harald Richter
Prof. Dr. Christian Siemers (50% standing-in for vacant professorship Distributed Systems since 04/2008)
apl. Prof. Dr. Günter Kemnitz

Secretary
Andrea Behfeld
Christine Kammann

Scientific Employees of Prof. Richter
Dipl.-Inf. Christian Asam (until 08/2008)
Dipl.-Ing. (FH) Stefan Aust
B.Sc./B.Eng. Garry Rank (until 10/2008)
Dipl.-Ing. Rong Wang
Dipl.-Inf. Marcel Wille (until 04/2008)
Dipl.-Ing. Xing Xing Hu

Scientific Employees of Prof. Siemers
Dipl.-Inf. René Fritzschte
Dipl.-Inf. Sascha Lützel

Scientific Employees of apl. Prof. Kemnitz
Dipl.-Inf. Carsten Giesemann

External Ph.D. Students of Prof. Richter
Dipl.-Inf. Dietmar Sommerfeld, Computing Center of Max-Planck-Society (GWDG), Göttingen
Dipl.-Inf. Janko Heilgeist, Fraunhofer-Institute for Algorithms and Scientific Computing (SCAI), St. Augustin
Dipl.-Inf. Yang Xiang, Computing Center of Max-Planck-Society (RZG), Garching

External Ph.D. Students of apl. Prof. Kemnitz
Dipl.-Inf. Hossam Ramadan, Syria

DAAD Students of Prof. Richter
Mostafa Mahmoud Hassan, Egypt
Stefan Stefanov, Bulgaria
Saamer Akhshabi, Iran
Karen Abrahami, Armenia
Akshay Milap, India
3.4.2 Research Agenda

The group of Prof. Richter has its focus on following research areas: Computer networks (Realtime LANs for cars, process control and automation), Automobile mechatronics (Xby-wire, Cockpit-by-wire, driving simulator, autonomously driving rover), Computer architectures (Real-time parallel computers for measurement-data acquisition and -processing, feed forward and feed back control), Grid computing (Job scheduling in compute grids, job allocation in data grids), and Distributed Systems (Global Authentication and Authorization Infrastructure).

See the group’s homepage at: http://www.in.tu-clausthal.de/abteilungen/rechnersysteme/personen/ and the research home page at http://www.in.tu-clausthal.de/abteilungen/technische-informatik-und-rechnersysteme/forschung/

The research group of Prof. Siemers deals with various types of technical systems and applications: computer hardware, industrial control systems and mechatronical systems with the focus on embedded systems. Main topics inside these areas are execution time-based design methodology, system reliability and - emerging inside embedded systems - observability.

The TEC Project (Time-Enhanced C) deals with design support (both hard- and software) for small embedded systems and implements approaches for execution time-based design methodology. This is done to avoid malfunctions in real time applications at design time.

On the observability and reliability side, the PERM project e.g. embeds safety management features in the hardware of a RISC processor and uses compiler-generated additional information at runtime. The WatchCop project, a supervisor coprocessor for Von-Neuman architectures, controls program flow at runtime and supports scheduling inside operating systems. Last but not least the same appears to spatial computing devices like FPGAs, here the SEM (soft error mitigation) approach implements observing and mitigating faults originated by soft errors.

As additional topic graphical representation inside embedded systems (GRES) are included within the research group to emphasize the focus that man-computer-interfaces (MCI) are becoming more and more important inside the embedded world.

See the group’s homepage at: http://www.in.tu-clausthal.de/abteilungen/embedded-systems

The group of Prof. Kemnitz deals with various types of technical systems and applications: computer hardware, control systems, mechatronical systems and robots. The main focus is on reliability.
See the group's homepage at: [http://techwww.in.tu-clausthal.de/](http://techwww.in.tu-clausthal.de/)

### 3.4.3 Supervised Theses


### 3.4.4 Projects

**Project 41: CarRing II - A Real-Time Computer Network for Automobiles**

**Project Members**

- Prof. Dr. Harald Richter (Leader)
- Dipl.-Ing. Xing Xing Hu (Project Staff)
- Dipl.-Ing. Rong Wang (Project Staff)

**Funding**

German Science Foundation (DFG), TU Clausthal, German Academic Exchange Service (DAAD), Ministry for Science and Culture (MWK), Bund der Freunde der TUC, Faculty, diverse Companies

120,000€ (of 390,000€ total)
**Duration**

since 2005

**Project Description**

CarRing II is a real-time computer network which can outmatch and replace the field busses that are currently used in cars. It offers high reliability, scalability from small to large systems, efficient medium access, and a higher level of abstraction for the end user, beside a much higher data rate (>1 Gbit/s) than field busses. Furthermore, the milelong cable tree in the vehicle is significantly reduced. CarRing II is a complete implementation of the ISO 7 layer model, so that functionality from higher layers 3 to 6 have to be no longer implemented by user programs, as it is nowadays common practice in the automotive domain. Rather, those layers are executed in real time by specialized network processors, thus assuring predictable latencies for data transmission. These processors are integrated into a single FPGA which acts as a CarRing node. In each node, 9 Microblaze Softcore processors are working in parallel to execute CarRing II protocols, while communicating with each other in real time. Up to 16 nodes can be coupled in a ring, up to 255 rings are possible in every car (=> A maximum of 36720 communication processors per car). CarRing II is funded by DFG.

**References**

[Richter, 2009] (Page 215)

**Contact E-Mail**

hri@tu-clausthal.de

**Project 42:  TUCar - A Test Platform for Communication and Control in Cars**

**Project Members**

Prof. Dr. Harald Richter (Leader)  
Dipl.-Ing. (FH) Stefan Aust (Project Staff)

**Partners**

Dr. Vetter, IPP, TUC (until 2009)  
Dr. Kelber, DHB Componentes Automotivos  
Prof. Beck, IEE, TUC

**Funding**

TU Clausthal, German Academic Exchange Service (DAAD), diverse Companies (Volkswagen, Lenze GmbH, Sick GmbH)  
80.000€ (of 260.000€ total)

**Duration**

since 2009
Project Description

TUCar is a moving test platform for evaluating new concepts in communication and control of electronic controller units (ECUs). The mission of TUCar is the testing of the following two goals for a future car:

- Improved data transmission between all electronic components
- Re-centralization of ECUs

Therefore, the two sub-projects CarRing II and ConPar have been defined. CarRing II allows for intra-car communication by means of a realtime computer network instead of field busses. ConPar bundles ECUs in one unit via emulating them in a reliable realtime parallel computer. The Institutes for Electrical Information Technology and Electrical Energy Technology of the university are supportive to the project which is funded by Volkswagen AG, IAV GmbH and Lenze GmbH. A cooperation exists also with DHB Componentes Automotivos in Brasil.

References

[Aust and Richter, 2009] (Page 195)

Contact E-Mail

hri@tu-clausthal.de

Project 43: Rover - An Autonomously Driving Model Car

Project Members

Prof. Dr. Harald Richter (Leader)
Cand. Inf. Th. Hauschild (Project Staff)

Partner

Axel Schultze, IAV GmbH, Gifhorn

Funding

IAV GmbH
40,000€ (of 40,000€ total)

Duration

since 2008

Project Description

In project model rover, which is developed and built in close cooperation with IAV GmbH at Gifhorn, are the paramount tasks "communication in automobile" as well as "autonomous driving" and "central control of steering, motor and sensors". The rover is a self-steering car which is based in its mechanical construction on a steel chassis and a plastic autobody. The Rover is made in the scale of 1:5 (app. 80x20x10 cm³) and reflects in its design a race car. It contains a 32 Bit microcontroller from Atmel (AVR 32) als central ECU, as well as an electro servo steering, an electro drive, a hall sensor as position encoder, and 6 super sonic sensors.
It drives on a programmable trajectory which has, in our case, the shape of a flat laying 8. When the super sonic sensors detect an obstacle standing in the rover's curve, it reduces speed and tries to circumvent the hindrance, in order to return to its programmed trajectory afterwards.

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**Project 44: Compute Grid - A Meta Scheduler for DEISA**

**Project Members**

Prof. Dr. Harald Richter (Leader)
Dipl.-Inf. Janko Heilgeist (external project staff)

**Partner**

Dr. Thomas Soddemann, Fraunhofer-Institute for Algorithms and Scientific Computing (SCAI)

**Duration**

2006 – 2010

**Project Description**

The goals of the Compute Grid project are the design and the implementation of a meta scheduler for DEISA (Distributed European Infrastructure for Supercomputing Applications) which migrates user jobs between 11 European high performance computing centers (= automatic load balancing). Among the tasks to be solved are:

- A situation-dependent selection of algorithms for the discovery and allocation of free resources in the grid to jobs which are ready to run. This is accomplished by means of a robust peer-to-peer overlay communication network.
- An efficient grid scheduling by means of the multiple-criterion optimization-procedure AHP (Analytical Hierarchy Process), together with a dynamic-variable function (Tangens Hyperbolicus) to compute the AHP utility value.
- Design, implementation and test of the software
- Test in an realistic operation scenario (DEISA)

The Open Grid Services Architecture (OGSA) is used as a basis for the implementation, since OGSA provides standard interfaces for the grid environment. The usage of OGSA allows to operate the meta scheduler with Globus Toolkit V4 as well as with Unicore V6 als Grid Middleware.

**References**

[Heilgeist et al., 2009a] (Page 202),
[Heilgeist et al., 2009b] (Page 214),
[Heilgeist et al., 2008] (Page 202)
**Project 45: Data Grid - A Meta Scheduler for D-Grid**

**Project Members**
Prof. Dr. Harald Richter (Leader)
Dipl.-Inf. Dietmar Sommerfeld (external project staff)

**Partner**
Prof. Dr. Bernd Neumaier, GWDG, Göttingen

**Duration**
2006 – 2010

**Project Description**
The goal of this project is to optimize the performance of applications for the German D-Grid (subproject Medigrid), which exhibit frequent access to large data bases. The optimization is achieved by means of a meta scheduler which will become part of the Medigrid middleware. Among the tasks of the meta scheduler is to measure performance parameters of the sites participating in Medigrid, as well as to take into account the desired job requests and the available site resources, such that requests and resources are matched. Performance parameters are the number of CPUs, the lengths of the input queues, the sizes of the main memories, and the job and data transfer times. Part of the meta scheduler is a resource matcher which compares the tasks’ workflow of a job that was specified by means of GWUI (Grid Workflow User Interfaces) with that resources that are currently available. The resource matcher finds appropriate matchings by a just-in-time comparison of offers and requests. All necessary parameters for matching are taken into account in a two-tire procedure. In the first tire, HEFT (Heterogeneous Earliest-Finish-Time) is used as a priority-based algorithm to establish a static precedence for the tasks that have to be executed for a job (= full-ahead schedule). In the second tire, these tasks are allocated to available resources, according to performance measurements in the sites, tasks’ priorities, and estimated data transfer and CPU execution times (= (just-in-time schedule). Implementation is made by GlobusToolkit V4 and the Workflow Manager GWES.

**References**
[Sommerfeld and Richter, 2009d] (Page 210),
[Sommerfeld and Richter, 2009b] (Page 210),
[Sommerfeld and Richter, 2009a] (Page 215),
[Sommerfeld and Richter, 2009c] (Page 190),
[Sommerfeld et al., 2008] (Page 210)

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hr@tu-clausthal.de
Project 46: **Fast+Safe+Net - Hardware and Software Development**

**Project Members**
- Prof. Dr. Christian Siemers (Leader)
- Dipl.-Inf. René Fritzsche (Project Staff)

**Partners**
- Dipl.-Ing. Walter Zander, Zander GmbH&Co KG, Aachen, Germany (Leader)
- Dipl.-Ing. Alfons Austerhoff, Zander GmbH&Co KG, Aachen, Germany

**Funding**
- BMWi
  - 136,500€ (of 268,000€ total)

**Duration**

**Project Description**
Automation technology for controlling machines and safety technology to prevent persons and machines from accidents - both emerging technologies - are currently joining. While this is already addressed inside the preceding project, this project is started to develop all components for a safe distributed system for automation and control. One main component of this project is the research and development of one or more safe network standards PLCs (Programmable Logic Control), the other consist of the design methodology for safe distributed automation systems.

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Project 47: **University Region Harz (Hochschulregion Harz)**

**Project Members**
- Prof. Dr. Christian Siemers (Leader)
- Dipl.-Inf. René Fritzsche (until 09/2009) (Project Staff)
- Dipl.-Inf. Jens Drieseberg (since 10/2009) (Project Staff)

**Partners**
- Prof. Dr. Jörg Wagner, Fachhochschule Nordhausen, Germany (Leader)
- Dipl.-Ing. Jantje Samtleben, Fachhochschule Nordhausen, Germany

**Funding**
- Stifterverband für die Deutsche Wissenschaft and Heinz-Nixdorf Stiftung
  - 140,000€ (of 400,000€ total)

**Duration**
- 04/2008 – 03/2010
Project Description

The project “Hochschulregion Harz” is jointly designed and performed by the two partner universities in Clausthal and Nordhausen. The main goals are the development of joint research activities - focused on computer science, energy engineering and geo-engineering - and the development of collaborative teaching programs. While the research part consists of some small-scale projects, a collaboratively offered master of engineering (Embedded Software Engineering) is currently under development as teaching part inside the project.

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Project 48: Adaptive Hardware Architectures - Local Communities in Information Cities (LocCom)

Project Members
Prof. Dr. Christian Siemers (Leader)
Dipl.-Inf. Sascha Lützel (Project Staff)

Partners
Prof. Dr. Michael Beigl, University of Technology Braunschweig, Braunschweig, Germany (Leader)
Prof. Dr. Jürgen Dix, University of Technology Clausthal, Clausthal-Zellerfeld, Germany (Leader)
Prof. Dr. Wolfgang Nejdl, Leibniz University of Hannover, Hannover, Germany (Leader)
Prof. Dr. Heribert Vollmer, Leibniz University of Hannover, Hannover, Germany (Leader)
Prof. Dr. Lars Wolf, University of Technology Braunschweig, Braunschweig, Germany (Leader)

Funding
Land Niedersachsen  
152.865€ (of 2.541.218€ total)

Duration
03/2009 – 08/2011

Project Description

In a time where climatic questions and global heating are on focus, power efficient computing becomes a first class design constraint. Additionally most of the PDA’s have to manage computing with strong limited battery power. The “SmartFolk” will have the same problem, and battery power will not significantly increase next years. On the other side the same device has to offer real-time analyzing of incoming contexts and react to them.
Specifically the analysis of contexts will use a lot of limited battery power. The goal of this project is to define a computing architecture with sufficient computational power at a minimum of power consumption.

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Project 49: HuBoTUC – Humanoid Robots of Technical University of Clausthal

Project Members
Prof. Günter Kemnitz (Leader)
Dipl.-Inf. Carsten Giesemann (project staff)
Dipl.-Inf. Hossam Ramadan (project staff)

Duration
2009 – 2011

Project Description
Humanoide robots of type Robonova are enhanced to interactive controlable agents. The microprocessor based control units are substituted by a self-manufactured FPGA control units with additional sensors and a real-time wireless communication unit. Also parts of a visual tracking system are under construction. The robots are used to investigate various robot control algorithms.

References
[Ramadan, 2009] (Page 209),
[Kemnitz and Giesemann, 2010] (Page 214)

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Project 50: Redefining Terms Related to Dependability

Project Members
Prof. Günter Kemnitz (Leader)
Dipl.-Inf. Carsten Giesemann (project staff)
Dipl.-Inf. Hossam Ramadan (project staff)
Duration
2008 – 2009

Project Description
Dependability is an integrative concept that encompasses the following attributes: availability (readiness for correct service), reliability (continuity of correct service) and safety (absence of catastrophic consequences for the user(s) and the environment). In our project we redefined these attributes. We are looked at them not only as concepts but as quantities. That makes it possible to measure or estimate them by experiments. The measurability makes the quantities more comprehensive and allows defining experiments to get values and to compare different solutions with each other.

References
[Kemnitz et al., 2008a] (Page 204),
[Kemnitz et al., 2008b] (Page 204)

Contact E-Mail
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3.4.5 Scientific Activities

Person
Prof. Dr. Harald Richter

☐ PC-member of Conferences and Workshops

  See http://www.iaria.org/conferences2008/ADVCOMP08.html

  See http://www.iaria.org/conferences2008/ICSNC08.html

  See http://www.iaria.org/conferences2009/ADVCOMP09.html

☐ Visits, Awards, Invited Talks

- Numerous visits took place to LUH Hannover and TU BS Braunschweig in 2009 because of the preparation of the NTHCar project. Due to our external Ph.D. students, several visits took place to GWDG Göttingen, Max-Planck-Computing Center, and Fraunhofer-Institut für Algorithmen und Wissenschaftliches Rechnen (SCAI), St. Augustin.
• Best Paper Award on the IARIA International Conference on Advanced Engineering Computing and Applications in Sciences ADVCOMP 2009, Sliema, Malta for the contribution: Janko Heilgeist, Thomas Soddemann and Harald Richter, Design and Implementation of a Distributed Metascheduler.

• Invited Talk. 
  *MessPar - Ein Parallelrechner zur Echtzeitdatenerfassung und -verarbeitung.*
  Karlsruhe Research Center (K.I.T.), on invitation of Prof. Gemmeke, December 2008.

• Invited Talk. 
  *MessPar - Ein Parallelrechner zur Echtzeitdatenverarbeitung.*
  University of Linz, on invitation of Prof. Hagelauer, Austria, December 2008.

• Invited Talk. 
  *Datenübertragung für Fahrerassistenz- und -informationssysteme mit Hilfe von CarRing II.*

• Invited Talk. 
  *IT-Technologie als Innovationsmotor in der Automobilbranche - Qualitätsteigerung im Auto durch eine neue Art der Datenkommunikation.*
  Annual Meeting PASS Consulting Group, Bingen, on invitation of PASS GmbH, April 2008.

• Invited Talk. 
  *Datenübertragung im Automobil mit Hilfe von CarRing II.*
  Informatik-Kolloquium of TU Braunschweig, on invitation of Prof. Wahl, April 2008.

• Invited Talk. 
  *Das TUCAR/CarRing II-Projekt.*

• Invited Talk. 
  *CarRing II - Echtzeitrechnernetz für die Intra-Auto-Kommunikation.*
  Forum CeBIT 2008, Hannover, on invitation of CeBit organisation committee, March 2008.

☐ New Memberships

• Since 2009 member of the board of GI-Fachgruppe Informatische Bildung in Niedersachsen und Bremen.

• Until 2008 member of the Fakultätsrat of the faculty for Mathematics/Informatics und Mechanical Engineering.
3.4 Computer Systems / Embedded Systems

- **Cooperations**
  - Computing Center of Max-Planck-Society GWDG, Göttingen.
  - Computing Center of Max-Planck-Society RZG, Garching.
  - Fraunhofer-Institute for Algorithms and Scientific Computing (SCAI), St. Augustin.
  - Volkswagen AG, Wolfsburg.
  - IAV GmbH, Gifhorn.
  - DHB Componentes Automotivos, Porto Alegre, Brasil.
  - TU Varna, Bulgaria, for DAAD students exchange.

**Person** Prof. Dr. Christian Siemers

- **Editorial Board Memberships**
  - Advisory Board of *Mechatronik F&M*, Hanser (since 2005).
    See [http://www.elektronikpraxis.vogel.de/index.cfm?pid=2052](http://www.elektronikpraxis.vogel.de/index.cfm?pid=2052)

- **Other Functions**
  - Christian Siemers is an Expert Evaluator in the INNOWATT funding program of the BMWi since 2007.

3.4.6 Highlights

**Person** Prof. Dr. Harald Richter

- Exhibitor at the CeBIT Fair, Hannover, with the CarRing II-Teststand
- Host for Scholarship and Internship Holders: Prof. Richter receives on a regular basis about 4 students per year from abroad in the frame of the DAAD IAESTE (all countries) and WISE programs (India) that are doing their internship and student apprentices in our research projects.

- **Donations received**
  - 2009: Donation of 4 scholarships in the height of 1000 € each per year from IAV GmbH for our best students during their whole study
  - 2008: Donation of approx. 30 Tsd € from Volkswagen AG for project TUCAR
  - 2008/2009: Donation of approx. 40 Tsd € from IAV GmbH for project Model Rover
E-Learning: Lectures Rechnernetze I, II, and Rechnerarchitektur I, II are transmitted on a regular basis to Clausthal and Göttingen Universities (since 2004). See http://www.in.tu-clausthal.de/abteilungen/rechnersysteme/lehre/

Politics

- 2008: Letter to the minister president of Lower Saxony, Ch. Wulff, about the situation in informatics education at schools in the state (together with Prof. Diethelm und Dr. Struckmann)
- 2008: Collecting of more than 50 signatures from celebrities from car industry and academia in order to improve the situation in informatics education at schools in Lower Saxony (together with Prof. Diethelm, Prof. Modrow und Dr. Struckmann)

**Person** Prof. Dr. Christian Siemers

Christian Siemers is involved in the “Exzellenz-Initiative Profil und Kooperation” for small and medium-sized universities (following a call for proposals by the Stifterverband für die Deutsche Wissenschaft and the Heinz-Nixdorf Stiftung), funded from April 2008 until March 2010. Since April 2008 he coordinates the cooperation, and for this purpose he is with the University of Applied Sciences Nordhausen and with the Clausthal University of Technology, each for 50%, to be continued in 2010.

**Person** apl. Prof. Dr. Kemnitz

In 2009 Springer-Verlag has published the new textbook “Technische Informatik 1: Elektronik” by Günter Kemnitz [Kemnitz, 2009].
3.5 Databases and Information Systems

3.5.1 Overview

Leader Prof. Dr. rer. nat. habil. Sven Hartmann

Secretary Andrea Behfeld

Scientific Employees Dr. rer. nat. Thu Trinh

Dr. rer. nat. Thu Trinh

Dipl.-Math. Sven Arnhold

External Students Jing Wang, Alan Wilson Centre of Molecular Ecology and Evolution

Douglas Mubayiwa, IBM Australia

Wolfgang Scherer, AXA Versicherung

Alexander Stuwe, Berliner Volksbank

3.5.2 Research Agenda

The research of our group focusses on topics in data engineering (XML data processing, data semantics, data mining, database optimisation, database security, logic in databases, ontologies), information systems engineering (conceptual modelling, services, simulation), and optimal discrete structures and algorithms (combinatorial designs, graph decompositions, extremal sets). We are active in interdisciplinary research on emerging applications of databases and information systems in e-science and e-business.

For more information, please see our web site at http://dbis.in.tu-clausthal.de.

3.5.3 Supervised Theses


3.5.4 Projects

Project 51: Databases and Information Systems

Project Members

Prof. Dr. Sven Hartmann (Leader)
Dr. Thu Trinh
Dipl.-Math. Sven Arnhold

Partners

Prof. Dr. Joachim Biskup, Dortmund University of Technology
Prof. Dr. Phoebe Chen, Deakin University
Dr. Markus Kirchberg, Institute for Infocomm Research, A*STAR
Prof. Dr. Dirk Labudde, Mittweida University of Applied Sciences
Prof. Dr. Dirk Linowski, Steinbeis University
Prof. Dr. Bernhard Thalheim, University of Kiel

Funding

Alfried Krupp von Bohlen und Halbach Foundation, administered by the German Scholars Organisation
100,000€ (of 100,000€ total)

Duration

01/2008 – 12/2012

Project Description

We are investigating distributed data- and knowledge-intensive systems from a variety of perspectives, with a focus on models, architectures and methods for describing and developing them, but also on their mathematical, logical, computational and managerial foundations. Our work further includes the implementation of prototype systems that demonstrate the feasibility of our research for developing up-to-date systems for applications in like science, engineering, business, and education.

References

[Hartmann and Kern-Isberner, 2008] (Page 187),
[Hartmann et al., 2008e] (Page 188),
[Song et al., 2008] (Page 188),
[Hartmann and Link, 2008] (Page 191),
[Hartmann and Link, 2009c] (Page 192),
[Hartmann and Link, 2009d] (Page 192),
[Hartmann and Link, 2010b] (Page 201),
[Linowski and Hartmann, 2008] (Page 189),
[Trinh, 2009] (Page 211)

Contact E-Mail

sven.hartmann@tu-clausthal.de
Project 52: Cardinality Constraints for XML

Project Members
Prof. Dr. Sven Hartmann (Leader)
Dr. Thu Trinh

Partners
Prof. Dr. Sebastian Link, Victoria University of Wellington (Leader)
Dr. Flavio Ferrarotti, Yahoo! Research Latin America

Funding
Marsden Fund, administered by the Royal Society of New Zealand
100,000€ (of 200,000€ total)

Duration
03/2009 – 02/2012

Project Description
The Extensible Markup Language (XML) has evolved to be the lingua franca for data integration and data exchange on the Internet and elsewhere. This development has led to a dramatic increase of XML data that must be stored, managed and processed in its native format. The syntactic expressibility of XML together with the tree-like nested structure of its data impose new challenges for database researchers. It is particularly difficult to develop data management tools that are both efficient and cater for a large class of properties that are naturally exhibited by XML data. Our project is based on the somewhat surprising observation that cardinality constraints have not been exploited in the context of XML. Cardinality constraints can express many properties of XML data that cannot be captured by other classes of XML constraints. They have a direct impact on many XML recommendations such as schema specification languages, query languages or data manipulation and transformation languages. We aim at developing a well-founded theory that gives original insight into the characteristics of XML data, enhances the semantic capabilities of XML, allows designers to make an informed choice about which classes of cardinality constraints to incorporate into XML recommendations, and provides efficient algorithms to advance XML data processing.

References
[Hartmann and Link, 2010a] (Page 192)

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Project 53: Optimal Discrete Structures and Algorithms in Computer Science

Project Members
Prof. Dr. Sven Hartmann (Leader)
Dipl.-Math. Sven Arnhold
Partners

Prof. Dr. Genian Ge, Zhejiang University
Prof. Dr. Martin Grüttmüller, Leipzig University of Applied Sciences
Dr. Thomas Kalinowski, University of Rostock
Prof. Dr. Uwe Leck, University of Wisconsin
Prof. Dr. Rolf Rees, Memorial University of Newfoundland
Dr. Ian Roberts, Darwin University

Duration
01/2008 – 12/2012

Project Description
Discrete structures such as combinatorial designs and graph decompositions that meet subtle balancing conditions that are inherent in many problems in computer science. This makes them a powerful tool that can be utilised in studying and elegantly solving such problems. Discrete structures have been successfully applied to analyse, design and test algorithms, software and hardware. Examples include network communication schemes, authentication schemes, key distribution schemes, distributed data stores, highly reliable RAID, distributed sensor networks, information retrieval, and experiments in bioinformatics and combinatorial chemistry. We study the existence of selected discrete structures, develop methods for their construction, investigate potential applications, and search for general problem patterns that suggest the utilisation of discrete structures. We are particularly interested in mandatory representation designs, orientable designs, orthogonal covers, and completely separating systems.

References
[Ge et al., 2008] (Page 191),
[Grüttmüller and Hartmann, 2008] (Page 191),
[Grüttmüller et al., 2009] (Page 191),
[Hartmann et al., 2008b] (Page 192)

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Project 54: Keys and Functional Dependencies in XML Data

Project Members
Prof. Dr. Sven Hartmann (Leader)
Dr. Thu Trinh

Partners
Prof. Dr. Sebastian Link, Victoria University of Wellington
Dr. Henning Köhler, The University of Queensland

Duration
01/2008 – 12/2012
**Project Description**

XML is the new standard for the native storage, exchange and integration of heterogeneous data in many emerging application areas, including e-business and e-science. While XML provides a high degree of syntactic flexibility, it has little to offer for capturing the semantics of data. Consequently, the study of data dependencies has been recognised as one of the most important yet challenging areas of XML research. The investigation is motivated by a variety of potential applications in XML database operation, ranging from schema design, query optimisation, efficient storing and updating, consistent query answering, security and access control, to data cleaning. Several classes of data dependencies have been defined for XML, with keys and functional dependencies being most prominent examples. While there is a well-accepted single concept for the notion of keys and functional dependency in relational databases, the complex nature of XML data has resulted in various proposals for XML that deviate in their expressiveness but are all justified as they naturally occur in practice. Due to the complex structure of XML data, core decision problems for data dependencies like satisfiability and implication often turn out to be computationally intractable. It is therefore interesting to find natural and useful classes of data dependencies that can be reasoned about efficiently. Our objective is to identify such classes, to investigate their usefulness in XML design, to establish sound and complete rule systems for them, and to develop efficient algorithms for dependency inference or for discovering them from given databases.

**References**

[Hartmann et al., 2008a] (Page 201),
[Hartmann et al., 2010a] (Page 201),
[Hartmann and Link, 2009a] (Page 192),
[Hartmann and Link, 2009b] (Page 201),
[Trinh, 2008] (Page 211)

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**Project 55: User-friendly Constraint Acquisition**

**Project Members**

Prof. Dr. Sven Hartmann (Leader)
Dr. Thu Trinh

**Partners**

Prof. Dr. Sebastian Link, Victoria University of Wellington
Dr. Henning Köhler, The University of Queensland

**Duration**

01/2008 – 12/2012
**Project Description**

Integrity constraints model business rules that every legal database instance is compelled to obey. They restrict databases to those considered meaningful for the application at hand. In practice, the gathering and formalisation of integrity constraints is far from trivial. This task does not only demand high abstraction abilities but also tends to be rather complex. Human factors such as the experience and skills of the data architect play a major role in the acquisition process. In view of the problems encountered in database design practice and the importance of the sound and complete gathering of semantic information it is highly desirable to support the acquisition of semantic constraints. We investigate the efficient construction and effective use of example and counter-example databases that can guide the process of constraint acquisition. Such databases serve as a valuable design aid for data architects, e.g., to communicate with domain experts, to study consequences of particular design decisions, and to foresee potential anomalies during database operation. Eventually the generation, analysis and evolution of good example databases at design time may help data architects to specify a constraint set that best reflects the business rules for the application under development, thus preventing expensive corrections at run time.

**References**

[Hartmann et al., 2009a] (Page 201),
[Hartmann et al., 2008c] (Page 201),
[Hartmann et al., 2008d] (Page 201),
[Hartmann et al., 2009b] (Page 192),
[Hartmann et al., 2010c] (Page 192)

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**Project 56: Modelling Data-Intensive Scientific Workflows for Lab Automation in Analytical Research Laboratories**

**Project Member**

Prof. Dr. Sven Hartmann (Leader)

**Partners**

Jing Wang, M.Sc., Alan Wilson Centre for Molecular Ecology and Evolution
Prof. Dr. Mike Hendy, Massey University
Prof. Dr. Sebastian Link, Victoria University of Wellington

**Funding**

Tertiary Education Commission
45,000€ (of 45,000€ total)

**Duration**

06/2008 – 03/2011
Project Description

Nowadays, huge amounts of data have been generated from biological research laboratories. Lab automation is essential for knowledge discovery process. The goal is to develop a framework for assessing the effectiveness of lab automation for data-intensive applications. Our research is based on various aspects of effectiveness (cost-efficiency, return on investment, quality) that are suitable for analytical research laboratories. We study which internal and external factors impact effectiveness, and to which extent. The idea is to single out factors that can be easily estimated in a running lab and be used to assess the effectiveness sufficiently well. Eventually, we will investigate how our framework can be used for ex ante evaluations of investments. The focus of our research is on lab automation by up-to-date database technology, lab information systems, XML-based information flows, and the deployment of high-throughput instruments (such as DNA sequencers).

References

[Chen et al., 2008] (Page 198),
[Hartmann et al., 2010b] (Page 202)

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3.5.5 Scientific Activities

Person

Prof. Dr. Sven Hartmann

Organization of Conferences and Workshops

- Programme Chair

- Workshop and Tutorial Chair

- Programme Chair

- Programme Chair
PC-member of Conferences and Workshops


- *The International Workshop on Conceptual Modeling in the Large, CoMoL 2009*, Gramado, Brazil, November 2009. See [http://www.is.informatik.uni-kiel.de/events/CoMoL_2009/](http://www.is.informatik.uni-kiel.de/events/CoMoL_2009/)


• The Seventh Asia-Pacific Conference on Conceptual Modelling, APCCM 2010, Brisbane, Australia, January 2010. See http://2010.apccm.org/


• The 12th International Conference on Enterprise Information Systems, ICEIS 2010, Funchal, Portugal, June 2010. See http://www.iceis.org/

• The Forth International Workshop on Semantics in Data and Knowledge Bases, SDKB 2010, Bordeaux, France, July 2010. See http://www.is.informatik.uni-kiel.de/events/sdkb_2010/

• The 29th International Conference on Conceptual Modeling, ER 2010, Vancouver, Canada, November 2010. See http://www.er2010.sauder.ubc.ca

☐ Steering Committees

• Steering Committee Chair of The Asia-Pacific Conference on Conceptual Modelling, APCCM (since 2003). See http://apccm.org/


• Steering Committee Chair of The International Workshop on Conceptual Modelling for Life Sciences Applications, CMLSA (since 2007). See http://cmlsa2007.mucoms.org/

☐ Evaluator

• Expert Reviewer for the Hungarian Scientific Research Fund (OTKA). OTKA is the main organisation in Hungary for channelling funds to scientists in basic sciences and humanities.
3.5 Databases and Information Systems

 Invitations

- Invited Keynote *Dependency Mining in XML*, International Workshop on Semantics of Data and Knowledge Bases (SDKB) at the 11th International Conference on Extending Database Technology (EDBT), Nantes, March 2008.

Person  Dr. Thu Trinh

PC-member of Conferences and Workshops


- *The Forth International Workshop on Semantics in Data and Knowledge Bases, SDKB 2010*, Bordeaux, France, July 2010. See [http://www.is.informatik.uni-kiel.de/events/sdkb_2010/](http://www.is.informatik.uni-kiel.de/events/sdkb_2010/)


3.5.6 Highlights

- In 2009 Prof. Dr. Uwe Leck (University of Wisconsin) and Dr. Ian Roberts (Darwin University) visited our group for joint work on completely separating systems and their application as clustered graphs in network analysis. Professor Leck gave a colloquium talk on “Restoration of information in distributed database systems”

- In July 2009 Sven Hartmann was one of the coordinators for the 50th International Mathematics Olympiad in Bremen. Students from more than 100 countries participated in the contest, trying to solve six problems from algebra, geometry, combinatorics and number theory.

- In July 2009 Thu Trinh defended her Ph.D. thesis on “XML functional dependencies based on tree homomorphisms”.

- In June & July 2009 Prof. Dr. Sebastian Link (Victoria University of Wellington) visited our group for joint work on XML keys. He also gave a colloquium talk on “Keys and functional dependencies under bag semantics”.

- In May 2009 Sven Hartmann was internal examiner for the habilitation thesis of PD Dr. Wojciech Jamroga (now University of Luxembourg) on “Modeling, verification, and strategic reasoning in multi-agent systems”.
• In April 2009 Prof. Dr. Dirk Linowski (Steinbeis University) visited our group for joint work on data mining and risk management in finance. He also presented a colloquium talk on “Algorithmic approaches for optimising development project and real estate portfolios”.

• In March 2009 Sven Hartmann visited Massey University and the Allan Wilson Centre on invitation by Prof. Dr. Mike Hendy for joint work on scientific workflows in phylogeny.

• In February 2009 Sven Hartmann visited the University of Kiel on invitation by Prof. Dr. Thalheim. During his stay, he gave a colloquium talk on “Inference-proof access control in relational databases with functional and join dependencies”.

In 2008

• In December 2008 Prof. Dr. Dirk Labudde (Biotec Dresden, now Mittweida University of Applied Sciences) visited our group for joint work on membrane protein databases. He also gave a colloquium talk on “SFMS high-throughput experiments and applications in bioinformatics”.

• In October 2008 Sven Hartmann attended the welcome ceremony organised by the Krupp Foundation in Essen for returning scholars who were awarded a grant by the foundation.

• In October 2008 Sven Hartmann visited Victoria University of Wellington on invitation by Prof. Dr. Sebastian Link for joint work on cardinality constraints for XML.

• In June 2008 Sven Hartmann was examiner for the Ph.D. thesis of Dr. Flavio Ferrarotti (Massey University, now Yahoo! Research Latin America) on “Expressibility of higher-order logics on relational databases: proper hierarchies”.
3.6 Software Systems Engineering

3.6.1 Overview

**Leaders** Prof. Dr. Andreas Rausch

**Secretary** Annett Panterodt (since 03/2006)

**Scientific Employees**

- Dipl.-Inf. André Appel
- Dipl.-Inf. Christian Bartelt
- Dipl.-Inf. Constanze Deiters
- Dipl.-Inf. Michael Deynet
- Dipl.-Inf. Patrick Dohrmann (since 07/2009)
- Dipl.-Inf. Benjamin Fischer (since 01/2009)
- Dipl.-Inf. Edward Fischer
- Dipl.-Inform. Sebastian Herold
- Dipl.-Inf. Holger Klus
- Dipl.-Inf. Sandra Lange (since 07/2009)
- Dipl.-Inf. Dirk Niebuhr
- Dipl.-Wirt.-Inf. Björn Schindler (since 02/2008)
- Dipl.-Wirtsch.-Ing. Thomas Ternité

**Associated Members**

- Dipl.-Inf. Harald Klein (Siemens AG)

3.6.2 Research Agenda

The research goal of the group of Prof. Dr. Rausch is to improve the dependability of software systems and their development, operation, maintenance, support and evolution. Therefore we provide a kit containing methods, techniques and tools for successful engineering of software systems. Our task is to improve this kit with valid and consolidated findings from research, and to transfer it to practice.

The research of the group of Prof. Dr. Rausch focuses on the following areas: practicable and applicable process models, model based software development, and sustainable software architectures. The basis of these research areas is formed by fundamental programming techniques, technologies, and methods of software system engineering. All research results are demonstrated in seamless tool support realized within demonstrating scenarios. The results are validated together with industrial partners, and in their environment.

See Prof. Dr. Rausch’s homepage at: [http://www.in.tu-clausthal.de/abteilungen/software-systems-engineering/](http://www.in.tu-clausthal.de/abteilungen/software-systems-engineering/)
3.6.3 Supervised Theses


3.6 Software Systems Engineering


3.6.4 Projects

**Project 57: IT Ecosystems**

*Project Members*

- Prof. Dr. Andreas Rausch (Leader)
- Dipl.-Inf. Sandra Lange (Project Staff)
- Dipl.-Inf. Dirk Niebuhr (Project Staff)

*Partners*

- Technische Universität Braunschweig, Braunschweig, Germany
- Leibniz Universität Hannover, Hannover, Germany

*Funding*

MWK 401.110€ (of 2.541.218€ total)

*Duration*

01.03.2009 – 31.08.2011

*Project Description*

Classical approaches of computer science do not scale well for today’s large and complex software-intensive systems. Software systems cannot be considered in isolation, since they are connected among each other and interact massively. Instead they are to be designed as parts of a larger IT Ecosystem. In analogy to biological ecosystems, IT Ecosystems are based on the balance between individuals (autonomy) and sets of rules (control) defining equilibria within an IT Ecosystem. Maintaining and continuously evolving IT Ecosystems requires deep understanding of this balance.

The new research topic IT Ecosystems cuts across several research areas, including: emergence of system functions, extending classical engineering approaches, adaptive infrastructures, control of semantic diversity, and enhanced human-environment-machine interaction. These core areas are addressed by the newly established NTH focused Research School for IT Ecosystems, a cooperation of Technische Universität Braunschweig, Technische Universität Clausthal, and Leibniz Universität Hannover. A joint demonstrator will present innovative research results in the context of a smart city application.
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Project Homepage
http://www.it-ecosystems.org/

Project 58: CoBePro - Support for Controlling and Reporting in the IT Investment Programme of the German Federal Ministry of the Interior

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Patrick Dohrmann (Project Staff)
Dipl.-Inf. Edward Fischer (Project Staff)

Partners
Federal Ministry of the Interior of Germany (BMI), Berlin, Germany
Federal Office of Administration (BVA), Cologne, Germany

Funding
BMI/BVA
1.142.000€ (of 1.142.000€ total)

Duration

Project Description
The IT Investment Programme (having a budget of 500 m.€) was passed by the German Bundestag on February 20th. The available budget will be used to fund over 300 projects with each heading to improve Germany’s IT position in the current crisis. In order to manage that programme and validate its outcome, the PG Invest was founded. The first goal of CoBePro is to support PG Invest in respect to controlling and reporting. The second goal is to use the current situation as an opportunity for collecting valuable data of how projects develop.
This will yield an experience database which can be used to improve controlling and management of future projects. For example, a duration ratio like that between the analysis phase and the overall project can be used to make estimations of the actual progress more reliable.

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Project 59: SmartSchank - Electronic Process and Control Technology for Modular Dispensing Equipment

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Benjamin Fischer (Project Staff)
Dipl.-Inform. Sebastian Herold (Project Staff)

Partner
Dirmeier Schanktechnik GmbH & Co KG, Oberviechtach, Germany

Funding
AIF
120.000€ (of 450.000€ total)

Duration
01.05.2009 – 31.10.2010

Project Description
Electronic dispensing equipment helps gastronomic businesses like restaurants or pubs to minimize losing by uncontrolled or inexact serving of beverages. Today dispensing equipment is usually build of different units for tapping, accounting, etc. and a large, monolithic control unit. This central unit is expensive and mostly unaffordable for small gastronomic businesses. Thus, our cooperation partner, Dirmeier Schanktechnik GmbH & Co KG, aims at developing a decentralized solution. This means that dispensing equipments are build of modular units that can function on their own but automatically share and integrate their functionality when plugged together. To enable such modular behaviour, a software platform for dynamic adaptive system can be used to ease the development of such dispensing equipments - a platform like the DAiSI developed at our chair. Our task will be to realize the required functionality and to migrate DAiSI to the hardware platform provided by dispensing modules that is characterised by heavily restricted resources.

This project is funded by the Federal Ministry of Economics and Technology of Germany.
Project 60: ReqBwPilot - Validation of a Requirements Engineering Approach within the scope of a pilot project

Project Members
- Prof. Dr. Andreas Rausch (Leader)
- Dipl.-Inf. Michael Deynet (Project Staff)
- Dipl.-Inf. Edward Fischer (Project Staff)
- Dipl.-Inf. Sabine Niebuhr (Project Staff)
- Dipl.-Inf. Björn Schindler (Project Staff)

Partner
IT-AmtBw A5, Koblenz, Germany

Funding
IT-AmtBw
160.000€ (of 160.000€ total)

Duration
15.03.2009 – 28.02.2010

Project Description
Requirements engineering and architecture design are key factors in software development: both bear the risk of serious faults, since they include decisions with far-reaching consequences, which may appear later during project progression. Therefore the previous project ReqBw dealt with the development of an software engineering approach for coupling requirements and architecture. The goal of this project is validate, test and adopt this Requirements Engineering Approach within the scope of the pilot project.
3.6 Software Systems Engineering

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Project 61: Radio Frequency Identification (RFID) of Billets (MonLAID)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inform. Sebastian Herold (Project Staff)

Partners
Benteler Steel/Tube, Paderborn, Germany
Institute of Electrical Information Technology (Prof. Dr. Vossiek), TU Clausthal, Clausthal-Zellerfeld, Germany
Institute of Metallurgy (Prof. Dr. Palkowski), TU Clausthal, Clausthal-Zellerfeld, Germany
Institute of Management and Economics (Prof. Dr. Schwindt), TU Clausthal, Clausthal-Zellerfeld, Germany
Department of Informatics (Prof. Dr. Müller), TU Clausthal, Clausthal-Zellerfeld, Germany

Funding
Benteler Steel/Tube
6600€ (of 33000€ total)

Duration
**Project Description**

Our partner Benteler Steel/Tube intends to introduce RFID technology at their steel mills and hot rolling mills for the purpose of a seamless location monitoring of their steel billets and slabs. In cooperation with the MonLAID consortium, a feasibility study was developed. The MonLAID (MontanLeistungszentrum AutoID) consortium is an interdisciplinary consortium at the Clausthal University of Technology and focuses on theoretical and practical issues of AutoID technologies for the mining and steel-producing industries. It consists of experts for metallurgy, measurement technology, operations research, and computer science. The task of our group during this cooperation was to analyze the software architectures of existing IT applications and infrastructures and to investigate the impacts of possible AutoID technologies to the IT landscape of Benteler Steel/Tube.

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**Project 62: Study for introducing V-Modell XT in projects of the Bundeskriminalamt (EkoBKA)**

**Project Members**

Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Edward Fischer (Project Staff)

**Partners**

4Soft, München, Germany
Bundesministerium des Inneren (BMI), Berlin, Germany
Bundeskriminalamt (BKA), Wiesbaden, Germany

**Funding**

Bundesminister des Inneren
25000€ (of 25000€ total)
**Duration**

**Project Description**
The German BKA (Bundeskriminalamt, a public organization for crime investigation) not only uses information systems, but operates, maintains and develops them as well. In addition to common obstacles like ever-changing requirements and limited resources, BKA’s software development projects are in the need of being balanced with projects and processes of other national and international organizations. Without a well-defined process model, this challenge could not been solved yet. So the goal of this study is to find out how and which parts of the standard process model V-Modell XT could be introduced, in order to improve current situation.

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**Project 63: Distributed Modelling of User Interfaces, Processes, and Adaptive Services (MoIPAS)**

**Project Members**
- Prof. Dr. Andreas Rausch (Leader)
- Dipl.-Inform. Sebastian Herold (Project Staff)
- Dipl.-Inf. Holger Klus (Project Staff)

**Partners**
- University of Auckland, Auckland, New Zealand
- MID, Nürnberg, Germany

**Funding**
- BMBF, RSNZ
- 11,000€ (of 11,000€ total)

**Duration**
01.11.2008 – 31.10.2010

**Project Description**
The paradigm of service-oriented architectures promises to ensure the flexibility of information systems w.r.t. changing business processes and application integration. The size and complexity of such systems are issues that are tackled by Model-Driven Development. However, there do not exist seamless modelling approaches which integrate methods for important aspects of SOA-based systems. The project has two objectives. First, a seamless modelling approach for SOA-based information systems will be developed by integrating existing approaches for interaction modelling (Univ. of Auckland) and architecture modelling (Clausthal Univ. of Technology).
Furthermore, the approach will be extended to model the dynamic and adaptive characteristics of such systems for dynamically changing workflows. Secondly, the project addresses the cooperative modelling process. Tools to support cooperative design of freehand sketches of models and their automated integration will be developed.

The project is financially supported by the International Bureau of the Federal Ministry of Education and Research, Germany, and the Royal Society of New Zealand.

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Project 64: Conception of a process for quality assurance for the acceptance of source code in the project eBAfög based on the V-Modell XT (CodeQual)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Constanze Deiters (Project Staff)
Dipl.-Inform. Sebastian Herold (Project Staff)

Partner
BVA, Köln, Germany

Funding
BVA
25.000€ (of 25.000€ total)

Duration
**Project Description**

This work is performed within the scope of the project eBAföfg. The project eBAföfg itself deals with the redesign of the BAföfg software to manage the collection of the national student grants. It is accomplished by the BVA (Bundesverwaltungsamt) which commissioned an external service provider with the development of the software. At the end of the first implementation phase the BVA has to check the quality of the source code and the associated documents particularly with respect to maintainability and reusability.

The goal of the project CodeQual is to support the BVA in conception and implementation of a process for quality assurance. This includes conception and prototypic realisation of a process to check the source code towards the designed software architecture and also a process to evaluate the quality of the source code using metrics.

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Project 65: Open Pervasive Environments for migratory iNteractive services (OPEN)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf Holger Klus (Project Staff)
Dipl.-Inf Dirk Niebuhr (Project Staff)

Partners
Consiglio Nazionale delle Ricerche, Pisa, Italy
Aalborg University, Aalborg, Denmark
Arcadia Design, Sestu, Italy
SAP AG, Walldorf, Germany
Vodafone Omnitel NV, Ivrea, Italy
NEC Europe, Heidelberg, Germany

Funding
EU
350.086€ (of 465.892€ total)

Duration
1.2.2008 – 31.01.2011

Project Description
The objective of OPEN is to provide users with migratory interactive services, which enable users to change interaction platform and still continue their tasks through an interface adapted to the new context of use. The benefits of this type of service are multifaceted: migration can be used to improve user experience by switching to a more suitable device (bigger screen, better resources, etc.) and/or to a communication channel that can guarantee better Quality of Service (shorter delays, higher bandwidth, etc.).

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Project Homepage
http://www.ict-open.eu/
Project 66: BIENE

Project Members
- Prof. Dr. Andreas Rausch (Leader)
- Dipl.-Inf. Christian Bartelt (Project Staff)
- Dipl.-Inf. André Appel (Project Staff)

Partners
- VHS Goslar, Goslar, Germany
- Institut für Elektrische Energietechnik, Clausthal, Germany
- Verein Goslar mit Energie, Goslar, Germany

Funding
- EFRE
- 74.142€ (of 184.120€ total)

Duration
- 01.08.2008 – 31.07.2010

Project Description
Focus of the project is the development of a Second-Life platform for inver-
sive learning. Several interactive models, reactive components and a virtual
classroom are developed and evaluated, whether they are sufficient for the
means of 3D-learning or not.

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Project Homepage
- http://energie-goslar.de
Project 67: Weiterentwicklung des Entwicklungsstandards für IT-Systeme des Bundes auf Basis des V-Modell-97 (WEIT)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Christian Bartelt (Project Staff)
Dipl.-Inf. Michael Deynet (Project Staff)
Dipl.-Inf. Edward Fischer (Project Staff)
Dipl.-Inf Dirk Niebuhr (Project Staff)

Partners
IT-AmtBw, Koblenz, Germany
BMI/KBSt, Berlin, Germany
Siemens AG, Munich, Germany
EADS, Ottobrunn, Germany
IABG, Ottobrunn, Germany
4Soft, München, Germany
Prof. Dr. Dr. h.c. Manfred Broy, University of München, Germany

Funding
IT-AmtBw and BMI/KBSt
1.260.000€ (of 4.311.000€ total)

Duration

Project Description
Focus of the project is the further development of the Development Standard for IT Systems of the Federal Republic of Germany, the V-Modell XT. The V-Modell XT as it is a successor of the V-Modell 97, is a process model for planning and realizing development projects. It is designed as guidance for planning and executing development projects, considering the entire system life cycle. It defines the results to be achieved in a project and describes the actual approaches for developing these results. Moreover process management tools as well as process execution tools are developed and provided within the project.

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Project Homepage
http://www.v-modell-xt.de

Project 68: KAPCompact: A V-Modell XT Pilot Application Project (KAPCompact)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Edward Fischer (Project Staff)
Dipl.-Inf. Björn Schindler (Project Staff)

Partners
Funkwerk Kölneda, Kölneda, Germany
MID, Nürnberg, Germany
4Soft, München, Germany
Fraunhofer Gesellschaft, Fraunhofer IESE, Kaiserslautern, Germany

Funding
Funkwerk Kölneda HFWK
31,000€ (of 86,000€ total)

Duration
19.01.2007 – 31.05.2008

Project Description
The Funkwerk Kölneda (HFWK) is a system provider for communications technology. As safety is a vital issue in this sector, numerous engineering standards exists, constraining products and their development processes. This has regularly implied a significant resource consumption for HFWK.

To improve this situation, the process model V-Modell XT should be adopted and evaluated in this pilot project. In particular, following goals are covered: First, finding out at which degree the V-Modell XT is usefull to pursue different Safety Integrity Levels (SIL). Second, developing an integrated method for analysing, designing, implementing and testing Reactive Systems in conjunction with the V-Modell XT. Third, figuring out proper tool support, and finally fifth, operationalizing the adoption of the V-Modell XT to illustrate its impact.
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Project 69: Improvement and Maintenance of the V-Modell Bayern (WarWeiVMBay)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Wirts.-Ing. Thomas Ternité (Project Staff)
Dipl.-Inf. Edward Fischer (Project Staff)

Partner
Bavarian Department of the Interior, München, Germany

Funding
StMI Bayern
24.000€ (of 24.000€ total)

Duration

Project Description
The Bavarian Department of the Interior uses an organization-specific adaptation of the V-Modell XT as process model standard when developing software systems. This Process Model Bavaria was initially derived from version 1.0 of the V-Modell XT. Focus of the project WarWeiVMBay is the migration of the process model to the actual version of the V-Modell XT and to make available a development environment for further development and an easier adjustment of the process model to the developing standard.
Project 70: Evaluation and Application of the V-Modell XT at the Federal Network Agency (BNetzA)

Project Members
- Prof. Dr. Andreas Rausch (Leader)
- Dipl.-Wirtsch.-Ing. Thomas Ternité (Project Staff)

Partners
- MID, Nürnberg, Germany
- 4Soft, München, Germany
- Bundesnetzagentur, Bonn, Germany

Funding
- BNA und BMI/KBSt
  60,000€ (of 60,000€ total)

Duration
- 1.5.2007 – 30.6.2008

Project Description
The Federal Network Agency (Bundesnachrichtenagentur) has developed an organisation specific V-Modell 97 for its software development processes. In 2005, the V-Modell XT came apparent and it was decided to migrate the defines process to the V-Modell XT metamodel. The project goals include performing this migration. In addition to that, the requirements management process is to be revised and enriched with modern requirements engineering concepts.
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Project 71: Process Implementation and Improvement in Industrial Practice (V-Bench)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Christian Bartelt (Project Staff)
Dipl.-Inform. Sebastian Herold (Project Staff)

Partners
Fraunhofer Gesellschaft, Fraunhofer IESE, Kaiserslautern, Germany
TU München, Munich, Germany
MID GmbH Enterprise Software Solutions, Nuremberg, Germany
Josef Witt GmbH, Weiden/Oberpfalz, Germany
Lufthansa Systems AS GmbH, Norderstedt, Germany
Funkwerk Kölleda, Kölleda, Germany
4Soft GmbH, Munich, Germany

Funding
BMBF
210.400€ (of 1.900.000€ total)

Duration

Project Description
The research project "V-Bench" aims at developing cost-effective practices for introducing and maturing processes. These practices will be empirical proved in industrial pilot projects in the field of the development standard for IT systems of the Federal Republic of Germany, the V-Modell XT. Those practices are going to include approaches for the tailoring and evaluating of V-Modell variants, managing variants, and tool support for introducing and maintenance of tailored V-Modell versions by a prototypical internet-based process "work bench".
3.6 Software Systems Engineering

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**Project 72: Common Component Modeling Example (CoCoME)**

**Project Members**

Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. André Appel (Project Staff)
Dipl.-Inform. Sebastian Herold (Project Staff)
Dipl.-Inf. Holger Klus (Project Staff)

**Partners**

Prof. Dr. Ralf Reussner, Universität Karlsruhe, Germany
Raffaela Mirandola, Politecnico di Milano, IT
Prof. Dr. Frantisek Plasil, Charles University, Prague, CZ

**Funding**

GI Research Seminar
5,000€ (of 20,000€ total)

**Duration**

08/2006 – 06/2008

**Project Description**

Component-based software development (CBSD) has changed the current paradigm of software development. As systems become more and more complex, CBSD is to a greater extend applied in industry and plays a more and more important role in research. In order to leverage CBSD to build correct and dependable component-based systems, research has developed various formal and semi-formal component models. However, many of these component models like DisCComp, Fractal, Focus, or UML Extensions concentrate on different yet related aspects of component modelling. These are for instance communication issues or performance aspects. This hinders their validation for practical usage. Therefore, the main goal of the research seminar is to evaluate and compare the practical appliance of existing component models using a common component-based system as modelling example.

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**Project Homepage**

http://cocome.org/

**Project 73: Bafög: A V-Modell XT Pilot Application Project (Bafög)**

**Project Members**

Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Michael Deynet (Project Staff)
**Partners**

MID, Nürnberg, Germany  
4Soft, München, Germany  
BVA, Köln, Germany

**Funding**

BMI/BVA  
11.000€ (of 22.000€ total)

**Duration**

15.11.2006 – 30.4.2008

**Project Description**

The V-Modell XT is the obligatory prescribed process standard for all IT-projects in the field of defense and public administration of the Federal Republic of Germany. The Bafög project is a pilot project of the V-Modell XT. It is accomplished by the BVA (Bundesverwaltungsamt) and deals with the redesign of the Bafög software. The Bafög software manages the collection of education accommodation.

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**Project 74: RESIST (Reliable Adaptive Pervasive IT-Systems)**

**Project Members**

Prof. Dr. Andreas Rausch (Leader)  
Dipl.-Inf Holger Klus (Project Staff)  
Dipl.-Inf Dirk Niebuhr (Project Staff)  
Dipl.-Inf André Appel (Project Staff)

**Partner**

Siemens AG, Munich, Germany
3.6 Software Systems Engineering

Funding
Siemens AG
119,000€ (of 119,000€ total)

Duration
1.5.2007 – 30.9.2008

Project Description
IT-Systems of the future are profoundly networked, dynamic, and are able to adapt themselves to new environments and situations. In this project we aim at the conception and realization of a middleware for reliable dynamic adaptive systems. In order to show feasibility and usefulness we are going to implement an exemplary scenario based on the middleware. This middleware should enable the development of networked, dynamic adaptive systems while assuring correctness and reliability.

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Project 75: Seamless Requirements Engineering Approach with Respect to the NATO Architectural Framework (NAF) and the V-Modell XT Bw (ReqBw)

Project Members
Prof. Dr. Andreas Rausch (Leader)
Dipl.-Inf. Michael Deynet (Project Staff)
Dipl.-Inf. Sabine Niebuhr (Project Staff)

Partner
IT-AmtBw A5, Koblenz, Germany
**Funding**

IT-AmtBw  
140,000€ (of 140,000€ total)

**Duration**


**Project Description**

Requirements engineering and architecture design are key factors in software development: both bear the risk of serious faults, since they include decisions with far-reaching consequences, which may appear later during project progression. Therefore the goal of the project is to develop an approach for coupling requirements and architecture at an early stage with iterative intertwining of corresponding activities. This approach needs to minimize the risks while considering existing standards and guidelines for projects of IT-AmtBw.

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**Project 76: Dynamic Adaptive System Infrastructure for Nordic Wakling (DAiSINW)**

**Project Members**

Prof. Dr. Andreas Rausch (Leader)  
Dipl.-Inf. Holger Klus (Project Staff)  
Dipl.-Inf. André Appel (Project Staff)

**Partner**

Sun Microsystems, Inc., Santa Clara, USA

**Funding**

Sun Microsystems, Inc.  
15,000€ (of 15,000€ total)
3.6 Software Systems Engineering

Duration
1.8.2007 – 31.3.2008

Project Description
The goal of the project is to develop a prototype demonstrator for an assisted sport training system in the area of nordic wakling. Therefore Sun Spots are used as basic sensor and communication nodes. This demonstrator should be based on the dynamic adaptive system infrastructure (DAiSI) developed by the group of Prof. Dr. Andreas Rausch. The prototype will be shown on CeBIT 2008.

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3.6.5 Scientific Activities

Person Prof. Dr. Andreas Rausch

Editorial Board Memberships
  See [http://www.ijop.org/](http://www.ijop.org/)
  See [http://www.ijsa.net/](http://www.ijsa.net/)
- Editorial Board of *OBJEKTspektrum*, SIGS DATACOM GmbH (since 2008).

Organization of Conferences and Workshops
- Conference Chair
- Conference Chair
- Conference Chair
  See [http://see-conf.de/](http://see-conf.de/)
PC-member of Conferences and Workshops


- **QoSA 2008**: Fourth International Conference on the Quality of Software Architectures, Karlsruhe, Germany, October 2008. See [http://qosa.ipd.uka.de/QoSA08/index_html#GC](http://qosa.ipd.uka.de/QoSA08/index_html#GC)


3.6 Software Systems Engineering


Other Functions

- Andreas Rausch has joined the expert group of the Federal Ministry of the Interior of the Federal Republic of Germany, which advises on the Standards and Architectures for e-Government Applications of the Federal Republic of Germany.

- Andreas Rausch is a founder member of the International Software Architecture Qualification Board (iSAQB). iSAQB is responsible for certification of software architects on an industrial level.

- Andreas Rausch is the speaker of the NTH School for IT-Ecosystems, which is the first research program in planning of the Niedersächsische Technische Universität (NTH), a cooperation of the Technische Universität Braunschweig, Technische Universität Clausthal, and Leibnitz Universität Hannover.

- Andreas Rausch is founder and CEO of the WEIT e.V. The goal of this association is the further development of the Development Standard for IT Systems of the Federal Republic of Germany, the V-Modell XT. The most prominent member of the association is the Federal Republic of Germany itself.

3.6.6 Highlights

- In 2008 / 2009: Andreas Rausch has organised and chaired the largest German-spoken industrial conference on software systems development processes: SEE 2008 and SSE 2009 (Software & Systems Engineering Essentials).
In 2009: The chair of Andreas Rausch presented the Emergency Management System to the public during the *CeBIT trade show in 2009*. Great interest was shown by national and international experts and made the participation a huge success.
4 Publications

4.1 Books and Edited Volumes (18)


### 4.2 Book Chapters (13)


4.3 Journal Articles (56)


### 4.4 Refereed Conference and Workshop Publications (152)


### 4.5 Technical Reports (36)


4.7 Ph.D. Theses (10)


4.6 Habil Theses (1)


4.7 Ph.D. Theses (10)


### 4.8 Diploma Theses (89)


4.9 Bachelor’s Theses (6)


