b-it **Bonn-Aachen International Center for Information Technology**

ANNUAL REPORT
2007-2008

Vice Minister
Dr. Michael Stückradt

Prof. Dr. Gerhard Barth

The cover image uses a scientific visualization method to illustrate the geographic distribution of B-IT student origins.

FOREWORD BY THE CHAIRMAN OF THE B-IT FOUNDATION

In the past two years, the German Excellence Initiative has created significant additional impetus for internationally leading research in all fields of science and engineering. Obviously, excellence in research must be accompanied by excellence in internationally oriented graduate education and research training. In few areas, this need is stronger than in Applied Informatics, with its very high impact on innovation across all sectors of business and society, and its continuous shortage of top-level personnel.

This exactly has been the mission of the Bonn-Aachen International Center for Information Technology (B-IT) since its inception five years ago. A kernel of English-language master program in Media Informatics, Life Science Informatics, and Autonomous Systems is by now well established with highly qualified international applicants, and an impressive placement record of graduates. B-IT's unique cooperation structure of leading universities with the Fraunhofer research organization has proven a key success factor. For the regional bachelor and even high-school students, the B-IT contains additional programs to identify and promote high potentials early on.

This year, the NRW State Government has approved funding for another important step in the evolution of B-IT: the founding of a B-IT Research School which offers structured training for doctoral candidates in eight areas of applied IT as well as scholarships for exceptional candidates. I would like to invite students from all over the world to take advantage of B-IT's unique opportunities.

I would like to thank the directors and faculty of B-IT as well as the international advisory board, and to encourage them to continue their successful work.

Dr. Michael Stückradt
Vice Minister of Innovation, Science
and Technology NRW
Chairman, B-IT Foundation Council

The International Advisory Council of B-IT
RWTH Aachen University, University of Bonn, Bonn-Rhein-Sieg University of Applied Sciences, have, in cooperation with the Fraunhofer Board of Management, established an International Advisory Council. Its mission is to ensure the relevance of B-IT's educational efforts for careers in the business world, to monitor B-IT's international competitiveness, and to foster B-IT's development by giving recommendations and guidelines. The rectors of the participating universities have appointed Prof. Dr. Gerhard Barth as Founding President; Barth is well known as founder of the German AI research institute DFKI, as top manager in companies such as Daimler-Chrysler, Alcatel, and Dresdner Bank, and more recently as partner in a consultancy firm. In addition, the council includes five internationally renowned persons from academia and industry:

- Prof. Dr. Gerhard Fischer, University of Colorado, Boulder
- Dirk Friebel, Nokia Research Center, Bochum
- Prof. Dr. Ossama Khatib, Robotics Lab, Stanford University, Palo Alto
- Prof. Dr. Thomas Lengauer, Max-Planck Institute for Informatics, Saarbrücken
- Prof. Dr. Hermann Maurer, Media Lab, University of Graz

b-it Bonn-Aachen International Center for Information Technology

Report by the Scientific Directors

If anything, the demand for highly qualified Master and Doctoral graduates in Applied Information Technology has grown even more in the past year. After five years of build-up, the pioneering international programs offered by the Bonn-Aachen International Center for Information Technology (B-IT) are now contributing significantly to satisfying this demand in the important fields of Media Informatics, Life Science Informatics, and Autonomous Systems / Robotics.

Due to careful selection of entering students from all over the world, our ca. 80 beginners per year boast a success rate over 80%, in many cases with study times close to the optimum and with very good to excellent results despite high academic and practical demands in our research-integrated programs. The placement record of graduates in impressive and continuously improving further, with about one half going to industry and he other half continuing towards a doctorate, locally or in leading institutions throughout the world. The B-IT master graduates have become an important competitive advantage for the region, but B-IT also continues to foster interest and competence in applied informatics through its excellence programs at the bachelor and even high school level.

If you have followed our Annual Reports over the past few years, you will notice two important additions.

Firstly, the research grants acquired by B-IT professors have reached a total of over 2.8 M€ in 2007 such that we found it necessary to add a new section "Research@B-IT" to illustrate the research opportunities offered to B-IT students. Highlights include a large participation in RWTH Aachen's Excellence Cluster on Mobile Communications UMIC and an NRW "braingain" Research Group by Christian Kandt at at the University of Bonn, as well as large-scale EU-funded projects on robotics and emergency management at FH Bonn-Rhein-Sieg and Fraunhofer.

B-IT main building.

Secondly, we are proud to announce that B-IT will extend its educational spectrum by structured doctoral training in the new B-IT Research School we won in the NRW Research School Competition in Spring, 2008. Funded by state resources and matching central funds by the university rectorates, the B-IT Foundation and external donors, the B-IT Research School has accepted its first scholarship students and will start offering doctoral training courses in the fall of 2008.

We would like to extend our cordial thanks to the B-IT Foundation Council led by Chairman Vice Minister Michael Stückradt and Secretary Hans Stender, to the B-IT Advisory Board under the able leadership of Founding President Gerhard Barth, to the B-IT Faculty and especially the study coordinators Martin Hofmann-Apitius and Otto Spaniol, to our assistant directors Alexandra Reitelmann, Jürgen Rapp, Christoph Quix, Stefan Lüttringhaus-Kappel, and Thomas Bode, but most of all to the B-IT students for their enthusiasm and excellent cooperation.

This report intends to inform stakeholders, existing and future students and doctoral candidates, as well as the interested public about the B-IT activities in the academic year 2007-2008. Enjoy reading it!

Armin B. Cremers, University of Bonn
Matthias Jarke,
RWTH Aachen University and Fraunhofer FIT
Kurt-Ulrich Witt,
Bonn-Rhein-Sieg University of Applied Sciences

Prof. Dr. Armin B. Cremers
University of Bonn

Prof. Dr. Matthias Jarke
*RWTH Aachen University
and Fraunhofer FIT*

Prof. Dr. Kurt-Ulrich Witt
*Bonn-Rhein-Sieg University
of Applied Sciences*

B-IT in Profile

The southwest of North-Rhine Westphalia is one of the largest, most vibrant locations in the European media and telecom industry. It is also one of the most innovative and fast-growing biotech regions in Germany, and there is much interest in the emerging fields of mechatronics and robotics. To make it the optimal place to study for professional work in these fields, the Bonn-Aachen International Center for Information Technology (B-IT) has been established as a joint venture of RWTH Aachen University, University of Bonn, Bonn-Rhein-Sieg University of Applied Science and the research institutes of the Fraunhofer Institute Center Birlinghoven Castle.

B-IT offers highly selective International Master Programs in Applied IT, as well as summer / winter schools for qualified undergraduate computer science students. Most courses take place in the beautiful B-IT building next to the former office of the German Chancellor on the banks of the River Rhine in Bonn. Admission to the B-IT Master Programs is linked to, and conditional upon, placement in research lab courses at the participating Fraunhofer institutes. Students in good standing are offered financial support during these lab courses.

The B-IT Universities Institute offers English language Master of Science (M.Sc.) programs in Media Informatics and Life Science Informatics, whereas the University of Applied Sciences offers a Master Program in Autonomous Systems. The Master Programs prepare students for successful international careers that require technical excellence and leadership, creativity and the ability to innovate. B-IT master programs are distinguished by their international orientation (structured according to the European ECTS standard), their focus on IT competence, and the deep integration of teaching and research.

A second goal of B-IT is the optimization and acceleration of existing undergraduate computer science curricula at Bonn University and RWTH Aachen University for selected top students.

Home Countries of B-IT Students
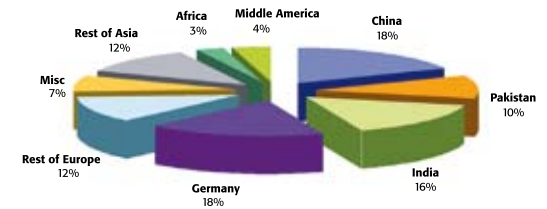
B-IT's International Program of Excellence (IPEC) pursues this goal by compact course modules delivered in summer and winter schools during the semester breaks.

B-IT is financially supported by a 56 M€ Foundation initiated through the Bonn-Berlin program of the German federal government, as well as by matching federal project funds and NRW state funds. The B-IT Foundation was officially set up in October 2002, and a cooperation treaty was signed by the Rectors of the participating universities and the Fraunhofer Board of Directors. B-IT directors and B-IT professors are very active in fundraising as a basis to further broaden the education and research activities in B-IT. Research funding provides means for re-investment to keep our equipment up to date but also offers funded opportunities for B-IT student research as well as doctoral studies opportunities for B-IT graduates. Beyond research funding, a systematic fundraising drive for more direct extension of the educational mission of B-IT is currently being prepared by the B-IT Foundation. This will complement successful fundraising activities of the past years, such as the 2.5 M€ Erasmus-Mundus program EuMI and the recently approved B-IT Research School.

For the participating universities, the B-IT programs have also helped pave the way towards a smooth transition from the traditional German diploma system to the Bachelor-Master system following the Bologna accord; for example, the B-IT master programs were the first to be accredited within the participating universities in 2004-2005. The success of even the initial phases of the B-IT programs is also demonstrated by a very good placement record for the first groups of master graduates, both in science and industry.

B-IT actively engages in the regional science and culture community and in national science strategies such as the Year of Mathematics 2008. The Tent of Science 'Head or Tail?' from 2 to 5 July 2008 invited people to Bonn city for strolling through projects showing how mathematics shapes their everyday life. The B-IT Computer Security group was part of this exhibition.

Mathematics is the fundamental building block of cryptography. Cryptography in turn grants security, authenticity, anonymity, and much more. That in turn enables us in our every day life to buy and sell in the internet, to communicate with people around the world, too. Visitors could themselves encrypt messages with the Enigma simulation and run the Turing-Bombe simulation to break it, thus re-living history of the Second

From left: Vice rector Max Baur, director of the Telekom Foundation, former Foreign Minister Klaus Kinkel, Lord Mayor of Bonn Bärbel Dieckmann, and B-IT Professor Prof. Dr. Joachim von zur Gathen. © Frank Homann

World War and experiencing what security of encryption actually means. VisKy demonstrated for anyone how secure encryption can 'look' like. A photo of a visitor is encrypted in form of two slides. Superimposed they show the silhouette of the visitor. Yet, each of these slides is random, the visitor could roll dice to determine a few pixels.

Officers

Founding Scientific Directors
Prof. Dr. Armin B. Cremers,
University of Bonn
Prof. Dr. Matthias Jarke,
RWTH Aachen University
Prof. Dr. Kurt-Ulrich Witt,
Bonn-Rhein-Sieg University of Applied Sciences

Assistant Directors
Dr. Jürgen Rapp, Dr. Christoph Quix,
RWTH Aachen University
Dr. Stefan Lüttringhaus-Kappel,
Dr. Thomas Bode, Dr. Alexandra Reitelmann,
University of Bonn

Coordinators B-IT Study Programs:
Prof. Dr. Otto Spaniol
(RWTH Aachen University),
Media Informatics
Prof. Dr. Martin Hofmann-Apitius
(Fraunhofer SCAI), Life Science Informatics

International Advisory Council
Prof. Dr. Gerhard Barth,
Founding President

B-IT Foundation
Dr. Michael Stückradt (Chairman)
Vice Minister, North Rhine-Westphalian Ministry of Innovation, Science and Research NRW
Hans Stender (Secretary)
Chancellor, Bonn-Rhein-Sieg University of Applied Sciences
MinDir Dr. Hermann Müller-Solger
Federal Ministry of Research and Education
Dr. Ulrich Buller
Board of Directors, Fraunhofer-Gesellschaft
Bärbel Dieckmann
Mayor, City of Bonn
Frithjof Kühn
County Chairman, Rhein-Sieg-Kreis
Prof. Dr.-Ing. Ernst Schmachtenberg
Rector, RWTH Aachen University
Prof. Dr. Matthias Winiger
Rector, University of Bonn
Prof. Dr. Wulf Fischer
Founding rector, Bonn-Rhein-Sieg University of Applied Sciences
Dr. Ernst Franceschini
President, Bonn / Rhein-Sieg Chamber of Commerce

Events and Visits

MEDIA COMPUTING GROUP BECOMES GERMANY'S TOP HCI RESEARCH GROUP

Professor Jan Borchers Media Computing Group, one of the Chairs established by the B-IT foundation, focuses on research in Human-Computer Interaction (HCI) – a research field at the crossroads of computer science, cognitive psychology and design that aims to create new and better user interfaces for interactive technologies. Since being established at RWTH Aachen University in 2003, the group has become Germany's leading HCI research group in terms of archival publications at ACM CHI, the premier international conference on Human-Computer Interaction. In fact, his group has published more such publications alone than any other German university or other institution in its entirety.
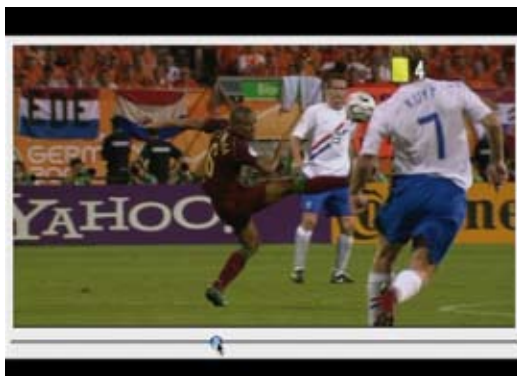
DRAGON makes scene video navigation up to 40% faster.

At CHI 2008, the Media Computing Group managed to bring home three awards: B-IT research assistants Thorsten Karrer, Malte Weiss, and Eric Lee, received the Best Of CHI award for their CHI Note on DRAGON, a direct manipulation interface for frame-accurate in-scene video navigation. The paper describes a new interaction technique that allows users to drag objects around in a video image in order to scroll forwards or backwards to that frame in the video where the object is at the desired position.

Dr. Elaine Huang, Humboldt Scholar at the Media Computing Group, received a "Best of CHI Honorable Mention" for her full paper "Breaking the Disposable Technology Paradigm: Opportunities for Sustainable Interaction Design for Mobile Phones". Finally, B-IT research assistant Gero Herkenrath achieved second place in the ACM Student Research Competition for his Diploma Thesis "TWEND: Twisting and Bending as new Interaction Gesture in Mobile Devices".

VISIT OF THE DELEGATION OF THE KING FAHD UNIVERSITY

Thomas Rose, B-IT professor for Media Processes, welcomed a delegation of the King Fahd University for Petroleum and Minerals, Dhahran, Saudi Arabia, in summer 2008. The delegation was headed by the dean and comprised about 25 students of several engineering programs. Several ways for mutual academic and teaching collaboration were discussed while the students were interested in Master and PhD program.

TANGIBLE AND EMBEDDED INTERACTION 2008 (TEI'2008)

The "Tangible and Embedded Interaction 2008" Conference (TEI'2008) brought together researchers from fields like tangible interfaces, graspable interfaces, physical computing, tangible interaction, IT product design, appliance design, interactive spaces, etc. in the B-IT Building in Feb. 18-20, 2008. In this context, Professor Hiroshi Ishii, incidentally an alumnus of Fraunhofer FIT, delivered the key note lecture. He

Professor Hiroshi Ishii at TEI'2008 delivering his key note lecture.

is a co-director of the ThingsThat Think (TTT) and head of the Tangible Media Group Tangible Media Group at MIT. Participants and public also enjoyed numerous exciting technological gadgets presented in the conference exhibition. TEI'2008 was organized by B-IT Professor Albrecht Schmidt, who is now Professor of Pervasive Computing and Interface Engineering at the University of Duisburg-Essen, Germany.

MEDIA COMPUTING GROUP BE-COMES APPLE AUTHORIZED TRAIN-ING CENTER FOR EDUCATION

Professor Jan Borchers' Media Computing Group works with Apple technology for most research projects. Following an agreement with Apple and several training courses, the group became Apple Authorized Training Centre for Education (AATCe) in Fall 2008. Several staff members of the group are certified trainers on Apple server and support topics and can now offer affordable training opportunities to other B-IT students and staff.

WORLD USABILITY DAY WITH B-IT LOCAL EVENT

Each year, on World Usability Day local institutions worldwide create local events that help to bring the importance of usability and the fundamentals of good user interface design to a wider audience. The B-IT Media Computing Group has held local events on this day for several years. This year, in collaboration with P3 Solutions, the group offered a whole day of talks and presentations by members from academia and industry, on the topic of usability in transportation. For example, DHL Logistics talked about usability concepts in their new self-service packet stations.

MOBILE RESPONSE 2008 HELD AT B-IT

The Second International Symposium on Mobile Information Technology for Emergency Response was held at B-IT on May 29 - 30, 2008. Chaired by Markus Klann (Fraunhofer FIT) and Jobst Löffler (Fraunhofer IAIS), the symposium presented the latest approaches and technical solutions in mobile information technology for emergency response planning and execution. Four keynote speeches by renowned speakers from Scotland, Italy, The Netherlands, and Germany addressed issues such as failure risks of mobile emergency management systems, building assessment after earthquakes, humanitarian information systems, reliable and secure communication infrastructures.

INNOVATION THROUGH CO-OPERATION

In the presence of Former Minister of Research and SPD party leader Björn Engholm, a meeting of business and science representatives discussed the potential of regional co-operations in the field of IT – inspired innovations at B-IT on February 12, 2008. The meeting focused on the cooperation of the Aachen-Bonn-Cologne region with its partners in the growing Baltic Sea economic area, accessed through the the old Hanse town of Lübeck. Both share the emphasis on media and life science informatics. The BMBF lead project FUSION on computer-assisted liver surgery was presented as one of the prime examples of this successful cooperation.

INFORMATIKTAGE 2008

Former GI president Prof. Matthias Jarke and his successor Prof. Stefan Jaehnichen opened Informatiktage 2008, the elite student meeting of the German Informatics Society GI, organized by B-IT for the third time in a row, in March 2008.

Chris Johnson, Professor of Computing Science at Glasgow University, delivered the key note lecture "Understanding the Failure of Mobile Systems in Emergency Situations" at the Mobile Response 2008.

Research at B-IT

Cologne fire fighters in an exercise that simulated a catastrophic accident with more than 500 casualties. © Feuerwehr Köln

NOVEL EMERGENCY PROCESS MODELS DEVELOPED

EU project ERMA develops a management suite for emergency management. In this context, a master thesis by Media informatics student Emilija Arsenova under the supervision of B-IT professors Thomas Rose and Matthias Jarke studied the use and customization of process modeling methodologies for the capture and analysis of emergency management procedures. In tight cooperation with the fire department of the City of Cologne, the team studied the cross-organizational coordination among different rescue organizations in case several hundred people are injured during an emergency. The results achieved high user and media attention and led to several follow-up activities at the national and international level.

PROCESS ASSISTANCE IN INTENSIVE HEALTHCARE

The support of Standard Operating Procedure in the medical domain was elaborated by DFG-funded research project OLGA (Online Guideline Assist). A team from Fraunhofer FIT led by B-IT Professor Thomas Rose and doctoral candidate Martin Sedlmayr, including two media informatics master students, developed a multi-level reference model for the formal representation of procedures, instructions and recommendations in the domain of intensive care. Due to the dynamic nature of intensive care such processes are extremely complex and flexible interfaces an essential requirement. The workflow execution support has been embedded into a well

The OLGA project builds a knowledge-based support for intensive care processes. Partner in the project is the Giessen anesthesiology clinic.

established electronic patient management system. OLGA has not only resulted in a successful doctorate, two related Master Theses and numerous scientific papers, but also received significant media coverage including a report by the German weekly magazine Focus.

AUTOMATING THE ANALYSIS OF CHEMICAL TEXTS

Scientific progress in pharmaceutical chemistry is regularly communicated by a combination of textual description and images of chemical structures in journal articles or patents. Chemical structure depictions in literature are very informative for human experts; however, they cannot be read by computers. A team at Fraunhofer SCAI developed chemoCR, a software that automatically recognizes chemical structure depictions and translates them back into a machine-readable chemical representation format. In a benchmarking experiment

Marc Zimmermann and B-IT student Olga Domanova with the President of the Federal Republic of Germany, Prof. Dr. Horst Köhler, and NRW Minister for Innovation, Prof. Dr. Andreas Pinkwart.

Dr. Marc Zimmermann and B-IT student Olga Domanova could demonstrate the efficiency of their approach. It shows that 70% of the effort spent in the pharmaceutical and biotechnology industry to reconstruct chemical information from structure depictions can be saved by using chemoCR. Both scientists had a chance to present their work to the President of the Federal Republic of Germany, Prof. Dr. Horst Köhler, when he visited Fraunhofer's Birlinghoven Castle in May 2008.

MEDIA COMPUTING GROUP ACQUIRES ADDITIONAL FUNDING VIA HUMTEC

HumTec is part of the Excellence Initiative Program launched at RWTH Aachen University with its new status as elite university. HumTec focuses on the interaction of people and technology. After acquiring previous funding for one PhD candidtate position in through the UMIC Excellence Cluster in 2006, the B-IT Media Computing group acquired funding from HumTec for two additional researchers. One will focus on the use of ubiquitous computing technology for e-health purposes in a project with architects and cognitive psychologists, the other will explore how authors transition from early nonlinear concepts to sequential text drafts in an interdisciplinary project with neuroscientists and literature researchers.

AUTONOMOUS SYSTEMS GROUP PARTICIPATES IN INTEGRATED PROJECT PROPOSAL BRICS

Robot developers in academia and industry need common research platforms and development tools to shorten the development cycles for new robot systems and applications. The robotics community has to pursuen domain-specific integrated development environments similar to the ones investigated for the automotive or telecom industries. BRICS is going to address this need. The main objectives of BRICS are therefore

- to significantly promote the interoperability of hardware and software components by harmonizing the interfaces and as well as the communication and data exchange between these components;
- to design and implement an integrated robotic development environment, including a software repository of best practices robotics algorithms.

The B-IT Autonomous Systems group (coordinated by Professor Prassler) will focus on the integration aspect. Partners in BRICS come from academia in Netherlands, Belgium, Italy and robot producing companies in Germany and Switzerland.

B-IT Research School
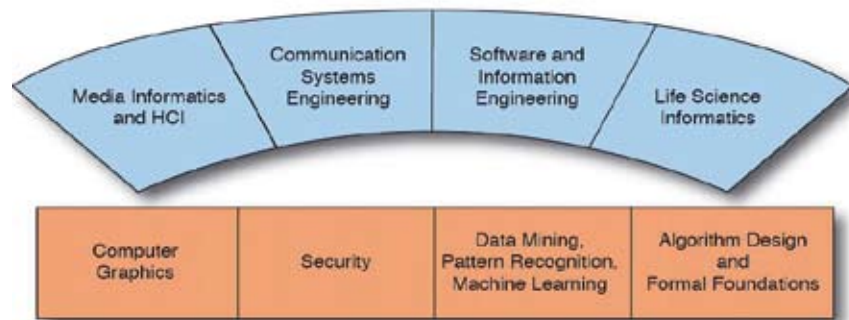
RADICALLY IMPROVED DOCTORAL TRAINING THROUGH B-IT

The North Rhine-Westphalian Ministry of Innovation, Science, Research and Technology (MIWFT-NRW) has approved financial support totaling initially over 1.5 M € for the Bonn-Aachen International Research School on Applied Informatics (B-IT Research School) for the period 2008-2013. The B-IT Research School is operated by RWTH Aachen University with the University of Bonn and the Fraunhofer Institute Center Birlinghoven Castle. Professors Matthias Jarke (RWTH Aachen University and Fraunhofer FIT) and Armin B. Cremers (University of Bonn) coordinated the proposal writing and serve as initial scientific directors.

The NRW financial support is matched by funds from the University Rectorates, the B-IT Foundation, and the participating institutes. The B-IT Research School will support scholarships for up to 20 doctoral candidates, plus a program of compact courses and research seminars within Applied IT. Two junior fellowship positions will be filled in early 2009 to support this work.

The B-IT Research School complements the successful international B-IT master programs with a structured doctoral training. A key aspect of our approach is that the B-IT Research School does not just support the scholarship students but also the 150-200 project researchers from the projects of RWTH Aachen, the University of Bonn, the Fraunhofer institutes in Birlinghoven, and the University of Applied Sciences Bonn-Rhein-Sieg. We thus close the gap between our Master Programs and our large research projects such as the UMIC Excellence Cluster, the Collaborative Research Centers and Focused Doctoral Programs, the EU- and BMBF-funded cooperation projects and direct industrial projects.

In the past ten years, the ABC regions Aachen-Bonn-Cologne has developed into one of the top IT regions in Germany. The B-IT Research Schools is an important additional cornerstone to reduce the shortage in top ICT researchers here. At the same time, the international competitiveness of the master programs and doctoral education itself is also further strengthened.

The B-IT Research School clusters the doctoral candidates across participating institutions in eight key themes where the region is highly competitive internationally. The figure above shows these areas. Each area is coordinated by one or two internationally known researchers and organizes its own program of regular research seminars, where the doctoral candidates

present their research, and of compact courses in which international visitors join the local faculty to train the candidates in latest scientific status and methods of their fields, but also in soft skills around project management, writing and presentation techniques, and general scientific methodology. The course program is organized such that project researchers are not hindered in their normal duties. Conversely, internship programs offer the more theoretically oriented students the opportunity to obtain experience in larger research projects.

The first six doctoral scholarships were granted in October 2008, the first compact courses are planned for late fall of 2008. Further scholarships will be filled in 2009. For a few exceptional first-year master students from the B-IT programs, there is an opportunity to apply for a joint Master-Ph.D. program where the second master year coincides with the first year of the three-year Doctoral Program in the B-IT Research School. The six initial scholarship holders are listed below in alphabetical order with their background and planned area of dissertation:

- Pham Manh Cuong (Vietnam), B.Sc. Hanoi University of Technology, M.Sc. B-IT Media Informatics; Information Systems, RWTH Aachen University
- Harsha Gurulingappa (India), M.Sc. B-IT Life Science Informatics; Fraunhofer SCAI and University of Bonn
- Florian Heller (Belgium), Dipl.-Inform. RWTH Aachen University; Media Computing, RWTH Aachen University
- May Hermann (Germany), Dipl.-Inform. University of Bonn; Computer Graphics, University of Bonn
- Stefan Kreutter (Germany), Dipl.-Inform. University Erlangen-Nürnberg; Life Science Informatics, Fraunhofer FIT and RWTH Aachen
- Deniz Sarier (Turkey), B.Sc. Istanbul Technical University, M.Sc. B-IT Media Informatics; Computer Security, University of Bonn
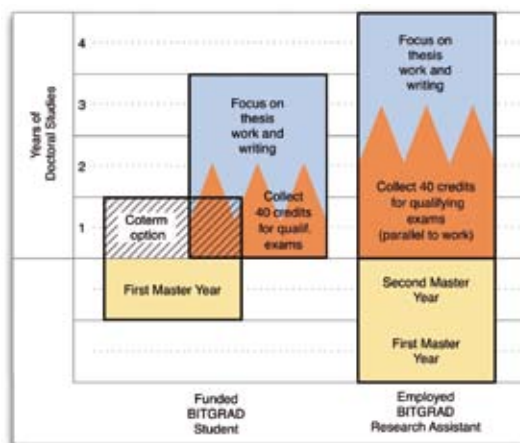
Florian Heller, who completed his Diploma Thesis at Jan Borchers' B-IT-funded Media Computing Group, has joined that group as a PhD candidate after being among the first batch of select students receiving a doctoral studies grant from the newly established B-IT Research School. This grant allowed the group to keep Florian, a talented CS student who grew up in Belgium, around after his graduation to commence his PhD studies with B-IT. In his thesis, Florian, who has both a strong CS/HCI and hardware background, will explore "Embedded & Tangible Interaction" – bringing the areas of Human-Computer Interaction and Embedded Systems closer together.

Florian Heller.

Deniz Sarier graduated in 2007 in Media Informatics, with a thesis on hybrid symmetric / asymmetric encryption written under the supervision of B-IT Professor von zur Gathen. She has won the Best Student Paper Award of the "2008 International Conference of Information Security and Internet Engineering", held in London, UK, and has been invited to the conference committee of the coming "World Congress on Engineering 2009 (WCE 2009)". After this major success at a very early career stage, she is now pursuing doctoral studies at the B-IT Research School. Besides her scientific accomplishments, she is also a piano player at concert level.

Award winner Deniz Sarier.

Master Program in Media Informatics

*Prof. Dr. Jan Borchers,
Media Computing*

*Prof. Dr. Thomas Rose,
Media Processes*

Computer scientists with an applied focus have been in great demand in the past, and this is expected to continue for the foreseeable future. Graduates of the Master Program in Media Informatics will be well-prepared for the challenges faced when working in computer systems engineering and for creative work with audio-visual media. The Aachen – Bonn – Cologne region is home to many prospective employers, including global players such as Philips, Microsoft, Telekom, Vodafone, Bertelsmann Group, as well as many television stations including RTL, WDR etc.

While a Bachelor degree in Computer Science typically qualifies to participate in large software projects, the Master degree provides the qualifications for project leadership. Graduates of the program in Media Informatics can be expected to be technically innovative, to work as system architects, and to manage large projects. Students who excel during their master program will also have the necessary qualification to pursue a doctoral degree in Germany or abroad. The DFG Research Training Group "Software for Mobile Communication Systems" and the new Excellence Research Cluster "Ultra-High-speed Mobile Information and Communication (UMIC)" offer an exceptional research environment for the students.

The Master Program in Media Informatics educates the students to successfully meet the novel technical and economic challenges at the intersection of computer science, software engineering, next-generation communication systems, and the media. It is offered as a joint program of RWTH Aachen University and University of Bonn. The program is characterized by a significant portion of lab courses embedded in research of the participating Fraunhofer Institutes for Applied Information Technology FIT and for Intelligent Analysis and Information Systems IAIS. The degree is conferred by RWTH Aachen University. Cooperation partners from industry and research contribute to a rich teaching program. The course contents are structured according to the ECTS (European Credit Transfer System) and consist of three main blocks:

- Computer Science and its mathematical foundations;
- Multimedia Technology;
- Fundamentals of Media Science and business.

Major topics include: Internet Infrastructures, Data Communication, Digital Interactive Media, Management of Information, Computer Graphics, Animation, Visualization, Speech/Image/Video Processing, Game Design, Security and Cryptography, Designing Interactive Systems, Cooperative Work Environments, E-Business, Knowledge Management, Virtual and Augmented Reality, and Software Engineering.

Thirty seven Media Informatics students have completed their degree in the academic year 2007-2008, ten with a grade of "very good", two even with the rare grade of "high distinction". All graduates quickly found interesting positions either as doctoral students in Germany and abroad, or in attractive companies. The incoming class of 2008 comprises 36 students from 17 different countries, about 30% are women. B-IT students were unusually successful in obtaining competitive prestigious scholarships this year. Seven incoming students, pre-selected from more than 500 applicants, were awarded the prestigious Erasmus Mundus scholarship within the European Master of Informatics program we are conducting jointly with the universities of Edinburgh (UK) and Trento (Italy). Another Media Informatics student received one of the three RWTH master student scholarships awarded within the faculty of Mathematics, Informatics, and Natural Sciences, and a few students obtained DAAD scholarships. Many Media Informatics students also participated as student research assistants in exciting projects at the universities, in Fraunhofer, or in industry.

HONOURS FOR B-IT MEDIA INFORMATICS ALUMNI

Recent alumni of the B-IT Media Informatics Program received some major honors in the context of the European Erasmus-Mundus Scholarship programme "European Master in Informatics (EuMI)". EuMI is one of the earliest and most successful among the currently ca. 80 EU-sponsored double degree scholarship programs within Erasmus-Mundus. In EuMI, B-IT Media Informatics cooperates with RWTH Aachen's Software Systems Engineering Program as well as with master programs of the Universities of Trento (Italy) and Edinburgh (UK) which have achieved top places in national research rankings. Since 2004, a total of 94 scholarships have been awarded. The German EuMI participation is coordinated by Professors Matthias Jarke and Gerhard Lakemeyer (RWTH Aachen University).

In the EuMI general assembly held in Trento in April 2008, best student awards were presented to graduates of the first two EuMI years. For the first year, the winner was Yong Li from China, who came to B-IT with a B.Sc. from Tsinghua University and wrote his master thesis under the supervision of Professors Matthias Jarke (Aachen) and Alan Bundy (Edinburgh). In the second graduation year, two Media Informatics graduates, Mahmoud el Gayyar and Siddhu Warrier, were among the top three graduates. Mr. El Gayyar has meanwhile joined the group of Professor Cremers, the supervisor of his Master thesis, in the GLOWA Volta project on sustainable water resource management carried out jointly with the Center for Development Research (ZEF) at the University of Bonn.

EuMI meeting, Trento.

Last not least, B-IT Media Informatics graduate Taghi Pakshima was elected as founding Vice President of EMA, the Erasmus-Mundus Almuni association representing the 4700 previous and present scholarship holders in early 2008.

SOME EXPERIENCE REPORTS BY MEDIA INFORMATICS GRADUATES

Ahmad Noman
Software Engineer, Solutions 4 Media, Cologne, Germany

I am currently working as a Software Engineer at S4M, a subsidiary of Arvato Systems, Bertelsmann AG. When I look back, I can attribute much of my professional success to sound foundations developed during my masters' studies in media informatics. The distinguishing feature of this program is the amazing variety of available courses and labs. My thesis at Fraunhofer gave me the chance to become actively involved in German research project VIOLA and EU research project PHOSPHOROUS, which was itself a great experience. My description would stay incomplete without a word about the beautiful city of Bonn. The friendly atmosphere and scenic landscape makes it a fascinating living place whose memories are still captivating for me.

Salys Sultan
Assistant Lecturer, The University of the West Indies, Trinidad and Tobago

I graduated from the Media Informatics program in 2007. Since then I returned to Trinidad and Tobago to pursue my PhD in Computer Science at the University of the West Indies (UWI). My research areas include modeling and design of mobile applications, computer-supported ubiquitous learning and advanced technology in education. I am also working as a assistant lecturer in the department of Mathematics and Computer Science. The Master in Media Informatics program equipped me with the necessary tools and experience. The program was both challenging and fun. One of my favorite aspects was the lab course where we went out into the field and obtained some hands-on experience while working with top researchers. I would recommend this program to anyone!

Media Informatics Graduates accepted a wide range of positions in research and business:

Avedas AG
Bank of Mexico
Bertelsmann AG
CAS GmbH
COMNEON GmbH
Deutsche Telekom AG
ECT Group
Ericsson AG
FGAN
Forschungszentrum Jülich
Fraunhofer FIT
Fraunhofer IAIS
ip.labs
Kisters AG
LHS Telekommunikation GmbH
LYCOS
Mastercard
Microsoft
Novartis
PricewaterhouseCoopers AG
Qiagen
QSC AG
RWTH Aachen University
sd&m AG
Siemens AG
Teleca
TU Eindhoven
University of Asia and the Pacific
Universität Bonn
University of Edinburgh
Universität Hamburg
Universität Heidelberg
Universität Stuttgart
University of West Indies
WorkPlace

Master Program in Life Science Informatics

Prof. Dr. Jürgen Bajorath, Life Science Informatics

Prof. Dr. Martin Hofmann-Apitius, Life Science Informatics

The Master Program in Life Science Informatics (LSI) is offered by the University of Bonn and RWTH Aachen University in cooperation with the Fraunhofer Institutes of Scientific Computing (SCAI) and Applied IT (FIT). The degree is conferred by the University of Bonn. This interdisciplinary program educates the participants to successfully master the novel technical and economic challenges at the crossroads of biotechnology, medicine, pharmaceutics and computer science. The curriculum consists of three main blocks:

• Computer Science and Mathematics for life scientists;
• Basic principles of Life Science Informatics;
• Biology of the cell and systems biology.

Major topics include biomedical database systems, data mining and machine learning, statistical genetics, drug design, medical imaging and visualization, computational neuroscience, computational modeling of regulatory and metabolic networks, cheminformatics, bioinformatics, molecular modeling, molecular biology, pharmaceutical chemistry, biotechnology and systems biology. The program emphasizes a profound understanding of biological structures (such as proteins, nucleic acids, genes, metabolic, neural networks and organisms) as well as the appropriate application of methods of computer science to this field. It also includes training designed to sensitize students to the ethical implications of emerging biotechnologies. This combination will enable the successful students to understand biological or medical problems and to find appropriate and valid solutions that bioinformatics can offer.

The program is characterized by a significant share of research lab courses embedded in both basic and applied research of the participating Fraunhofer Institutes FIT and SCAI as well in labs of CEMBIO (Center for Molecular Biology) and LIMES (LIfe and MEdical Sciences Research Biocenter Bonn). The final six months of the program are dedicated to the master thesis which can be done in cooperation with industry. Each student is assigned a professor as personal mentor.

Computer scientists with an applied focus in biosciences as well as biologists with a strong background in computer science have been in great demand in the last few years, and this is expected to continue in the foreseeable future. Graduates of the program are well prepared for the typical professional tasks in applied data analysis and data modeling, in industrial functional genomics, drug design and pharmacology. The Aachen – Bonn – Cologne – Düsseldorf region (ABCD region) is home to many prospective employers, including global players as well as highly specialized medium-sized companies.

Professor Martin Hofmann-Apitius has taken over as head of the Master Program of Life Science Informatics from Professor Jürgen Bajorath. The changes in the head of program position allow the realization of different, complementing and future-oriented directions in the curriculum.

The number of applicants to the Life Science Program grew from 67 in 2006 to 105 in 2007 and to 118 in 2008. 19 applicants were selected for start in October 2008. Eight Life Informatics students completed their degree and very quickly found interesting positions mostly as PhD candidates (e.g. University of Oxford, Charité Berlin, B-IT Research School) or in the BioTech industry.

© Reuters / Hannibal Hanschke

Dr. Annette Schavan, Federal Minister for Education and Research, and the German Chancellor, Dr. Angela Merkel, attend a FUSION presentation in the BMBF booth at CeBIT 2008.

b-it
Bonn-Aachen
International Center for
Information Technology

B-IT LSI LECTURE SERIES

B-IT Professors Martin Hofmann-Apitius and Jürgen Bajorath conceived and organized the B-IT Life Science Informatics Lecture Series in order to foster the development and knowledge of Life Science Informatics. Eminent researchers from all over the globe gathered in B-IT to present the current state-of-the-art in the dynamically growing field of Life Science Informatics. The lecture series was very well attended (ca. 80 attendees per lecture) also from outside B-IT. Lecturers included among others, Professors Michael Ashburner (Cambridge University, UK), John Quackenbush (Harvard University, Cambridge, Massachusetts, USA), and Carole Goble (University of Manchester, UK), Dr. Alexander Hillisch, Director Bayer Medical HealthCare, Leverkusen, Germany) and Dr. Martin Stahl (Roche, Basel). Discussions during the receptions following each lecture lasted sometimes for hours.

NEWS FROM LSI STUDENTS
Enuo He

B-IT student Enuo He, on which we reported in the past report, has now successfully graduated from the Life Science Informatics Program. After internships at the European Bioinformatics Institute (EBI) in Hinxton UK and the CALTEC in Pasadena, USA, she completed her studies at B-IT in autumn 2008. Her master thesis was carried out at Forschungszentrum Jülich in co-operation with B-IT Professor Hofmann-Apitius. She got offers from renowned universities and eventually accepted an offer for a PhD position at Oxford University, UK.

Enuo He.

Erfan Younesi, finishing LSI student

Erfan Younesi, past student speaker of the LSI students and editor of the first LSI student newsletter, is currently finalizing his master thesis with Professor Hofmann-Apitius, in systems biology of breast cancer. During his master thesis, Erfan's submitted paper was accepted at the German Conference on Bioinformatics, September 9-12, 2008 in Dresden. Erfan joined B-IT in 2006, from Bu-Ali Sina University, Hamadan, Iran and after a postgraduate diploma at the Department of Horticultural Genetics and Biotechnology, Mediterranean Agronomic Institute of Chania, Greece, affiliated to the International Centre for Advanced Mediterranean Agronomic Studies, CIHEAM, Paris. He will now continue his work in the group of Professor Martin Hofmann-Apitius as a PhD candidate.

Ye Hu, finishing LSI student

Ye Hu joined B-IT in 2006, graduating from Southeast University in Nanjing, a 211 elite university in China. She joined the group of Professor Bajorath to carry out her master thesis in co-operation with Professor Gütschow, Pharmaceutical Institute, University of Bonn. Her master thesis resulted in the publication "RelACCS-FP: a structural minimalist approach to fingerprint design", Chemical Biology and Drug Design, 72, 341-349, 2008. Ms. Hu will continue in Professor Bajorath's group as a PhD candidate.

Olga Domanova, senior LSI student

Olga Domanova, who joined B-IT in Winter Semester 2007/2008 with a DAAD fellowship, graduating from the Technical University of St. Petersburg, Russia, spent 6 weeks in the System Biology Lab of Dr. Baldo Oliva, Municipal Institute for Medical Research in Barcelona, Spain. Together with Professor Hofmann-Apitius they collaborate in @neurist, a large scale research project funded by the EU, focusing on "Integrated Biomedical Informatics for the Management of Cerebral Aneurysms".

*Professor
John Quackenbush,
Boston, Havard*

*Professor
Michael Ashburner,
Cambridge, UK*

International Program of Excellence in Computer Science

Prof. Dr. Joachim von zur Gathen, Computer Security

Prof. Dr. Stefan Kowalewski, Embedded Systems

Prof. Dr. Christian Bauckhage

The International Program of Excellence in Computer Science (IPEC) at B-IT offers compact courses primarily during the semester break and at the highest educational level. This results in faster studies and advanced quality in selected subject areas. These courses apply to a limited number of highly qualified students of the University of Bonn, the RWTH Aachen University and, in the future, other German or foreign universities.

Undergraduate IPEC courses are planned in a way that the time required for the bachelor degree will be reduced up to one year. Additionally there are cross-cutting courses that accelerate the master studies at the B-IT as well as regular summer and winter schools that are designated for selected topics of computer science. These courses are held in cooperation with international guest scientists. Applications of foreign students are welcome.

The expected impact of the Program of Excellence is not limited to a significant acceleration of undergraduate and graduate studies in conjunction with an international visibility. It also brings together outstanding students with internationally noted scientists and with fellow students from abroad and activates new forms of encouraging competition among students. The IPEC courses usually comprise a mix of lecture classes, seminars, and lab courses, such that students can make best use of the compressed time schedule.

Prof. Dr. Christian Bauckhage, Fraunhofer IAIS, accepted a position as Associate Professor of Media Informatics at the University of Bonn in October 2008. After getting his doctorate in Bielefeld, Germany, he held research positions at York University (UK) and Deutsche Telekom Laboratories, Berlin, prior to joining B-IT. His research area is image / video retrieval and statistical learning. Prof. Bauckhage follows Prof. Albrecht Schmidt who moved to the University of Duisburg-Essen in early 2008.

In the academic year 2007-2008, 32 compact undergraduate courses for small teams of very good students were held, many of them with a lab or seminar component and thus a lot of active participation. A total of 239 participants successfully passed these courses, continuing the upward trend of the last years. With the transition from the Diploma to the Bachelor curriculum in Aachen (2006) and Bonn (2007), these numbers are expected to grow further and the program will be restructured in the coming year to specifically target this audience. Moreover, as already in the previous year, one of the IPEC undergraduate compact courses was held in Jiangsu province, China, as part of their cooperation treaty with B-IT.

B-IT Foundation funding of the Embedded System chair held by Professor Stefan Kowalewski has been taken over by RWTH Aachen University since 2007. In late 2006, Professor Kowalewski became one of the Area Coordinators of Excellence Cluster UMIC. In August 2008, he was elected Speaker of RWTH Aachen's Informatics department after turning down an offer for a chair at the Technical University of Munich.

CRYPT@B-IT 2008

This summer school on cryptography offered undergraduate and graduate students, postdocs and researchers the opportunity to crypt a bit. It provided acquaintance and interaction in an intellectually stimulating and informal atmosphere in pleasant surroundings. It took place 28 July – 1 August 2008 in the b-it building and invited to the exploration of some fundamental areas of cryptography:

• Design and analysis of block ciphers and cryptographic hash functions.
• Cryptography: Numbers at work and play.
• The Enigma crypto machine.

crypt@b-it Student Faruk Göloglu, Dr. Gebhardt (BSI) and Michael Nüsken (B-IT, Cosec) discuss a real Enigma.

In addition, there were tutorials and hands-on exercises on topics related to the lectures, including an exhibit of an actual Enigma machine. The permanent presence of world-class researchers and teachers was much appreciated by the audience, and in fact some research collaborations were started during the summer school.

Lecturers
• Joachim von zur Gathen, B-IT
• Vincent Rijmen, COSIC, Katholieke Universiteit Leuven, Belgium and IAIK Krypto Group, Graz University of Technology, Austria
• Igor Shparlinski, ACAC, Macquarie University, Sydney, Australia
• Max Gebhardt, BSI Bonn, and
• the members of the cosec group.

SCHÜLER-KRYPTO 2008

On two days in February 2008, 262 high school students, as well as 15 teachers met for the seventh Schüler-Krypto to learn @ bit on secret messages, encryption and decryption. They came from Aachen, Ahaus, Andernach, Bedburg, Castrop-Rauxel, Geseke, Hürth, Kaarst, Mönchengladbach, Neuwied, Odenthal, and places near Bonn.

After a one hour introduction to the topic by Prof. von zur Gathen and Michael Nüsken the students got to the nitty-gritty. Everybody was asked to take up the role of James Bond and program RSA on the laptop built-in to Bond's BMW Z8. We used MuPAD on it, a computer algebra system which among many other things is capable of calculating with arbitrarily large numbers. After lunch everybody decrypted answers from Moneypenny, set up a public-key infrastructure and exchanged encrypted messages with each other. As a sidetrack, in a game-like setting the students could experimentally find out how the main step in the encryption and decryption of RSA, namely the modular exponentiation, can be executed in a jiffy. And finally everybody could take home her personal visual cryptogram.

Master Program in Autonomous Systems

Prof. Dr. Gerhard Kraetzschmar, Educational Robotics

Prof. Dr. Paul-Gerhard Plöger, Autonomous Systems

Prof. Dr. Erwin Prassler, Robot Planning

The Master Program in Autonomous Systems is offered by the B-IT Applied Science Institute (b-itAS) in the Department of Computer Science at the Bonn-Rhein-Sieg University of Applied Sciences. b-itAS cooperates closely with the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS in implementing the program, which started in winter 2002. The program is managed by three professors (Gerhard Kraetzschmar, Paul G. Plöger, Erwin Prassler), two teaching and research assistants (Iman Awaard, Ronny Hartanto) and additional staff, which has been recruited in due course of the two European research projects XPERO and RoSta, namely Timo Henne, Asamat Shakhimardanov, Björn Kahl and Alex Juarez.

Students get a solid theoretical background in Autonomous Systems. Examples of lectures are Autonomous Mobile Robots, Control and Systems Theory, Robot Manipulation, Learning and Adaptivity, Hardware-Software Co-design of Embedded Systems, and Probabilistic Reasoning. The students may specialize in fields like System Design, Navigation, Sensors and Modeling, Computer Vision or Manipulation. The courses are combined with research projects conducted at IAIS or other approved institutions. The b-itAS program has been accredited by ASIIN in 2006.

In the academic year 2007-2008 from more than 250 applicants a total of 23 students from 7 countries were admitted. 12 students have completed their degree in this year; twelve more graduations are expected shortly. More than half of the recent graduates pursued their careers as research associates at renowned universities including B-IT itself. The three professors of the program are actively involved in many scientific activities, including memberships in technical committees of IEEE or in the RoboCup Federation trustee board, numerous program committees of workshops and scientific conferences like IROS, ICRA or ICMA. To promote the b-itAS course on an international level, we proposed a dual degree Masters program with the GJU German-Jordan University in Amman, Jordan. This program has been presented to DAAD for start-up funding and is currently under review.

B-IT PRIZE WINNING: STAY WITH THE BEST

How can we foster learning based on experimentation in embodied agents? This is the primary question behind the master thesis "A Software Integration Framework and Architecture for Robotic Learning by Experimentation: XPERSIF" authored by Iman Soliman Awaad and Beatriz León Pinzón. The publication contributed the single most important part within the Integration work package of the European research project XPERO. XPERO unites universities from France, Italy, Austria and Slovenia to carry out basic research in the area of learning in embodied agents. The most complex task was to find a valid way how data and software written by five partners could be integrated into a common software framework. As an example the framework needed to be able to process robotic "curiosity", "astonishment" and "surprise".

The two candidates did such a tremendous job that they were awarded the prize for the best thesis in computers science donated by the DSG-Canusa GmbH, a worldwide leading company in shrink-on techniques. Both opted for an academic career. Mrs Awaad accepted a position staying with B-IT, while Mrs. Leon is on a PhD program at the University Jaume in Valencia, Spain.

Iman Soliman Awaad and Beatriz León Pinzón.

The b-itAS team at the RoboCup World Championships in Suzhou, China. In 2007 b-itAS acquired a new robot platform with a 5 degree-of-freedom Katana arm, including several sophisticated sensor systems and a powerful computing unit.

TEAM B-IT-BOTS RETURNS HOME FROM THE ROBOCUP WORLD CHAMPIONSHIPS IN CHINA AICE CHAMPION

The team B-it-bots from Bonn-Rhein-Sieg University of Applied Science RoboCup 2008 in Suzhou, China, is vice-world champion in the RoboCup@Home-League. The annual Robo-Cup championships do not only cover robotic soccer at but there are also competitions in service robotics and emergency management. Since 2006 the RoboCup@Home league is on its way to develop into a standard benchmark for service robotics. The robots must cope with different tasks in domestic surroundings, like building a map of the surroundings unknown to them, using this for the navigation, recognizing different everyday objects and remembering the positions in their environment for example. You then must grip and transport these objects, recognize well-known persons, become acquainted with unknown persons and communicate via natural language with users. The integration of all these very different and demanding functions is a special challenge for the teams.

Professors Paul Plöger and Gerhard Kraetzschmar, the research associates Ronny Hartanto and Walter Nowak as well as the b-it-AS master students Dirk Holz, Jan Paulus, Thomas Breuer and Geovany Macedo formed the team b-it-bots early in 2008. However, the most important team member is and remains: the robot Johnny! In a thrilling first stage of the competition, the teams b-it-bots and AllemaniACs of RWTH Aachen University delivered a neck and neck race. By a perfect last test run the AllemaniACs could still overtake the leading b-it-bots and go to the final by a narrow margin. The b-it-bots then pulled all the stops and caught up with the AllemaniACs with a brilliant performance during the all decisive Open Challenge in the final. At the end both teams ended up with exactly the same score, and thus shared the vice championship, a fine success for the two B-IT partner institutions.

B-IT Universities Institute

ABC – three letters that stand for a veritable "magic triangle": the region between Aachen, Bonn and Cologne, which is not only economically strong, but also a leader in science, education and research. The large number of research establishments based here make the area one of Europe's biggest and most important science landscapes. Almost 10 per cent of all German students – around 130,000 people – are studying at the Rheinisch-Westfälische Technische Hochschule in Aachen, the Rheinische Friedrich-Wilhelms-Universität Bonn and the Universität zu Köln, which together constitute one of the most important higher education locations in Europe. The three ABC institutions are closely linked and collaborate in many fields of teaching and research.

UNIVERSITY OF BONN

The University of Bonn is a research-oriented university with currently 30.000 students. Its research tradition of 200 years is closely linked to the names of Hermann von Helmholtz, Heinrich Hertz and Friedrich August Kekulé who carried out seminal work at the University of Bonn. This strong academic tradition has been continued until present with the more recent Nobel laureates Wolfgang Paul and Reinhard Selten. Bonn cooperates with numerous other universities and research institutions around the globe. The specializations it has developed enjoy worldwide recognition. More than 5,000 students from 130 countries are enrolled in Bonn. Their presence underlines the international character of the university and enriches both academic and social life in Bonn. Living up to its long tradition as a classical university with a full range of academic disciplines, the University of Bonn offers nearly a hundred different first degree programs. Students can choose from a wide and modern spectrum of subjects that allows a multiplicity of combinations.

RWTH AACHEN UNIVERSITY

RWTH Aachen University was founded as a Polytechnic in 1870 with considerable support from local industry. In 1948 it was established as Rheinisch-Westfälische Technische Hochschule Aachen (RWTH), the Institute of Technology of the State of North Rhine-Westphalia. Today, RWTH is one of the most renowned technical universities in Europe, with around 30,000 students, of which more than the half are enrolled in engineering. More than 4,000 international students are enrolled, including around 900 Asian students. RWTH offers more than 65 first degree programs in Science, Engineering, Economics, Medicine and Arts and more than 20 graduate programs in Science and Engineering. The specific strength of RWTH's engineering education is the combination of education and advanced research. RWTH's engineering departments closely cooperate with national and international industries. Most of the engineering professors at RWTH held positions in industry before they became RWTH faculty members. The RWTH master programs educate engineers who are keen to engage in R & D, innovation, and entrepreneurship. In 2007, RWTH Aachen was elected as one of nine "elite universities" within the German excellence program. Under this program, RWTH receives a total of ca. 180 Mio. € for its strategic development, three excellence clusters, and a Graduate School. B-IT faculty are involved in two excellence clusters and the graduate school as well as the central strategy proposal.

The spacious Hofgartenwiese is a major summer attraction on the University of Bonn campus.

Entrance of Birlinghoven Castle.

Virus hunters in "Epidemic Menace", a pervasive game developed in the European "Integrated Project on Pervasive Games – IPerG", working with Fraunhofer FIT's Augmented Reality environment.

The Birlinghoven Castle campus has for almost 35 years been one of the largest and most influential computer science research sites in Germany. Since 2001, it is a member of the Fraunhofer Society of Applied Research. Today about 500 researchers work in the IZB institutes. That represents a quarter of the Fraunhofer ICT Group, Europe's largest IT research organization. The institutes collaborate closely with the European ERCIM network of national IT research centers as well as with leading research establishments in the USA, Eastern Europe and Asia. The campus also hosts one of the best-equipped Computer Science research libraries in Germany. Three IZB institutes contribute to the B-IT master programs Media Informatics and Life Science Informatics:
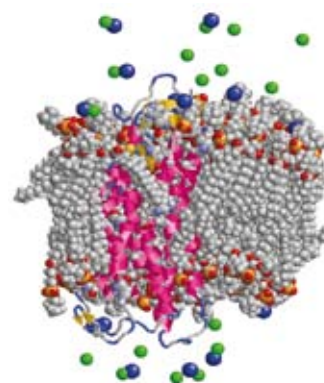
FRAUNHOFER FIT

Fraunhofer FIT investigates human-centered computing in a business or engineering process context. The usability and usefulness of information and cooperation systems is optimized in their interplay between human work practice, organization and process. In Life Science Informatics the institute focuses on protein analysis, visual support for navigation in micro surgery, and assistive information technology. In Media Informatics innovative information visualization systems, mixed and augmented reality environments for industrial planning, pervasive gaming applications, and value chains for public-sector information services are main research topics.

FRAUNHOFER SCAI

The Fraunhofer Institute for Algorithms and Scientific Computing (SCAI) engages in computer simulations in product and process development and is a strong partner in industry. The Department of Bioinformatics is doing applied research and development in the field of: Information Extraction / Semantic Text Analysis, Applied Chemoinformatics and Datagrid / Grid Infrastructure. Complementary to the data- and knowledge-driven approaches taken in the Department of Bioinformatics, the Department of Simulation Engineering focuses on chemical engineering by means of multi-scale simulations. Through gaining a deep understanding of the microscopic behaviour and mechanism of chemical systems, material and drug development is improved.

Fraunhofer SCAI: Membrane-embedded receptors, like the prototypic rhodopsin shown above, are pharmaceutically most interesting. The aim is to gain control over cellular response by designing new drugs.

B-IT Applied Science Institute

BONN-RHEIN-SIEG UNIVERSITY OF APPLIED SCIENCES

Founded in 1995, the Bonn-Rhein-Sieg University of Applied Sciences significantly extends the range of applied research and teaching in the greater Bonn area. It specializes in business administration, natural sciences, engineering and computer science, strongly encouraging cooperation with industrial partners and a focus on use-driven and interdisciplinary research and teaching.

The three campuses at Sankt Augustin, Rheinbach and Hennef are well equipped with modern laboratories, studios, workshops and facilities for cooperative research. By 2005, the six departments will accommodate more than 4.500 students and about 120 faculty members.

The Department of Computer Science offers a Bachelor and a Master program in Computer Science and in cooperation with the Departments of Business Administration a Bachelor program in Business Information Systems. The Master program Autonomous Systems is offered by the b-it Applied Science Institute, a cooperation between the Department of Computer Science and the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS.

Campus of the Bonn-Rhein-Sieg University of Applied Sciences.

FRAUNHOFER IAIS

Fraunhofer IAIS develops solutions that, by their intelligence, enable humans to take better decisions and that, by their autonomy, relieve humans in general and in particular extend the range of human actions. Knowledge computing and autonomous robots are the two core areas of the institute which have a history reaching back to 1998. Recently the IMK and AIS institutes merged and formed the joint institute IAIS.

One focal point of IAIS is to develop business intelligence solutions for integrated analysis of databases, multimedia- , text- , web- and geo-data (visualization, extraction of information, data mining) to support better decision-making. Logistics companies and one of the major European retail groups use IAIS systems for interactive support of location analysis and marketing campaigns. IAIS software simplifies generating and sharing ideas in small teams and large groups, e.g., for citizen participation in urban planning. Complex systems are modeled in IAIS with multi-agent systems that have been developed in telematics applications. In the field of autonomous robots, IAIS develops sensor-based, robust wheel-driven and walking mobile robots.

The institute is a leader in the research on sensor fusion of 3D laser-scanner data for the exploration of unknown environments. In addition to supporting explorative tasks, robots can be valuable educational tools: They combine solutions from mechatronics, computer science, and electronics that are major elements of engineering curricula. Here, IAIS provides its own robotic systems and related courses. Real-time simulation and control of non-linear systems, intelligent control systems as well as hard- and software integration round out the competence profile of the institute.

General Information

GENERAL ADMISSION REQUIREMENTS

- A first university-level degree (B.Sc., B.Eng.), as specified for the individual programs, with grades well above average is required. The Graduate Record Examination (GRE) is strongly recommended;
- All courses are held in English, thus fluency in English in vital. It is evaluated on the basis of TOEFL 550 paper-based, 213 computer-based, or IELTS 6.0;
- Working knowledge of German is necessary to take up some of culture that the Aachen – Bonn – Cologne region has developed over the last 2,000 years. A basic German language course must be completed until the end of the third semester.
- Admission is coupled to placement in the Fraunhofer lab courses and therefore strictly limited. Application deadline has been March 1 for Fall admission but may change from year to year; check www.b-it-center.de for current admission details.
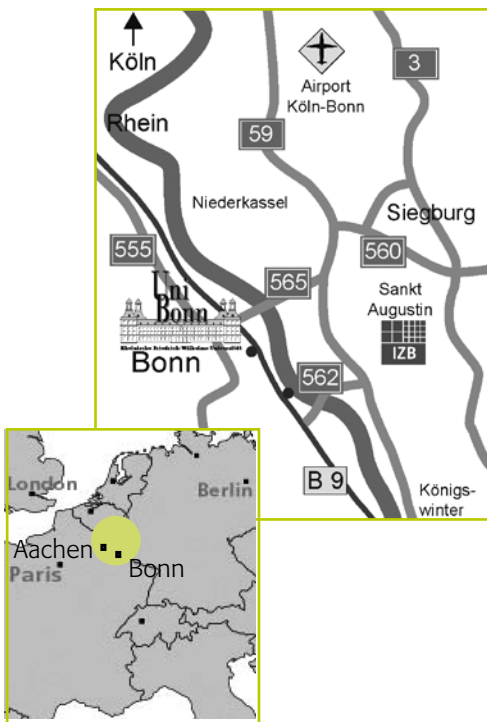
FEES AND FINANCES

Tuition fee is 500-650 € per semester. In addition, a Student Union fee of 170 Euro per semester covers student activites, subsidized meals, and free public transportation in the region.

A student's monthly expenses, including study material, will be about 650 Euro. B-IT does not offer formal scholarships but several student assistantships are avaible on a competitive basis. For information on funding from German sources please contact the DAAD – German Academic Exchange Service www.daad.de.

STUDYING IN BONN

Most of the teaching in B-IT is concentrated in Bonn and its eastern neighbor, Sankt Augustin. Newcomers to Bonn soon grow very fond of the city – a fact confirmed by thousands of students and academics, German and foreign, who have come here to learn, teach or research. Since the German Bundestag moved its seat and parts of the Federal Government to Berlin in 1999, Bonn attracted a number of international organizations, especially United Nations bodies, and some major corporations. Among others, Deutsche Telekom and Deutsche Post have their headquarters there. Now Bonn is evolving into an internationally recognized science region – with the university as one of the dynamic forces driving this change. In addition, Bonn offers a wide variety of attractions and amenities. The city's most famous son, Ludwig van Beethoven, is the star attraction of a lively and varied arts and culture scene. The city boasts an opera house, several theatres, concert halls and other venues, as well as a range of fascinating museums.