Annual Report
09|10

b-it
Bonn-Aachen
International Center for
Information Technology

Helmut Dockter

Prof. Dr. Gerhard Barth

FOREWORD BY THE CHAIRMAN OF THE B-IT FOUNDATION

Since its inception seven years ago, the Bonn-Aachen International Center for Information Technology (B-IT) has pioneered excellence in international graduate education for applied information technology. The key to this success has been a unique cooperation between two leading universities, a young university of applied sciences, and the Fraunhofer society for applied research.

The B-IT Master programs excel in many regards. Due to careful selection and intensive education, student success rates are among the highest in North Rhine-Westphalia, ranging up to over 90%. In 2010, B-IT students have successfully participated in worldwide research competitions, winning e.g. two RoboCup robotics championships, as well as best student paper awards in several international conferences. Research contributions of B-IT Professors were demonstrated, among others, to millions of visitors at the German-Chinese Pavilion of the Expo-2010 in Shanghai/China.

B-IT graduates are not just in great demand by industry, but have also been offered prestigious doctoral fellowships by institutions such as Cambridge University, ETH Zurich, Stanford University, and the University of Oxford. Meanwhile, several early B-IT master graduates have already completed their doctorates. The new government of North Rhine-Westphalia, now led by Hannelore Kraft as Prime Minister and Svenja Schulze as Minister of Innovation, Science and Research, continues to place great emphasis on activating top talents and high-quality international education. I invite young talents from all over the world to take advantage of B-IT's internationally renowned graduate programs, and would like to thank the directors, faculty, and students of B-IT for their successful work.

Helmut Dockter
Vice Minister of Innovation, Science and Research NRW, Chairman, B-IT Foundation Council

The International Advisory Council of B-IT

RWTH Aachen University, University of Bonn, Bonn-Rhine-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 representatives from academia and industry:

- Prof. Dr. Gerhard Fischer,
  University of Colorado, Boulder
- 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 main building.

Report by the Scientific Directors

The success of the Bonn-Aachen International Center for Information Technology (B-IT) has continued in the academic year 2009-2010, with record numbers of highly qualified graduates in Media Informatics, Life Science Informatics, and Autonomous Systems as well as an excellent placement record, new research grants and highly visible public events.

The international visibility of the B-IT international research-integrated master programs has grown further. The Media Informatics group of Prof. Jan Borchers co-designed one of the most successful exhibits at the EXPO 2010 world exhibition in Shanghai; German president Horst Köhler and Chancellor Angela Merkel were just two among the hundred thousands of visitors attracted by this exhibit. Major media attention was also gained by one of the most downloaded courses in the iTunes University collection, and the opening of Germany's first Fab Lab in his group. B-IT student teams from his group as well as the groups of B-IT professors v.z. Gathen and Bauckhage won best student paper or best student demo awards at a number of international conferences and exhibitions. Continuing their success story of the previous year, the B-IT-Bots team of the Master Program in Autonomous Systems mentored by professors Kraetzschmar and Plöger ranked among the top-3 in two major RoboCup tournaments. B-IT also organized a number of industry and science events in Bonn itself. Not surprisingly, B-IT graduates continue to be in high demand by employers in both industry and research.

Many B-IT students do not stop with a Master degree but follow up with doctoral studies at well-known universities. By now, early graduates from all three B-IT master programs have succeeded in finishing doctoral degrees and continue their research careers at the post-doctoral level. Since late 2008, B-IT also offers its own Research School for doctoral studies in eight areas of applied IT; in spring 2010, the number of doctoral scholarships awarded by the B-IT Research School grew to 27. In fall 2010, the master programs in Media Informatics and Life Science Informatics underwent a rigorous evaluation as part of their re-accreditation by the national ASIIN Agency. This did not stop at formal documents, but also included the analysis of exams and theses as well as interviews with faculty and students. For the first time in Germany, the new European accreditation agency EQANIE joined an ASIIN evaluation with international reviewers, such that the study programs are now also accredited at the European level. Reviewers were particularly impressed with the enthusiasm and quality of the B-IT student group.

We would like to extend our cordial thanks to the B-IT Foundation Council led by Chairman Helmut Dockter, Vice Minister of Innovation, Science and Research NRW and Secretary Hans Stender, to the B-IT Advisory Board led by Founding President Gerhard Barth, to the B-IT Faculty and especially the study coordinators Martin Hofmann-Apitius, Gerhard Kraetzschmar and Otto Spaniol, to our assistant directors Alexandra Reitelmann, Jürgen Rapp, Gertraud Peinel, Christoph Quix, Stefan Lüttringhaus-Kappel, Thomas Bode and Iman Awaad, 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 2009-2010. Enjoy reading it!

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

Prof. Dr. Armin B. Cremers
University of Bonn

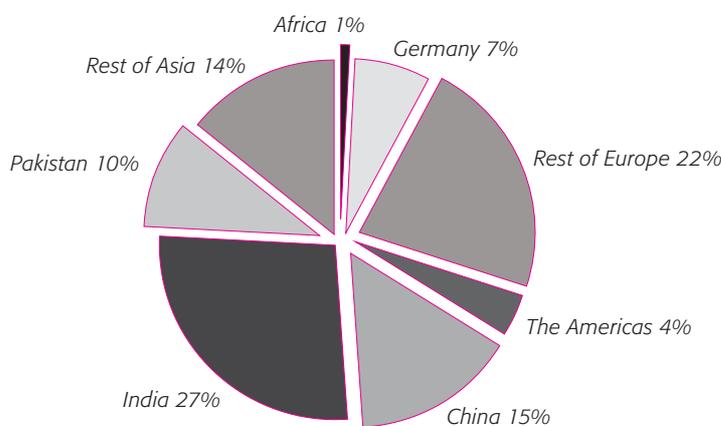**Prof. Dr. Matthias Jarke**
RWTH Aachen University and Fraunhofer FIT

Prof. Dr. Kurt-Ulrich Witt
Bonn-Rhine-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-Rhine-Sieg University of Applied Science (BRS U) 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. 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. The B-IT Research School offers doctoral training with partial financial support from NRW state.

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 the B-IT programs is also demonstrated by a very good placement record, both in science and industry.

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 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 Society.

Home Countries of B-IT Students.

B-IT WELCOME PARTY

This year's incoming students were welcomed by Professor Cremers in B-IT lecture hall. B-IT Professor Hofmann-Apitius called the incoming Life Science Informatics and Media Informatics students respectively for their presentation within this meanwhile highly acclaimed event. PhD candidate and former speaker of the LSI student council Erfan Younesi showed a welcome presentation and LSI student Ashutosh Malhotra premiered a short film entitled "Aude Sapere!"

which was especially shot for this occasion. The Welcome Party also saw the impressive dance performance of Mr Nagendra Babu Donthi Raju, student of the B-IT Master program of Autonomous Systems.

OFFICERS

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

Coordinators B-IT Study Programs
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Prof. Dr. Martin Hofmann-Apitius
(Fraunhofer SCAI), Life Science Informatics
Prof. Dr. Gerhard K. Kraetzschmar
(Bonn-Rhine-Sieg University), Autonomous Systems

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Bonn-Rhine-Sieg University of Applied Sciences
Dr. Thomas Bode,
Dr. Stefan Lüttringhaus-Kappel,
University of Bonn
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B-IT Research School
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Dr. Alexandra Reitelmann,
University of Bonn

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Founding President

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Dr. Ernst Franceschini
President, Bonn / Rhine-Sieg Chamber of Commerce

Events and Visits

Silhouettes: An interactive gesture-based installation for the EXPO 2010 in Shanghai.

President of the Federal Republic of Germany, Prof. Horst Köhler (left), and Prof. Borchers (right) after the game.

SILHOUETTES: AN INTERACTIVE COLLABORATIVE GESTURE-BASED EXPERIENCE FOR THE EXPO 2010 SHANGHAI

Silhouettes is an interactive collaborative gesture-based experience for the German-Chinese House at the World EXPO 2010 in Shanghai from May 1 – October 31, 2010. It was developed by Prof. Peter Russell's CAAD group and B-IT Professor Jan Borchers' Media Computing Group at RWTH Aachen University together with Chinese artists from Beijing. Echoing the theme of EXPO 2010 and the German-Chinese House, hundred thousands of EXPO visitors – among them the German and Chinese presidents Horst Köhler and Hu Jintao, and Chancellor Angela Merkel – participated in jointly creating a virtual city neighborhood by interacting with a large-scale display wall using only their body silhouettes. Their city neighborhood became part of a growing 3D virtual city that can be seen online (http://expo.arch.rwth-aachen.de). After completion of EXPO 2010, the German-Chinese Pavilion – a showcase example of sustainable and environment-friendly construction, will be set up in Hangzhou where one of the traditional partner universities of B-IT resides.

B-IT-BOTS AND MAS PROGRAM ORGANIZE FIRST ROBOCUP@HOME RESEARCH CAMP

The RoboCup@Home league is a young league in the international RoboCup competition. It aims to encourage research that enables the viable service robots for future domestic applications. In order to evaluate the robots' capabilities, a set of benchmark tests is used during the competition in a realistic home environment. Since the first competition in 2006, the RoboCup@Home league has seen dramatic increases in both the complexity of the tests and the number of participating teams. One key factor that accelerates the research and development in the field of service robotics, and especially in the RoboCup@Home context, is collaboration. The goal of the RoboCup@Home Research Camp is to encourage the collaboration between teams.

The first RoboCup@Home Research Camp was organized in March 2010 in the B-IT labs at BRS U, with the perspective to prepare teams for the World Championships at RoboCup-2010 in Singapore. The Camp balanced information sharing and experimental runs within the @Home environment. Five teams participated and contributed to a very successful event, which provides good feedback for the organization of future research camps.

COOPERATION OF MAS PROGRAM AT BRS U WITH AALTO UNIVERSITY IN HELSINKI

A successful cooperation between Bonn-Rhine-Sieg University and Aalto University in Helsinki, Finland, was started. Prof. Erwin Prassler stayed as a visiting professor in Helsinki. Together with Dr. Björn Kahl, who was in Helsinki for two weeks in August 2010, and representatives of the BRICS research project, joint research project proposals in the areas of "Ambient Assisted Living" and intelligent robotics have been discussed. The Finnish universities Aalto (Helsinki) and Tampere, together with other universities, form the Finnish Centre of Excellence on Generic Intelligent Machines (GIM). Together with representatives of our department and other partner universities, the proposal for an EU-Project "Future Worksite" is being prepared. Its goal is to enable a fully automatic and therefore cost effective building site of the future with remote-controlled and semi-autonomous construction vehicles.

SPRING FEAST OF THE RECTOR OF THE UNIVERSITY OF BONN AT B-IT

The rector of the University of Bonn, Prof. Fohrmann, held the spring feast of the University of Bonn in the B-IT building on June 10, 2010. Prof. Cremers welcomed the guests highlighting the research done, the international master programs and the Research School run at B-IT. B-IT Prof. von zur Gathen and his co-workers gave an insight into one field of research at B-IT. They presented VisKy (Visual Cryptography) as a hands-on experience to all guests of the event.

IDEA CONTEST "AFFORDABLE ROBOTICS" 2009

For decades the robotics community has promised and announced that robots will pervade our daily lives and serve humans wherever dirty, dull and dangerous tasks need to be done. But how many robots providing a reasonable service at a reasonable price can you buy today in a warehouse? After fifty years of robotics research and development there is only a handful of such robots out there. If robots really shall serve humankind at large, then they must become *affordable*. What we badly need are the "tin lizzies" and the "beetles" of robotics. In May 2009 B-IT MAS Prof. Erwin Prassler invited the entire robotics community – researchers as well as developers and engineers, juniors as well as seniors – to an idea contest on affordable robots. He phrased his invitation as an appeal to the robotics community to leave at least for a short moment the established paths of robotics to think the unthinkable. A total of 20 research teams submitted ideas for affordable robots. The winner was selected by the participants of a town-hall debate "Affordable Robots or the Volkswagen Beetle in Robotics" taking place during ICAR 2009.

INTERNATIONAL CONFERENCE ON ADVANCED ROBOTICS 2009 CHAIRED BY MAS PROFESSORS

MAS Professor Erwin Prassler organized the International Conference on Advanced Robotics (ICAR) in Munich in June 2009 as General Chair, and MAS Professor Gerhard Kraetzschmar served as Workshops and Tutorials Chair. ICAR 2009 was the 14th edition of this medium-sized, renowned conference, which was the first international academic robotic conference in history. The theme of the conference was "able robots" The term "able robot" was supposed to replace the frequently used but still fuzzy term "intelligent robot". "able" is not only to be the lexical intersection of "cap-able", "depend-able", "measur-able", "afford-able" it also stands as synonym for four rather fundamental and important features of robots which are supposed to deliver useful and economically competitive services in everyday environments under everyday conditions.

2ND B-IT ECONOMIC FORUM

B-IT organized the 2nd B-IT Economic Forum on March 10, 2010. B-IT provided a platform for an intercourse among scientists, industry and politics. The 2nd B-IT Economic Forum serves to highlight the competence available in the field of Life Science Science Informatics in the Aachen-Cologne Bonn region. A dialogue is essential in promoting the dynamically growing field of Life Science Informatics and benefiting from its outcomes. These benefits may include innovative research, new products and economic growth. The gathering was well attended and very well received by participants from all participating fields.

Dr. Hartanto training Johnny Jackanapes, one of the world's best service robots.

Prof. Fohrmann (right) and Jürgen Nimptsch, Mayor City of Bonn (left), at Spring Feast of the University of Bonn at B-IT. Photo: Volker Lannert

Research@B-IT

EU PROJECT "BRICS: BEST PRACTICE IN ROBOTICS" IN FULL MOTION

Even after 50 years of robotics development and research the process of developing a new robot and its applications has more similarities with ingenious engineering or designing a piece of artwork than with a structured and well-defined process. This holds particularly true for advanced service robot systems. The prime objective of BRICS is to structure and formalize the robot development process and to provide development tools, computational models, and functional libraries, which allow engineers and developers of complex robotic systems to reduce the development time and effort by an order of magnitude. Academic and industrial providers of robotic components – both hardware and software – identify and document best practices in the development of complex robotics systems, and refactor existing components to achieve a much higher level of reusability and robustness. BRICS coordinators are Rainer Bischoff from KUKA Roboter GmbH and MAS Prof. Prassler from GPS Stuttgart. The group at BRS U is led by MAS Prof. Kraetzschmar and is responsible for Architectures, Middleware, and Interfaces as well as the Education Showcases.

PROJECT INFOSTROM

Snow falls, high levels of humidity and heavy winds may result in broken power lines as well as groups of people trapped in isolated surroundings due to icy conditions. Since 2009, the project Infostrom at the B-IT research group of Prof. Thomas Rose addresses the planning of response and recovery processes in the event of a break down of power supply. Minor break downs are rather common due to maintenance needs or minor incidents such as broken lines because of storms. However, manifold incidental damages might cause an episode with fundamental impact on citizens' daily operations and personal health. Once power supply is down for an increasing period of time problems tend to compound: more infra structure components will start to vanish ranging from communication services over gas supplies up-to missing cash availability. The question arises, how to prepare counter measures as best practices to build upon, and how to communicate to and with the citizen? In cooperation with industry partners including RWE, SAP, and PSI, InfoStrom continues our line of projects in the context of emergency management that have addressed means for process support, impact assessment and simulation of emerging technologies for relief and rescue organizations.

LEARNING BY EXPERIMENTATION: XPERO SUCCESSFULLY COMPLETED

In November 2009, the EU funded FP6 project XPERO coordinated by MAS Prof. Prassler enjoyed a successful project completion and excellent research results. The XPERO cooperation partners comprised the Fraunhofer Institute for Autonomous Intelligent Systems, Vienna University of Technology and the Universities of Verona, Ljubljana, and the American University of Paris. The aim of the project was to enable a robot to perform independent learning of new, qualitative knowledge. To this end methods and requirements for machine learning derived from its own experiences were examined and integrated into various well-known learning methods. The distinctive feature of the XPERO approach is that the robot independently explores (i.e. without human teachers) its environment and draws conclusions. In April 2009, the project won the first prize for the best technical exhibit at FET'09 (Future and Emerging Technologies) in Prague, Czech Republic.

Highly strained power lines.

Participants of von zur Gathen 60 year party.

A MODERN COMPUTER ALGEBRA-IST: CELEBRATING THE RESEARCH AND INFLUENCE OF JOACHIM VON ZUR GATHEN AT 60

The research of Joachim von zur Gathen has spanned many areas of mathematics and computer science, including computational complexity, cryptography, finite fields, and computer algebra. His influence and contributions to these fields has been felt through his many papers, students, collaborators, colleagues and friends. Many joined in celebrating the rich and ongoing career of our friend, colleague and teacher at b-it from 27 to 29 May 2010. The conference celebrated the jubilee with a variety of scientific and personal talks about various areas connected to Joachim von zur Gathen's research. As a spotlight we quote Michael Barnett, a colleague and friend: "Congratulations, Joachim, on your birthday and for your contributions to mathematics and science. To your many friends gathered to celebrate these, I may mention that my dialogue and joint publication with Joachim resulted from my seeing a mint copy of Modern Computer Algebra in the display of recently acquired books in the Princeton University Mathematics Library, just after it was published. That book, and the exchange of ideas when I visited Paderborn at Joachim's invitation, gave a new impetus to my work in theoretical chemistry. In a world of ever increasing specialization, the benefits of Joachim's contribution to interdisciplinary communication and collaboration has been valued widely and will continue to be."

B-IT MEDIA COMPUTING RELAUNCHES VIENNA PERSONAL ORCHESTRA EXHIBIT

The House of Music Vienna launched the redesigned Personal Orchestra Exhibit of B-IT Professor Jan Borchers' Media Computing Group in November 2009. Using an infrared baton, visitors can conduct the Vienna Philharmonic by controlling speed, volume, and the emphasis of different instrument sections. The new system now features our PhaVoRIT continuous real-time high-quality audio stretching, six new recordings of the orchestra in full HD video, an electronic music stand displaying the score, and helpful hints by maestro Zubin Mehta. The original exhibit was installed in 2000, and has been used by 1.5 million visitors since, making it the most successful station in the house, and a top tourist attraction mentioned in most leading tourist guides.

B-IT MEDIA COMPUTING GROUP WINS CHI 2010 STUDENT RESEARCH COMPETITION AWARD FOR THIRD TIME IN A ROW

Yvonne Jansen, a student at Prof. Jan Borchers' Media Computing Group, a B-IT endowed Chair at RWTH Aachen University, won the 2nd place in the Undergraduate Student Research Competition at ACM CHI 2010 today. She received the award for her work on Mudpad, a new technique to bring localized, active haptic feedback to multitouch tables and similar surfaces using magnetorheological fluid. Just for the competition, Yvonne created a small "travel" version of her table-size system, using the prototyping facilities at the group's new Fab Lab. This is the third year in series for the Media Computing Group to bring home an award in this competition. CHI is the premier international conference in Human-Computer Interaction, organized by the Association for Computing Machinery (ACM).

Excursion to the Arithmeum: The jubilee teaching.

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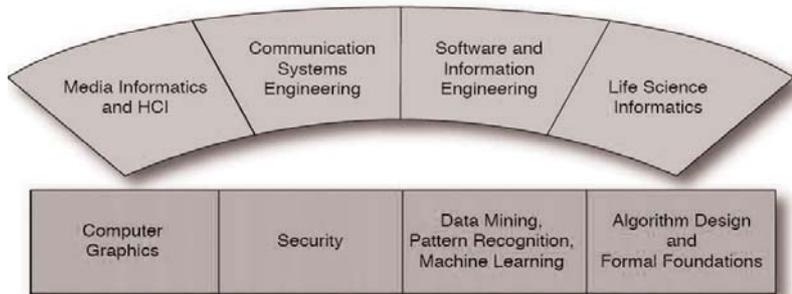
RADICALLY IMPROVED DOCTORAL TRAINING THROUGH B-IT

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) serve as initial scientific directors. The area of life science informatics within the B-IT Research School has been strengthened by a Junior Faculty Fellowship held since 2009 by Prof. Dr. Holger Fröhlich. 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 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-Rhine-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.

The B-IT Research School clusters the doctoral candidates across participating institutions in eight key themes where the region is highly competitive internationally. 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. Further scholarships were awarded after a tough selection from over 250 applications in April 2009 and again in April 2010 out of 220 applications, thus reaching now a total of 27 doctoral scholars from 11 countries; six of them are graduates from the B-IT master programs. From the start, several of the scholarships have been co-financed by industry or other organizations.

Prof. Dr. Holger Fröhlich.

STRATEGY WORKSHOP, SEPTEMBER 1-2, 2010

Kathrin Ullrich, one of the organizers of the Strategy Workshop.

The B-IT Research School students organized a Strategy Workshop September 1-2, 2010, for getting to know each other, discussions, and information exchange. The workshop fostered peer learning among PhD research school students across research areas. Work in plenary sessions was complemented by discussions in small groups. The PhD students discussed their final results intensively with the General Assembly of B-IT supervisors a few weeks later.

BEST STUDENT PAPER AWARD

Deniz Sarier graduated with a M.Sc. in the B-IT Media Informatics program in 2008 and currently holds a scholarship as a PhD candidate in the B-IT Research School, supervised by B-IT Professor Joachim von zur Gathen. Her paper "Generic Constructions of Biometric Identity Based Encryption Systems" received the Best Student Paper Award at WISTP2010, the 4th International Workshop in Information Security Theory and Practices. The workshop was devoted to "Security and Privacy of Pervasive Systems and Smart Devices" and the Award is sponsored by ISL, the Institute of IT-Security and Security Law, University of Passau.

Geographic origin of B-IT RS scholarship holders.

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 Excellence Research Cluster "Ultra-Highspeed 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 media 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, Media Science and business aspects. 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.

25 Media Informatics students completed their degree in the academic year 2009-2010. The graduates quickly found interesting positions either as doctoral students in Germany and abroad, or in attractive companies. The incoming classes of fall 2009 and 2010 comprise 80 students, from a total of 30 countries.

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). Moreover, Media Informatics students won all three RWTH master student scholarships awarded within the faculty of Mathematics, Informatics, and Natural Sciences.

FIRST GERMAN FAB LAB IN AACHEN
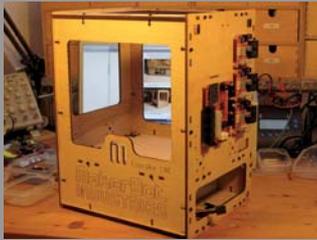
Fab Lab Aachen sample project

Since December 2009, the first Fab Lab in Germany at the B-IT Media Computing Group in RWTH Aachen is part of a worldwide network, initiated at MIT, open to the general public every Tuesday at no cost except for materials. A Fab Lab is a small workshop with tools that enable digital fabrication. The Aachen Fab Lab offers several 3D printers to create 3D objects, a lasercutter to cut and mark almost any material, and a CNC milling machine to produce high quality printed circuit boards (PCBs) in a few minutes. It is also used by students in classes, by pupils, for research projects and by other institutions at RWTH Aachen University. All Fab Lab projects are documented at http://fablab.rwth-aachen.de.

BEST CONTRIBUTION AWARD FOR B-IT STUDENT

B-IT Media Informatics student Zeynep Akata was awarded the prize for best work on image retrieval at this year's international Summer School on Visual Recognition and Machine Learning in Grenoble, France. Ms Akata is one of the few master students who were admitted to this prestigious event that took place from July 26-30 and attracted 120 researchers and PhD students from renowned institutions in the US and Europe. Together with her supervisors Dr. Christian Thurau and B-IT Professor Christian Bauckhage, Ms. Akata develops novel algorithms for "Multiview Processing of Images for Segmentation, Retrieval, and Clustering".

NEWS FROM MEDIA INFORMATICS ALUMNI

Elda Paja

I joined the MI curriculum as part of EuMI program, having RWTH Aachen as main university and the University of Trento as partner university. I was lucky to have the chance to study in both these universities, as they are elite universities in the respective countries. While studying in Bonn I had the chance to improve my research skills in the seminar classes, attend labs at the Fraunhofer FIT institute, which I consider very valuable. After finishing my masters I was offered right away a fellowship at the University of Trento. I will officially start my PhD in November 2010. I will be co-supervised by Prof. John Mylopoulos and Prof. Paolo Giorgini, in the field of Software Engineering and Formal Methods.

Chatchavan Wacharamanotham

After my graduation in 2009, I am now a PhD student in the B-IT Media Computing Group, RWTH Aachen. The Media Informatics program prepared me in academic knowledge, professional network, and soft skills. I had a chance to get practical and in-depth knowledge from lab courses at RWTH Aachen, University of Bonn, and Fraunhofer where I explored both image processing and human-computer interaction. That led to my internship in Media Computing and Medical Image Processing. Apart from the knowledge and experiences in the field, Media Informatics program has a diverse mixture of students from different academic and cultural background. This helps me understand the cultural differences and surely prepared me for intercultural work such as in the recent project Silhouette, an exhibition for Germany-China House in World EXPO 2010. I am glad and proud to have graduated from this program

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

Adecco Engineering & IT, Arab American University Jenin, Atma Jaya Yogyakarta University, Avedas AG, B-IT, Bahria University Bank of Mexico, Bertelsmann AG, Bombardier Inc., Brainloop AG, BTC Business Technology Consulting, CAS GmbH, CBC Cologne Broadcasting, Center, COMNEON GmbH, Deutsche Telekom AG, Dynevo GmbH (Bayer), Ericsson AG, European Computer Telecoms AG, FGAN, Finantix Srl, Forth Corporation, Fox Chase, Fraunhofer FIT, Fraunhofer IAIS, Huawei, IdeaObject Softwares (Pvt) Ltd., IP Labs, iPharro Media GmbH, IW-One AG / QSC AG, Kisters AG, Lakshmi Technology and Engineering, LHS Telekommunikation, Lycos, Mastercard, Microsoft, NAVTEQ, Next Level Integration GmbH, Novartis, Oando Plc, PricewaterhouseCoopers AG, Qiagen GmbH, Research Center Jülich, RWTH Aachen University, Samsung Electronics, SAP AG, sd&m AG, Siemens AG, Siemens Healthcare AG, Solutions 4 Media, Sytel Reply GmbH, T-Systems, Technical University Eindhoven, Teleca, Tessella plc, The University of the West Indies, TU Darmstadt, TU Munich, University of Agder, University of Asia and the Pacific, University of Augsburg, University of Bonn, University of Duisburg-Essen, University of Edinburgh, University of Hamburg, University of Heidelberg, University of Stuttgart, University of Trento, Vodafone AG, Systems, Workplace Systems.

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.

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.

In this year, 15 students graduated with master theses. A study on all LSI alumni revealed that 67% of LSI alumni continue their work in a PhD thesis, whereas 21% prefer a position in industry. 13% work in academia and do not pursue a PhD. A new trend became obvious among those students who went for a PhD thesis. Excellent students received several outstanding offers, often including two or three offers to Max-Planck graduate schools.

The LSI alumni and their success seem to have had a positive effect on the applications for the term starting in October: The program received 171 applications (2008: 128) for the academic year beginning in October 2010. 22 incoming students begin their studies in October 2010. ⸰

THE ABC OF LIFE SCIENCE INFORMATICS

The Master Program in Life Science Informatics (LSI) program has been made well known through a yearly one-day symposium the "The ABC of Life Science Informatics". The successful event from the previous years will be held again on December 17, 2010. The gathering is aimed a bringing together research groups from academia and industry working in the fields of bioinformatics and chemoinformatics in the Aachen-Bonn- Cologne region (the ABC-region). The Master Program of Life Science Informatics subsequently faced this year far more requests for internships and offers for master theses than they could be satisfied with students from the program. Most were from the ABC region.

LSI LECTURE SERIES 2010

LSI Lecture Series in Summer Semester 2010 focused on the Virtual Physiological Human (VPH). A blend of lecturers elucidated the topic such as Prof. Tony Solomonides, Faculty Director of Postgraduate Research, Bristol Institute of Technology, who discussed the use of grids, Prof. Rod Hose, Computational Biomechanics, Department of Cardiovascular Science, School of Medicine, University of Sheffield who centered on: "Towards the Virtual Physiological Human: The Challenges of Embedding Simulation Processes into Clinical Workflows" or Prof. Dr. Aljeandro Frangi, Director Computational Imaging Lab, Pompeu Fabra University, Barcelona, who gave an "Overview on @neurIST: Integrated Biomedical Informatics for the Management of Cerebral Aneurysm". Prof. Wiro Niessen, Head of the Biomedical Imaging Group Department, Medical Center Rotterdam Erasmus University, looked into the quantitative imaging of biomarkers whereas Prof. Peter Sloot, University of Amsterdam, presented a comprehensive lecture on the topic of "Modeling HIV from Molecule to Man".

LSI SUCCESS STORIES

Albina Asadulina
joined the Master program of Life Science Informatics with a Bachelors Degree of Engineering in Computer Science from Kyrgyz Russian Slavic University in Winter Semester 2008/2009. She joined the LSI curriculum with a DAAD fellowship and was additionally accepted into B-IT work study program. Ms Asadulina joined the group of B-IT Professor Hofmann-Apitius where she is about to graduate with her master thesis. She has received several offers for graduate schools and considers now joining the Max-Planck Institute in Tübingen to start her PhD thesis.

Vytautas Gapsys
held a Bachelor's Degree in Biophysics of the University of Vilnius in Lithuania when he joined the Master Program of Life Science Informatics. He joined the group of Dr. Christian Kandt and graduated with a thesis in the field of structural computational biology. Mr Gapsys has then joined the group of Dr. Bert de Groot at Max Planck Institute for Physical Chemistry in Göttingen as a PhD student.

Kathrin Heikamp

earned a Master in in Biomathematics at RheinAhrCampus of the University of Applied Sciences Koblenz. She joined the Master Program of Life Science Informatics in WS 2008/2009 and completed her master thesis in the group of B-IT Professor Jürgen Bajorath in Summer Semester 2010. Ms Heikamp is currently working on her PhD thesis in the same group.

Professor Dr. Tony Solomonides.

List of employers of LSI Alumni:

B-IT Research School, Cambridge University, UK, European Bioinformatics Institute, Cambridge, UK, Fraunhofer Institute SCAI, Galilleo Press, German Center for Cancer Research (DKFZ) Heidelberg, Leaf Bioscience s.r.l., Italy, Max Dellbrück Center Berlin, Max Planck Institute for Biophysical Chemistry, Max Planck Institute for Plant Breeding Research, Max Planck Institute for the Biology of Ageing, Max Planck Institute Tübingen, National Technical University of Singapore, Singapore, Philips, Research Center Jülich, RWTH Aachen, University of Bonn, University of Cologne, University of Luxemburg, University of Oxford, UK, University of Tübingen, University of Utrecht.

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. Currently, this part of the program is being restructured as to provide an "honors class" supplement to the top 10% bachelor students in Aachen and Bonn, loosely linked to the NRW public-private scholarship programs the Ministry of Innovation has initiated for this group of students.

Ringvorlesung Datenschutz

This lecture series was dedicated to privacy, a highly critical, but relatively young topic. In fact, the political discourse is limited almost entirely to the second half of the twentieth century. Germany has been a leader with the world's first data protection law, and in no other country the topic is discussed as vehemently. After Rasterfahndung (dragnet investigation), Volkszählung (census) and Großer Lauschangriff (eavesdropping law), the debate seems to have subsided considerably. Only in recent years, privacy is put back into the center of attention. First, the German State has collected more data than ever before (eg. by Toll Collect), and in the "War on Terror" forwarded it to foreign governments (such as flight and bank data). Second, several large companies have rudely abused the privacy of their customers and employees. The public response was clear, but relatively restrained. Comparing to the 1980s we might have expected a much bigger outcry. This is all the more surprising as the current possibilities of automated monitoring outperform those of past decades by far. In this lecture series we took the liberty to withdraw from daily business and to ignore the scandals of recent years. Instead, an attempt was made to construct a draft of a worthy life, from which we can derive guidelines about how to deal with our neighbor, especially with their data. Ultimately, we head for a vision of a comprehensive data protection as a kind of social environment. The lecture series comprised five lectures. The speakers were Prof. Dr. Klaus Brunnstein, Universität Hamburg; Gerhart Baum, Bundesminister a.D.; padeluun, Künstler und Netzaktivist; Peter Schaar, Bundesbeauftragter für den Datenschutz und die Informationsfreiheit; Prof. Dr. Knut Wenzel, Goethe Universität Frankfurt.

CRYPT@B-IT 2010

The Enigma crypto machine.

This summer school on cryptography offered undergraduate and graduate students, post-docs 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 2-6 August 2010 in the b-it build-ing and invited to the exploration of some fundamental areas of cryptography: pairing-based cryptography; lattice-based cryptanaly-sis; the Enigma crypto machine. 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 research-ers and teachers was much appreciated by the audience, and in fact some research col-laborations were started during the summer school. Lecturers: Joachim von zur Gathen, b-it Bonn; Max Gebhardt, BSI Bonn; Alexan-der May, Ruhr-Universität Bochum; Kenny Pa-terson, Royal Holloway, University of London, UK; and the members of the cosec group.

SCHÜLER-KRYPTO 2010

On two days in February 2010, 252 high school students, as well as 15 teachers met for the ninth Schüler-Krypto to learn @ bit on secret messages, encryption and decryption. 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 ar-bitrarily 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.

Having fun with RSA.

Ringvorlesung Daten-schutz: The end of privacy? Prof. von zur Gathen; Peter Schaar, Bundes-beauftragter für den Datenschutz und die Informationsfreiheit; Prof. Markovetz (from left).

Master Program in Autonomous Systems

Prof. Dr. Gerhard Kraetzschmar, Autonomous Systems

Prof. Dr. Paul-Gerhard Plöger, Autonomous Systems

Prof. Dr. Erwin Prassler, Autonomous Systems

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-Rhine-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), four teaching and research assistants (Iman Awaard, Ronny Hartanto, Timo Henne, Anastassia Küstenmacher) and researchers, who have been recruited in due course of the two European research projects XPERO and BRICS, namely Shahzad Cheema, Nico Hochgeschwender, Björn Kahl, Uwe Köckemann, Jan Paulus, Michael Reckhaus, and Azamat Shakhimardanov.

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, Computer Vision, and Planning and Scheduling. 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 2009-2010, 17 students were admitted from 176 applications. 16 students completed their degree; more than half of them continued with doctoral studies or other research positions.

The MAS program started cooperations with Aalto University in Finland and German-Jordan University (GJU) in Amman, Jordan. The cooperation with Aalto includes a visiting professorship of Prof. Prassler in Finland and research cooperations. Our MAS student Matthias Füller, will be studying at the Department of Autonomous Systems at Aalto University for one semester and carry out an R&D work there. The cooperation with GJU is the first phase of a project that aims at installing a dual-degree Master program on Autonomous Systems between B-IT/BRS U and GJU.

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, ICMA, A AMAS.

Prof. Plöger conducted a sabbatical in the winter semester 2009/10. The sabbatical started with a visit to Canadian research and exchange partners of BRS U (Greg Dudek, University of Montreal; Ken Kent, University of New Brunswick; and Evangelos Milios, Dalhousie University), followed by a stay at Jacobs University in Bremen, where Prof. Plöger was hosted by Prof Herbert Jaeger, inventor of Echo State Networks. The sabbatical concluded with a stay at the Moscow State Institute of Radio-engineering Electronics and Automation (MIREA) on the behalf of Dr. Tatiana Demenkova, where Prof. Plöger conducted an invited course on HW/SW Co-Design. The main purpose was to attract diploma students from MIREA to pursue a Master's degree in Autonomous Systems at BRS U. The program is welcoming three Russian students to the winter semester 2010.

THE B-IT-BOTS TEAM CONTINUES ITS SUCCESS STORY

Johnny and the gang have successfully defended their German Open title in Magdeburg in April 2010. Five German teams and one Dutch team showed their robots. Johnny is able to navigate and interact autonomously in a home environment. Johnny can recognize the inhabitants of the home and guests, and can even detect some emotional states of people. Johnny is able to learn their names, remember objects and their positions and function despite the background noise, which is a major problem at such competitions as it cannot be realistically simulated in the lab. In the Demo Challenge scenario, Johnny received the restaurant's guests at the entrance, delivered their orders from the kitchen, chose music according to the guests' emotional state and helped evacuate the restaurant when there was a (simulated) fire.

In June 2010, for the third time in as many years, the b-it-bots have successfully taken their place as one of the 'top 3' teams in the world and brought home the sixth trophy from the sixth competition that Johnny has competed in! The team took third place at the RoboCup World Championship 2010 in Singapore in the RoboCup@Home league. The b-it-bots could once again demonstrate their strength on an international level in an exciting competition with 24 teams from four continents.

The b-it-bots team consists of eight students of the international Master's Programme in Autonomous Systems – Thomas Breuer, Geovanny Giorgana, Zha Jin, Christian Müller, Frederik Hegger, Shashank Sharma, Shahmi Junoh, and Jose Ruiz, and six research assistants – Dr. Ronny Hartanto, Jan Paulus, Michael Reckhaus, Nico Hochgeschwender, Azamat Shakhimardanov and Iman Awaad. The supervising professors are Paul G. Plöger and Gerhard K. Kraetzschmar. The team receives support by b-it Bonn-Aachen International Center of Information Technology, the President of BRS U, the Department of Computer Science at BRS U, the Association of Friends and Sponsors of BRS U, PMD Technologies Siegen, and DAAD. Congratulations to Johnny and his team!

B-IT ALUMNI: RONNY HARTANTO COMPLETES PH.D. AND STARTS WORK AT DFKI BREMEN

Ronny Hartanto from Indonesia is the first international student of the Master Program Autonomous Systems. After his excellent master's degree in 2004, he was immediately hired as a research assistant for B-IT. Among other things, he was a team member of the European research project XPERO. After joining our RoboCup teams since the very beginnings, he took over the leadership of the b-it-bots, the University's RoboCup@Home team, with great success and led the team to win six cups in three years.

In November 2009, he defended with excellent success (1,0) his Ph.D. thesis on "Fusing DL Reasoning with HTN Planning as a Deliberative Layer in Mobile Robotics" at the Department of Computer Science at the University of Osnabrück. Doing postdoctoral research at a different place is the next important step on Dr. Hartanto's career ladder. For his new start in Bremen, where he is a project manager in the team of Prof. Frank Kirchner at the Robotics Innovation Center DFKI Bremen, we wish him all the best!

B-it-bots team.

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 Rhineisch-Westfälische Technische Hochschule in Aachen, the Rhineische 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. 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.

The Birlinghoven Castle campus is one of the largest and most influential computer science research sites in Germany. 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. Three IZB institutes contribute to the B-IT master programs Media Informatics and Life Science Informatics:

FRAUNHOFER FIT

FIT, the Fraunhofer Institute of Applied Information Technology, 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.

Underwater treasure quest: As a demonstrator Fraunhofer FIT created the world's first mobile underwater AR game. Its main component is a waterproof display in front of a diver's mask. The display lets the diver see his or her real underwater environment plus additional virtual objects.

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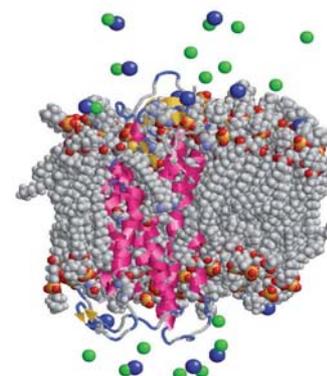
Fraunhofer SCAI: Membrane-embedded receptors, like the prototypic rhodopsin shown above, are pharmaceutically most interesting. The aim is to gain control over cellular response by designing new drugs.

B-IT Applied Science Institute

BONN-RHINE-SIEG UNIVERSITY OF APPLIED SCIENCES (BRS U)

Founded in 1995, the Bonn-Rhine-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 2010, the six departments accommodate more than 5.500 students and about 125 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-Rhine-Sieg University of Applied Sciences.

FRAUNHOFER IAIS

At Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS, research experts explore and develop innovative systems designed to analyze data and to make information available. On the one hand, the IAIS teams realize application solutions in the fields of data mining, business intelligence or high-resolution management for optimizing products, services and processes. On the other hand, the institute's scientists develop systems that use innovative forms of media presentation to help make large amounts of data accessible (knowledge extraction, interactive exploration, knowledge management, media analysis and visualization).

The institute's research and development activities are defined by the business areas Marketing, Market Research & Media Analysis, Business Planning & Controlling, Digital Media Asset Management, Process Intelligence, Preventive Security, Spaces for High-Tech Experience, Media Production and Adaptive Robotics. Within these business areas, the IAIS experts develop innovative and service-oriented IT solutions for customers from commerce and industry, e.g. trade, media, telecommunications or energy industries as well as for partners from the public sectors.

The Institute's scientific research focuses on Machine Learning, Multimedia Pattern Recognition, Visual Analytics, Process Intelligence and Adaptive Robotics. Fraunhofer IAIS and its staff of approximately 250 combine to create a comprehensive industry sector knowledge database encompassing all of the engineering sciences, in particular IT, but also Mathematics, Natural Sciences, Business Studies, Geo Sciences and Social Sciences.

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. Therefore, a basic German language course is offered before start of the program and during the first year.
- 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.

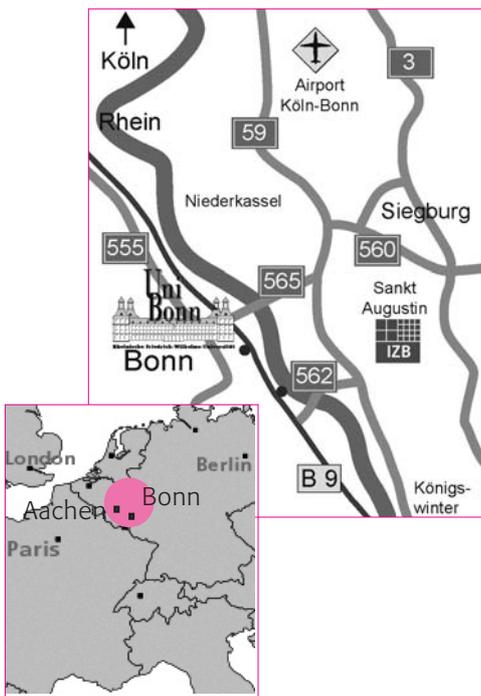## FEES AND FINANCES

Tuition fee is 500 Euro per semester. In addition, a student union fee of ca. 200 Euro per semester covers student activites, subsidized meals, and free public transportation in the whole state of North Rhine-Westphalia.

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.