# Contents

Welcome to KTH CSC! 5
The School of Computer Science and Communication, CSC 6
Highlights 8
Faculty and Staff 2006 15
Undergraduate education 16
Graduate Education 19
NA – Numerical Analysis 20
CVAP – Computational Vision and Active Perception Laboratory 22
CB – Computational Biology 24
TCS – Theoretical Computer Science 26
HCI – Human-Computer Interaction 28
Media – Media Technology and Graphic Arts 30
TMH – Speech, Music and Hearing 32
EU-Projects 34
Commercialization 34
Research and Competence Centers 35
Other Hosted Centers at CSC 37
Computing facilities 38
CSC in figures 2006 39
Historical highlights 40
The CSC Organization 42
Doctoral Theses 05-06/06-07 44
Licentiate Theses 05-06/06-07 46
List of Shortenings 47
Welcome to KTH CSC!

The School of Computer Science and Communication, CSC, was formed first of July 2005 as one of nine Schools at KTH. CSC is a fusion of the departments of Numerical analysis and Computer Science, NADA, and Speech, Music and Hearing and Language and Communication, TMH. NADA is also a department at Stockholm University.

The new organization gives the school responsibility and resources for undergraduate education and research. Our primary ambition is to bring students and faculty closer together as a means to the end: academic excellence and student achievement. The merge of departments has created a flurry of new activities both in education and research. At the same time, the momentum of ongoing activities guarantees the continuity.

This bi-annual report is an overview of the School’s activities and achievements in its two first years of operation. We hope you will find it interesting.

Ingrid Melinder, Dean

Stockholm in November 2007
The School of Computer Science and Communication, CSC

KTH CSC, is one of nine Schools at KTH. Numerical Analysis and Computer Science, NADA, is a department at Stockholm University, SU, hosted by CSC.

CSC runs undergraduate education, graduate education and research in scientific computing, computer science, media technology, human-computer interaction, speech technology, musical acoustics and language. The school is organized in seven departments:

- Numerical Analysis, NA
- Computational Biology, CB
- Computational Vision and Active Perception Laboratory, CVAP
- Theoretical Computer Science, TCS
- Human-Computer Interaction, MDI
- Media Technology and Graphic Arts, MEDIA
- Speech, Music and Hearing, including the unit for Language and Communication, TMH

The School hosts several research centers

- Centre for Autonomous Systems, CAS
- Center for Sustainable Communication, SUS
- Center for Parallel Computers, PDC
- KTH Network Operation Center, KTHNOC

CSC is a partner in

- Strategic Research Center for Industrial and Applied Mathematics, CIAM, hosted by KTH SCI
- Stockholm Bioinformatics Centre, SBC, hosed by SU
- Stockholm Brain Institute, SBI, hosted by Karolinska Institutet, KI and hosts the Swedish neuroinformatics node of the International Neuroinformatics Coordinating Facilities, INCF, hosed by KI.

Educational Activity

The school is responsible for two KTH Master of Science in Engineering Programs: Computer Science, and Media Technology. The school is also responsible for the Bachelor of Science program in Media Technology, the international Master’s program in Scientific Computing, and the two Swedish Master’s Programs in Computer Science and in Human-Computer Interaction. The course list numbers 150 basic courses and account for more than 11,000 annual course places at KTH and SU. Advanced courses in computer science, mathematics and media technology are given in master programs and to other students with special interests and about 250 MSc theses are presented. Details are given in the section on Undergraduate Education.

Graduate students bring immense value to research activities and many excellent students have chosen CSC for their graduate studies. Around 100 graduate students are currently enrolled and 49 passed their PhD degree and 30 their Licentiate degree during the period.

It is important to introduce first year students to our research environment by activities such as inviting the students during the introduction period to the research groups and the seminar series Research and Future.

Research Profile

Our profile in computer science covers algorithms and computational complexity, computational biology, as well as computational vision and robotics. Central themes in human-computer interaction are IT-supported co-operative work, computer-supported writing, learning and language technology, user-centered design, and human-robotic interaction. In media technology the focus is on applied technology within media to support human communication over distances in time and space. The department of Speech, Hearing and Music is engaged in speech communication, speech technology, speech coding, music acoustics, auditory perception and second language acquisition. The department is also the home of the KTH Unit for Language and Communication.

The activities in scientific computing cover the whole spectrum from theory to applications for differential equation models. The theoretical developments are complemented by algorithmic research for parallel computers. One of the main national high performance computing centres, PDC, is hosted by CSC and is a strong incentive for our education and research.

World Class Programming

For each of the last seven years, at least one CSC team has qualified for the World Finals in the ACM International Collegiate Programming Contest. The competition for the seventy final tickets is fierce, with more than 6000 teams from 150 countries entering national and regional finals. The success can be attributed to gifted individuals and dedicated training, and teams from CSC have also performed well in other national and international programming contests. A team brought home the grand slam: gold, silver and bronze medals from the 2007 24 hours contest in Warsaw. It is a tribute to consistent performance that KTH was asked to arrange the North East Regional Contests 2005 and 2006 and has won the arrangement of the World Finals 2009.
**Centres**

New research centres with long time funding are now replacing those coming to a planned end. Supported by research funding agencies, industrial consortia, and KTH, one of their main goals is to facilitate and speed up the flow of people, results, and ideas between universities and industry.

The Vinnex Centre for Sustainable Communication starts in 2007 and aims to create and develop innovative communication tools that provide viable alternatives to travel and transportation services as a means to reduce our consumption of natural resources. A collaboration between two Schools at KTH and many industrial partners, it combines research and expertise from many areas such as media technology, telecommunications, information technology, transport systems, environmental strategy, social science, architecture, design and planning.

CSC is partner in CIAM, a strategic centre at KTH funded by the Swedish Foundation of Strategic Research. CIAM is operated by a consortium of experts in analysis, discrete mathematics and combinatorics, stochastics, numerics, optimization, systems theory, and computer science, dedicated to bringing to the fore the applied and applicable aspects of modern mathematics. The mission of CIAM is to create a bridge between a broad area of mathematics and industrial applications.

CSC is partner in Stockholm Brain Institute (SBI, www.stockholbrain.se) and heads its computational neuroscience platform. SBI is a consortium for Cognitive and Computational Neuroscience, joining three leading Swedish Universities; Karolinska Institutet, KI, KTH and SU, in the endeavour to understand higher brain functions. To achieve a coherent understanding of a complex and dynamical system such as the brain, mathematical modelling and numerical simulation provide necessary tools.

CSC is responsible for the Swedish INCF node. The Global Science Forum of the OECD has established a new organization, the International Neuroinformatics Coordinating Facility, INCF (www.incf.org), to further the development of Neuroinformatics as a global effort with the support of all OECD ministers of research. INCF is located in Stockholm partly due to the existing active neuroinformatics research collaboration between KI and KTH. Neuroinformatics is mainly concerned with information technological tools for neuroscience, e.g. databases, computer simulation, and data analysis.

Stockholm Bioinformatics Centre (www.sbc.su.se) was started 2000 on initiative from the Swedish Foundation for Strategic Research, SSF and is a collaboration between SU, KTH, and KI. The rapid progress in genomics and structural biochemistry necessitates development in our ability to handle and analyze such data. “Bioinformatics” was defined as “the application of mathematics and computer science to problems in biology. Bioinformatics is particularly concerned with retrieval, handling and analysis of biomolecular (DNA, protein) data”.

The Centre for Autonomous Systems, CAS, was started 1996 with four participating departments at KTH. The centre performs research in (semi-) autonomous systems including mobile robot systems for manufacturing and domestic applications. It is now in a rebuilding period where a new generation of scientists is taking over.

During 2005 and 2006 three centers of excellence financed by The Swedish Agency for Innovation Systems came to the planned ends of their ten-year periods of financing: the Centre for User Oriented IT Design, CID, the Centre for Speech Technology, CTT, and the Parallel and Scientific Computing Institute, PSCI. These significant investments have had a vital impact on the School’s education and research, and parts of the activities still continue within their respective departments.

**Commercialization**

The School’s departments are involved in extensive co-operation with business and industry. This has been very significantly increased over the last ten years by the activity of our six research centres and by participation in seventy EU projects, involving cooperation with some hundred companies and organizations.

The push from funding agencies and KTH’s increased focus on industrial innovation and entrepreneurship has stimulated commercialization. A few showcases are presented more in detail below. Efield markets an integrated electromagnetic simulation system, initially developed in PSCI. The Synface and Verdict creators won the prestigious Chester Carlson Prize, Venture Cup East and VINN NU, and CogEye is a system for recording real time video panorama.
Jonas Beskow, a 35-year old researcher at KTH CSC, Department of Speech, Music & Hearing, has been awarded the Chester Carlson Research Award. Dr. Beskow received the distinction for devising a computer system that enables persons with a hearing defect to manage telephone conversations with much greater facility than before.

His Synface system is built around three-dimensional computer animations of talking faces. The user can instantly read the moving lips and changing expressions of the animated face on a screen connected to the telephone conversation. This offers a most valuable support for better understanding of what the person at the other end of the line is saying. The system has been tested by a number of people with impaired hearing, and these all think it is excellent.

"An award for prominent efforts to give the human voice a face, which does improve communications between man and machine in for instance a dialogue system, and between people, especially those with impaired hearing, and in noisy environments", says the prize motivation. The award amounts to SEK 75,000.

The Chester Carlson Fund awards prizes to persons or institutions involved in the furthering of IT and information science. under the auspices of the Royal Swedish Academy of Engineering Sciences.

Computer Tells Difference Between Wood and Concrete

A new tool for acoustic simulation in buildings offers new possibilities to perform this via computer modelling. The software enables the operator to move walls, and change building materials, as the simulation proceeds, with instantly presented changes in the acoustic effect.

So far, acoustic simulations have required much manual effort, but the new tool automatically removes details of no interest to the acoustic environment. It also simplifies some complex components at the same time. This enables the operator to make continuous alterations of an environment in the course of the simulation.

– This is the very first time one may walk about inside a fairly complex type of edifice – and listen to its acoustics at the same time, says Gert Svensson, senior scientist at KTH and head of the Uni-Verse Project, funded by EU. Just like other software tools being developed under the auspices of the Uni-Verse project, the new program could use the 3-D model of an ordinary CAD program. In addition, this is compatible with several of the Virtual Reality programs used in the computer game industry.

UVAS, the new tool ("Uni-Verse Acoustic Simulator"), was introduced at a large European IT fair in Helsinki in November 2006. The acoustic part of the project was mainly performed at the Interactive Institute in Stockholm, jointly with the Helsinki University of Technology.

New Centres of Excellence in Research at KTH

Vinnova has recently started a new program of extra support for Centres of Excellence in research. There will be fifteen new "VinnExcellence Centres", one will be hosted by CSC in cooperation with The School of Architecture and the Built Environment, ABE. Plans call for a ten-year period of activity and funding will be shared between Vinnova, private enterprise, and the universities.

Centre for Sustainable Communications

Centre for Sustainable Communications aims to explore, innovate and evaluate circumstances where ICT (media & communications) can make significant contributions towards sustainability. The Centre provides a multidisciplinary research platform for developing open access communications, infrastructure and mediated services for people in remote as well as urban environments.

It aims to create and develop new, innovative communication tools and methods that provide viable alternatives to existing travel and transportation services, thereby supporting growth and inclusion while reducing our consumption of natural resources. The Centre's activities combine research and expertise in media technology, telecommunications, information technology, transport systems, environmental strategy, social science, architecture, design and planning in support of the aim to achieve a sustainable development.
Germund Dahlquist

In January we celebrated Germund Dahlquist’s 80th birthday, a few weeks later on February 8, 2005, he passed away. Germund Dahlquist was a great mathematician and numerical analyst, and the founding father of NADA now CSC. Dahlquist made groundbreaking contributions to the theory of numerical methods for initial value problems in ordinary differential equations. His work has had a profound impact and has shaped computational practice for time-dependent problems, especially in stiff differential equations.

In 1949 he joined the newly formed Swedish Board of Computer Machinery. In 1951, a time when no commercial computers were available, a Swedish effort to build an electronic computer begun. BESK (the Binary Electronic Sequential Calculator) was similar in design to, but not a copy of, the first generation of von Neumann’s Princeton computers. BESK became operative in December 1953 and was for a short time the world’s fastest computer. In his work with BESK, Dahlquist became involved in numerical analysis, and he soon began to explore various difference methods for solving differential equations.

Employed initially as an applied mathematician and programmer, he served later, from 1956 to 1959, as head of Mathematical Analysis and Programming Development. Beginning in 1959 and continuing up to and after his retirement in 1990, Dahlquist worked at KTH. There, he started NADA and built a broad scientific and educational program. In 1963 he was appointed full professor of “Computer Sciences, in particular Numerical Analysis,” the first position of its kind in Sweden.

Several efforts are made to keep the spirit of Germund Dahlquist alive. The Society for Industrial and Applied Mathematics, SIAM, gives a Dahlquist Prize every other year since 1995.

In Honor of Professor Germund Dahlquist, CSC on the initiative of Dean Ingrid Melinder arranged a Mini-Conference in Numerical Analysis. The conference took place February 10th 2006 at the main campus of KTH.

Comsol, a company started by students of Germund Dahlquist, sponsors a Dahlquist Research Fellowship at KTH, with first awarded recipient in January 2007, Assistant Professor Raul Tempone. http://www.csc.kth.se/om/priser/fellowship/

KTHNoc New Router-Lab

In February KTHNoc inaugurated a new router-lab, funded by a generous donation from Imtech Telecom. The celebration included a technical seminar with leading experts within internet-technology.

The National CS and NA Department Conference

On June 15th a conference in Computer Science and Numerical Analyses took place here at KTH CSC. Faculty members from universities all over Sweden were here to discuss development in scientific subjects, Bologna cooperation, and education. Lots of pictures and conclusions from the discussions can be found at: http://www.csc.kth.se/aktuellt/evenemang/amneskonferens06/

From EU-project: “Could FAUST “Disinvent” the A-bomb?”, Young people (age 13-18) focused on them imagining being researchers involved in addressing the major problems in the world – in their opinion.

Could Faust “Disinvent” the A-bomb?

In October 2006 we closed the EU Culture 2000-project with an exhibition in the Nobel-museum in Stockholm: Could Faust “Disinvent” the A-bomb? The exhibition showed parts of a theatre play, dance performance and young and old people in Europe reflecting over Science and its consequences. What led men devoted to research and science to dedicate the best years of their life to the invention and the construction of the atomic bomb?

The theme of the project: questions and views regarding the social responsibility of the scientist, the social responsibility of oneself to others, and each individual’s responsibility to the future were approached by four European partners in very different ways.
**DataTjej 2007**

DataTjej 2007, the 10th annual conference of its kind, was held in January 2007 at KTH in Stockholm, Sweden. The participants are representatives from Sweden’s Technical Universities, in total around 100 female students.

The purpose of DataTjej is to build networks and support female students in their choices concerning education and profession. Our aim is that the conference will result in more female university students choosing a career in the field of IT and Computer Science.

With the expansion of the IT industry geographical borders are removed and the whole world becomes a potential employer. We want to emphasise the opportunities this creates for our participants. The theme of the conference will therefore be Globalization. The theme fits well with the strategic activities of KTH as the university has been involved in various international projects in several countries during the last few years.

DataTjej2007 is a unique prospect for companies to meet future female Masters of Science graduates in the field of Computer Science and IT. Since we have the honour to arrange the 10th conference of DataTjej our ambition is to develop the conference and further improve the quality. We want to make DataTjej a well-established and well-known concept and set a solid ground for future conferences of its kind.

The organizers of DataTjej2007 is project leader Lorica Claesson with a group consisting of eight female students from the Master of Science in Engineering programs in Computer Science and Information and Communications Technology at KTH.

**European Programming Champs to be Crowned at KTH**

In April 2005 KTH’s programming team was awarded a silver medal at the ACM ICPC World Finals in Shanhai. During both 2005 and 2006 CSC hosted the ACM ICPC regional contest for Northwestern Europe. The contests had over 40 teams each from the Scandinavian countries, United Kingdom, Germany and the Netherlands. A KTH team coached by Fredrik Niemelä and Per Austrin of the CSC theory group managed to qualify for the World Finals in San Antonio 2006 as well as in Tokyo 2007, which means that KTH has qualified to the World Finals six consecutive years.
Student Kick Off

In February 2006 we arranged a kick off in a genial manner for our students to inaugurate the school. Seminars held by our young researchers and historical retrospect by our professors initiated a series of seminars “Research and Future” to increase the interest in research among the students. During this year we have had interesting and inspiring presentations by Jonas Beskow, Danica Kragic, Olle Bälter, and Johan Hoffman.

Student Awards

Fredrik Niemelä was voted Best Computer Engineering Student at KTH in 2005, of those graduating in 2004.

Johanna Hidén was awarded the KTH honors grant, 2005.

Johanna Eriksson was elected by the KTH Students’ Union to receive the President’s prize for equality and diversity in December 2005.

Jakob Nordström, TCS, is co-winner of Danny Lewin Best Student Paper Award at the conference 38th ACM Symposium on Theory of Computing (STOC ‘06) in Seattle, USA 2006, one of the most renowned conferences in theoretical computer science.

Svenska Spels Research Scholarship 2005 to KTH-student

Svenska Spels research scholarship 2005 has been awarded to Peter Jakobsson. Peter has a Master of Science in Media Technology from KTH as well as a Bachelor’s degree in philosophy.

Peter received Svenska Spels research scholarship at the annual “Spelakademin” in Visby, for his master thesis: “Subversive Gaming - an ethnography of the online world Project Entropia”. This master thesis is an ethnographic study of the economy in this virtual world with the purpose of exploring some of the problems that MindArks revenue model poses for the company and the users. Associate professor Daniel Pargman, at CSC, was the thesis advisor.

- It’s great that Svenska Spel takes notice of a study about an online world, says Peter after collecting the 25 000 SEK award check for his work on subversive gaming.

The jury awarded him for his excellent analysis and discussion that highlights the negotiations around the different interests of the actors involved. The paper also makes use of the distinction between strategy and tactics to analyze the different means the players and the company have at their disposal in the negotiation process.

To the right: from the Opera Fedra.

Grafiska Leverantörsföreningens Prize, Best Master’s Thesis 2005/06

Jenny Rågnäs was awarded Grafiska Leverantörsföreningens prize for best Master’s thesis 2005/06, 10 000 sek. She received the prize at a ceremony at Noors slott in September.

Jenny studies for a Masters degree in Media Technology. The work was performed for MWM, Media Workflow Management, with the title “Management Information Systems in Postpress Production - The need for production management and key figures in mailroom operations”.

Firework Concert

Firework Concert is a tradition started 2005. In September 2007 played about two-hundred wind players together at “Borggården” at KTH Campus. They were managed by KTHs Director musices Gunnar Julin. Peter Nordin designed the Fireworks.

Fedra

Students from The Master Program in Media Technology collaborated with the opera ensemble Folkoperan to create a modern production of Jean-Philippe Rameau’s opera “Hippolyte et Aricie” from 1733, now renamed “Fedra”. This production was modernized and directed by Claes Fellbom. The performance took place in the spring 2005, and used completely virtual scenery with continuously changing images projected onto the walls of the stage. This production of “Fedra” gave the audience a new and extraordinary experience, and was an activity within the Centre for Opera and Technology, a collaboration between KTH and The University Collage of Opera in Stockholm, sponsored by The Foundation for the Culture and the Future.
**New Professors**

We welcome Stefan Carlsson who 2006 took up the chair in computer science, in particular computer vision, after Jan-Olof Ekhlund, and Marko Turpeinen who was appointed professor in Media Technology, Fall 2006. David House was promoted professor in Acoustic Phonetics 2007.

**The Royal Swedish Academy of Science Research fellow and Knut and Alice Wallenberg Foundation**

Royal Swedish Academy of Science Research Fellowships are awarded to CSC researchers Jeanette Hellgren Kotalesky 2000-2005, Tony Lindeberg 2001-2006 (prolonged) and Anna-Karin Tornberg 2006-2011. The purpose is to create the best possible condition for eminent researchers to work in Sweden.

Anna-Karin was appointed associated professor in 2006 and docent in 2007. She works in Numerical Analysis with a special interest in computational techniques for moving boundary problems.

**Jeanette Hellgren Kotalesky**

**Anna-Karin Tornberg**

**Johan, Petter and Douglas Receives Ingvart Carlsson Award**

Johan Hoffman received the Ingvart Carlsson Award 2006 and both Petter Holme and Douglas Wikström 2007, for young post docs. The aim of the award is to make it possible for some highly qualified post docs to obtain a homecoming grant to help them get started. Johan is currently associate professor and docent in Numerical Analysis at CSC and was Post Doc Fellow for two years at the Courant Institute in New York, US. Petter currently holds a research position at CSC and was post doc for three years at University of Michigan, US and University of New Mexico, US. Douglas is appointed as assistant professor in computer science at CSC and held a post doc position for one year at ETH Zurich, Switzerland.

**The Swedish Research Council as Post Doc**

Jenny Sundén, lecturer in media technology and Jonas Beskow were awarded a Swedish Research Council funded post doc position for 4 years staring 2005, 2006 respectively.

**New Associate Professors - Docent**


**Assistant Professors**

Eva Lotta Saltnäs was appointed Assistant Professor within Future Faculty 2006.

**Gunnar Fant, Trinity College Honorary Doctor**

We congratulate Professor emeritus Gunnar Fant who has been appointed Honorary Doctor by Trinity College in Dublin.

**School Orchestra**

**Opera singer Gunnar Lundberg in honor of the Deans 60th birthday**
Algorithms: From Theory to Applications

We celebrated Professor Stefan Arnborg in honor of his 60th birthday with a symposium and a gala dinner, for heading the M.Sc. Program in Computer Science and Engineering at KTH since many years. Prof. Arnborg has greatly influenced the education in Computer Science. His research has covered many different issues in Computer Science, however developing efficient algorithms has been a common denominator. The results span from theoretical and mathematical aspects of algorithms to extracting interesting information from vast amounts of real data. Stockholm, February 25, 2005. http://www.nada.kth.se/arnborg-symposium/

Professor Stefan Arnborg

Conference in Honor of Björn Engquist’s 60th Birthday

Björn Engquist contributions to applied mathematical science world-wide were recognized in 2005 on the occasion of his sixtieth birthday by three international conferences, one at KTH, one at UC Los Angeles, and one at Peking University.

Ingrid Melinder in Honor of Her 60th Birthday

In August we celebrated Ingrid Melinder in honor of her 60th birthday with speeches, opera and farce for her long duty in teaching, as head of department for NADA, and as CSC dean.

Research Challenges in Speech Technology

Ten leading international and Swedish speech researchers were invited to speak at this special seminar in October to celebrate the 60th birthdays of Rolf Carlson and Björn Granström and honor their exceptional contributions and life-long commitment to the field of spoken language research and speech technology.

Professor Rolf Carlson

Professor Björn Granström

Media Technology in Future Communication?

And we also... announced a future symposium, in honor of Professor Nils Enlund and his 60th birthday, Media-technology in future communication?

Professor Nils Enlund

D-driferiet

Dean Ingrid Melinder and Anders Askenfelt
Teaching Awards

The STINT Scholarship in "Excellent Teaching" in 2006

Professor Viggo Kann, Director of Studies at CSC, was awarded a STINT scholarship in "Excellent teaching" in 2006. He visited Amherst College in the US during fall 2006 and reported his observations during the CSC Faculty Conference in May 2007. The dean says that we can learn a lot from his experience that will help us improve our education. We will particularly discuss their advisor system, the induction of new professors, ways of using alumni as sources of knowledge and feedback, the invitation of alumni and family to visit the university to make it better known, ways to involve the students more in daily issues at the school as guides, tutors and assistants.

KTH CSC Awards

To show our particular appreciation of the involvement of teachers and other staff members in teaching and improvement, CSC has established three challenge trophies that are presented annually.

The Dragon of Enlightenment

The Dragon of Enlightenment was established in 2000 to honor Gerd Eriksson, for her many years of meritorious work in undergraduate education and for inspired teaching. “The prize is awarded to a teaching assistant at CSC for meritorious work during the year in undergraduate education. Particular consideration is given to oral/spoken and written work that brings the discipline to life through creative presentation, illustrative activities, and unconventional exemplification.” In 2005 Magnus Rosell and in 2006 Carina Edlund were awarded the Dragon of Enlightenment.

The Creative Tie

The Creative Tie was established in 2002 to honor Henrik Eriksson for his many years as an inspiring teacher. "The prize is awarded to teachers and inspirers connected to CSC for meritorious work during the year." Stefan Nilsson was awarded 2005 and in 2006 Örjan Ekeberg was awarded the Creative Tie.

The Crystal Bear

The Crystal Bear was created in 2005 to honor Ingrid Melinder for her leadership at CSC and NADA. "The prize is awarded to a staff member for meritorious achievements in the School. Special consideration is given to continuing work or new initiatives and their implementation, particularly initiatives of change, which make the School an attractive professional and social environment for staff and students." In 2006, the prize was bestowed on the chairman of the School’s Doctoral Board, Jakob Nordström, and in 2005 Julio Cabrera, our janitor, was awarded the Crystal Bear.

Torsten Dahlin Scholarship

Bo Westerlund, industrial designer and researcher in interaction design, received the Torsten Dahlin Scholarship in 2005. The scholarship is intended to promote research and development within the design field. Bo Westerlund has developed various workshop methods for the involvement of users in conceptual development.
The School is responsible for education in many Bachelors and Masters degree programs, in and outside the School, and for continuing education. We offer about 180 courses with (a total of) 1,300 full-time-equivalent students per year, distributed over 11,000 course places and 250 Masters Theses. Our main disciplines are scientific computing (30 courses), computer science (50 courses), media technology (30 courses), human-computer interaction (30 courses), speech and music technology (10 courses) and language (33 courses).

We feel a great commitment for the education we participate in, and bear the main responsibility for the two Master of Science in Engineering programs (270 ECTS credits) in Computer Science (from 1983) and Media Technology (from 1999), and for a Bachelor-level degree program (180 ECTS credits) in Media Technology (from 2000). At Stockholm University (SU), Computer Science (from 1993) and Scientific Computing (from 1999) have been introduced as main disciplines, and NADA has been largely responsible for the mathematical-computer science study program since 1977. In addition, the School is responsible for several Masters-level programs and specializations in our disciplines.

At present, we are adapting the curriculum to harmonize with the “Bologna model”, which means the introduction of a two-year Master of Science in Engineering program, building on a three-year Bachelor’s degree. However, we expect our upgraded (from 270 to 300 ECTS credits) five-year Master of Science in Engineering programs to remain as vocational degrees.

KTH aims to be an international university that can welcome students from all over the world and at the same time actively encourage our own students to study outside Sweden. This means that language and cultural skills will be increasingly important. Our Language Unit offers a wide range of undergraduate courses in English, German, French, Spanish, Italian, Russian, Japanese, Chinese, Swedish and Swedish as a Foreign Language. In the autumn of 2006, a course in Technical Arabic was offered. We also offer courses in practical English for students at Masters and PhD levels as well as for teachers.

Undergraduate Education

The tradition at CSC is for the teachers to invite all new students in groups to see their research environment in order to discuss university studies in general and research in progress in particular.

Undergraduate Education Advisory Group 2005-2006

Professor Yngve Sundblad, Director of Undergraduate and masters’ Studies
Helene Rune, Administrative Director of Undergraduate Education Division
Professor Stefan Arnborg, Programme Director, Computer Science
Professor Nils Enlund, Programme Director, Media Technology
Ninni Carlsund Levin, Associate Professor, Numerical Analysis
Mona Eriksson, Assistant Professor, Media Technology
Danica Kragic, Associate Professor, Computer Science
Mats Boj, Associate Professor, Mathematics
Thomas Sjöland, Associate Professor, IMIT
Per-Anders Legeryd, Student Representative, Computer Science
Jörgen Björklund/Isa Ericsson, Student Representative, Media Technology
Programs

Master of Science in Computer Science and Engineering
This program aims to train students to leading roles in assessment, development and implementation of new computer and information technology. After a core curriculum in mathematics, computer science and engineering, students specialize in at least one of several areas in computer and information technology and management, and finish with a written thesis.

Master of Science in Media Technology
This program provides the students with an educational profile that will enable them to work with the development and marketing of new innovative media products both within established companies and as contractors within areas where the development has just started. Engineers graduating from this program will in addition to knowledge of the latest technology also understand the information content and its formation, economy, marketing and media usage.

Bachelor of Science in Media Technology
The B.Sc. in Media Technology aims to train for careers within a wide range of technology activity covering technical systems solutions for various kinds of media production. The program is focused to provide knowledge about media production technology and an understanding of the contents of media. Human communication processes and the educational profiling of media, apart from the digital technology aspects, are also considered important.

Master of Scientific Computing
The scientific course program gives profound knowledge in Scientific Computing for industrial processes and comprises a number of areas: Numerical methods, mathematical modeling, object oriented program construction, algorithms for parallel programming and applications in fluid dynamics, electro-magnetics, financial mathematics, computational physics and chemistry.

Swedish Master of Information Technology
This program results in a Master of Science with a major in information technology and specialization in computer science. Students entering the program should have good knowledge of mathematics and information technology. The program then aims to give deeper knowledge in computer science and within a chosen specialization.

Swedish Master of Human-Computer Interaction
This program results in a Master of Science with a major in Human-Computer Interaction. This program aims to widen the students' competence in the area of Human-Computer Interaction, which means to put focus on the user and his or her needs when constructing IT-based tools.
Bachelor and Master Programs

The aim of the Master of Science in Engineering program in Computer Science and Engineering is to give graduate engineers the prerequisites and the ability to participate successfully in and manage the work of assessing, developing and introducing new computer technology. A major part of the program is mathematics and programming techniques. It has now been strengthened by training in information ethics and security questions in response to the needs of technological and social development.

The aim of the Master of Science in Engineering program in Media Technology is to equip the students to solve problems related to the design and use of media technology and mediated services in various communication situations. The students are prepared for tasks on both the sender and receiver side, and for the entire communication process between these two.

The Bachelor of Science in Engineering program in Media Technology is geared towards the use and distribution of information in different media with the main emphasis on functionality. It provides broad knowledge of media technology, where knowledge of systems and methods takes priority over detailed implementation.

We offer three different Master of Science programs, building on Bachelor’s degrees (180 ECTS credits). The international Master of Science program in Scientific Computing [three semesters] started in 1997 and to date, about 100 students from over 30 different countries worldwide have taken their degrees. In 2006, this program was extended from 90 ECTS credits to a two-year Master’s.

The Master of Science program (one year) in Computer Science and in Human-Computer Interaction at KTH has been under development since it began in autumn 2004.

At Stockholm University we have recently renewed the Bachelor and Master of Science degree programs, in co-operation with the Department of Mathematics. Since 1977 we have been involved in a four-year program in Mathematics and Computer Science. In the programs students study mathematics and computer science and they can specialize in computer science, mathematics, mathematical statistics, scientific computing or economics. Today, the School is responsible for 13 specializations, of which the student can choose after three year of study. Business Development and Media Technology (AFM) is run in co-operation with the Stockholm School of Economics (HHS) and Biomedical Technology is run jointly with Karolinska Institutet (KI). Both of these specializations are open to most engineering programs at KTH. AFM is offered to students at both HHS and KTH.

Courses offered

Our objective is to offer courses to all Master of Science in Engineering programs at KTH and the Faculty of Science at SU. This applies both to those who want to specialize in our disciplines and those who have chosen other disciplines but need the computer as a sophisticated tool. Our ambition to change old courses and create new ones is driven by advances in the scientific fields and by improved tools and new applications. We have experience of adapting the curriculum to students who have studied at other universities and we aim to develop new types of education to facilitate these transitions further. To contribute to adult education, we will give introductory courses in our disciplines at Stockholm University from 2007.

www.csc.kth.se/utbildning/kth/db/05-06/alla/

Student Exchange

Some comments to the figure below:

- Most of the CSC students, 70%, travelling to universities outside Europe (usually Asian Universities).
- 75% of Exchange Students Arriving to CSC are from European Universities.
- Eight of the students accepted to the computer science programme (fall 2005) are Double Degree students (the student receives a Master of Science (M.Sc.) diploma from each of two universities: both the home university and the host university, means that one out of ten students who receive a degree from the programme are Double Degree students.

CSC Students Travelling to Other Universities

<table>
<thead>
<tr>
<th></th>
<th>Computer Science</th>
<th>Masters Media</th>
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<tr>
<td><strong>Academic Year 05/06</strong></td>
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<tr>
<td>Exchange Students</td>
<td>21</td>
<td>12</td>
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<tr>
<td>Master’s thesis</td>
<td>10</td>
<td>4</td>
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<tr>
<td><strong>Spring Term 05</strong></td>
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<tr>
<td>Exchange Students</td>
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<td>Master’s thesis</td>
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<td>Tot</td>
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Exchange Students Arriving to CSC

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<td><strong>Academic Year 05/06,</strong></td>
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<td>Spring term 05</td>
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<td><strong>Total</strong></td>
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63

7

18 | KTH CSC Bi-annual Report 05/06 – 06/07
**Graduate Education**

The School’s graduate education maintains a high international standard and the graduate students bring immense value to the research activities. We produce researchers that are sought after and who can look forward to careers as university researchers, teachers and applied researchers at universities and colleges as well as in industry both in Sweden and abroad. CSC has about 100 graduate students and the annual target is 15-20 PhDs and a slightly fewer number of licentiate degrees. The foundation of good research training is created through a balance between depth and breadth. Both our research and our research training courses maintain high quality internationally, and probe deeply into the specific research areas. In addition, the research training provides broad scientific, social and cultural insights, thereby contributing to education in the wider sense. Some of the students are enrolled in local or national graduate schools but most of them are closely tied to one of the departments. KTH Computational Science and Engineering Centre, KCSE, offers graduate students the opportunity to obtain a dual expertise in scientific computing and applications through seminars, workshops and conferences. Today eight departments at KTH with broad interest in scientific computing and application attend the activities within KCSE. The professors Björn Engquist at CSC and Dan Henningson at SCI were the initiators of the centre and most graduate students in Numerical Analysis follow the programs.

The national Graduate School of Language Technology, GSLT is hosted by the Faculty of Arts at Göteborg University, and is a collaboration between leading centers in language technology in Sweden. Professor Rolf Carlson at CSC was one of the initiators of the school and is now a member of the Academic Board. GSLT is now one part in the Nordic GSLT. Totally 10 graduate students from KTH have been enrolled in GSLT.

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**Research Education Advisory Group**

Director of PhD Studies: Johan Håstad  
Director of Studies:  
David House, Media Technology and Graphic Arts, Human-Computer Interaction, Speech and Music Communication  
Michael Hanke, Computer Science, Numerical Analysis

Professors, Directors of subject fields:  
Stefan Arnborg, Computer Science  
Kerstin Severinson-Eklundh, Human-Computer Interaction  
Nils Enlund, Media Technology and Graphic Arts, Björn Engquist, Numerical Analysis  
Rolf Carlson, Speech and Music Communication
NA – Numerical Analysis

Head: Lennart Edsberg
http://www.csc.kth.se/na/

INTRODUCTION

The NA group is concerned with development of numerical algorithms, their theoretical justification, and efficient implementation on high-performance computers. The focus of the research is on multi-scale and multi-physics models. Non-linear conservation laws, high-frequency wave propagation, and stochastic differential equations are the mathematical tools studied with applications to materials science, complex and turbulent flows, computational electromagnetics and biology.

HIGHLIGHTS

Björn Engquist turns sixty
Björn Enquist succeeded Dahlquist (see below) on the chair in 1990. He initiated and ran PSCI (1995-2005), PDC (1993-2001) and is currently engaged in CIAM. His contributions to applied mathematical science worldwide were recognized in 2005 on the occasion of his sixtieth birthday by three international conferences, one at KTH, one at UC Los Angeles, and one at Peking University.

CIAM, SSF center for industrial applied mathematics inaugurated

The center brings together application specialists and (applied) mathematicians from KTH to work on industrially relevant projects formulated as graduate studies. The NA Group runs two of the current projects (see also the Chapter on Research and Competence Centers).

Anna-Karin Tornberg awarded a Research Fellow Post from KVA

After five years at the Courant Institute of Mathematical Sciences, New York University, Anna-Karin returns to the Numerical Analysis group (July 2006). She does so as an Associate Professor on a Research Fellow Post as awarded by the Royal Swedish Academy of Sciences (KVA). The aim of this Research Fellow Program, funded by the Knut and Alice Wallenberg Foundation, is to create the best possible conditions for exceptionally gifted researchers to carry out their research in Sweden.

Johan Hoffman wins Ingvar Carlsson award

Johan joined the NA Group in 2005 after a post-doc position at Courant Institute. He focuses on the development, analysis, and implementation of general, robust and efficient computational methods for the simulation of complex multiscale and multi-scale differential models. The Technology for Advanced Computation group participates in the cooperative Fenics software project (http://www.fenics.org/wiki/FEniCS_Project) with initial developments in cardiovascular flow, exhaust pipe muffler acoustics, and bird and insect aerodynamics.

Germund Dahlquist (1925-2005)

Germund passed away just a month after celebration of his eightieth birthday in January 2005. With him went one of the pioneers of the computer era. His unique personality and outstanding contributions to science and education is a source of inspiration for those who follow in his steps. In commemoration, the Dahlquist Research Fellowship was established in 2006 co-sponsored by Comsol, Inc., as a two year research position.

Raul Tempone awarded first Dahlquist Research Fellowship

Raul completed his PhD in 2003 on adaptive methods for stochastic differential equations and after post-doc positions at U Texas at Austin and U Florida he was appointed the Dahlquist Fellow at the NA Group in 2007.

ONGOING RESEARCH/PROJECTS

Non-Linear PDEs and Adaptive Methods

Applications to combustion, phase change problems, and semiconductor devices are all modeled by strongly non-linear partial differential equations. The computational tools for these models involve grid construction, adaptation heuristics and algorithms, theoretical solution estimates, and solutions of large systems of algebraic equations, which are all the subject of Non-Linear PDEs and Adaptive Methods.

Adaptive Numerics for Stochastic Differential Equations

As for reliable measurements, a computation needs an estimate of its accuracy to be useful. In adaptive approximation of differential equations, the number of degrees of freedom is minimized, to optimize the computational work, for a given error tolerance. Competitive computer programs for approximation of ordinary differential equations have had such adaptive time-step control for a number of years. Our goal in Adaptive Numerics for Stochastic Differential Equations is to develop reliable and efficient adaptive methods, with mathematical foundation, for problems including stochastic features in material science, the geosciences, and mathematical finance.

High-frequency Waves and Computational Electromagnetics

Excellent methods for computer simulation of low-frequency wave propagation, in acoustics, hydrodynamics, and electromagnetics, and engineers successfully use the software built around them in the last two decades. Although in principle applicable also to short-wave phenomena, these methods become computationally intractable because of the need for resolving the wavelength by a sufficient number of degrees of freedom. The search has been on for more than a century for proper combination of asymptotic models, such as rays, wave-fronts, and particles, with resolved field models, which can substantially reduce the computationally tractable wavelength limit. In other applications, such as channel models for wireless communication, there is need for quantification of wave-field properties that are stable to pertur-
bations of geometry and frequency. This would open for robust stochastic models, and the combination of stochastics, rays, and resolved fields is a very exciting project. It may even provide improved methods for attacking matter waves – the Schrödinger equation – and thus impact computational materials science.

**Multi-Phase Flows**

The area of multi-phase flows is a very rich and active field of research. Our numerical simulations will enhance the understanding of various complex flows, for example the dynamics of fiber suspensions and the effect of surfactants in processes on the micro-scale.

We are developing several different numerical methods to simulate these problems. The conservative level-set method has reduced mass conservation errors usually associated with this class of schemes, and is now being extended to handle contact problems such as the wetting of drops on a solid surface. A completely new surface representation for dynamic interfaces separating immiscible fluids is being developed together with algorithms to simulate the evolution of surface active agents. Boundary integral methods together with high performance computing allow for large scale simulations of fiber suspensions. Research on so called fast summation methods is performed to further accelerate these simulations.

We are a partner in the Linne Flow Centre at KTH, and enjoy the collaborations within the “Micro and complex fluids” working group, joining researchers performing theoretical, numerical and experimental work within this exciting field.

Simulation of sedimenting fibers. Initially the distribution is random and uniform. Clusters of fibers form as time proceeds and fall more quickly than single fibers.

**Computational modelling of the mammalian cell**

The objective of our research is to generate realistic and computationally effective models of cellular metabolism. By taking advantage of the versatile properties of enzyme systems that metabolize reactive, hydrophobic compounds we can utilize excellent control over processes that occur intracellularly. The experiments give precise information on localization and enzymatic conversion of probe molecules. An integrated part of the project involves the generation of efficient, versatile and computationally tractable models of cellular reactions and diffusion (using fundamental/experimentally determined constants) which are verified against experimental data. Contributions towards an accurate computational model of the cell are of great importance for basic science and drug development. The research is carried out in cooperation with Karolinska Institutet.

**Computational Harmonic Analysis**

In Computational Harmonic Analysis, wavelet bases are used for aggregating the influence of small scales on the large scales in an adaptive spatial resolution setting. The rapidly rising interest for applications, primarily in signal processing and image treatment, both in industry and academia, is reflected in the increasing number of collaborative projects undertaken by the wavelet group.

**Adaptive computation of turbulent fluid-structure interaction**

There is a multitude of problems in biology, medicine and industry that demand a coupled fluid-structure interaction problem to be solved. Computational tools for simulation of fluid-structure interaction is developed in the form of new theory, algorithms and open source software. Major challenges include the robustness of the fluid-structure coupling, mathematics and computational algorithms for simulation of turbulent fluid flow, and development of reliability and efficiency through a posterior error estimation and adaptive algorithms. The mathematical basis is the theory of epsilon-weak solutions and weak uniqueness, coupled with the computational framework of adaptive finite element methods. This effort is funded by SSF, VR and VINNOVA in the form of several projects reaching from fundamental basic research to real world applications in collaboration with industry.

The flow behind a rolling wheel on a formula racecar is dominated by large-scale turbulence. Efficient simulation requires adaptive meshing capable of resolving a scale span of several decades.

**Professors**

Björn Engquist,
Lennart Johnsson,
Claes Johnson (from 2007),
Gunilla Kreiss (to 2006),
Jesper Oppelstrup,
Axel Ruhe,
Anders Szepessy

**Other research personnel includes**

8 associate professors, 2 assistant professors,
2 researchers and about 16 PhD students
CVAP – Computational Vision and Active Perception Laboratory

Head: Stefan Carlsson
http://www.csc.kth.se/cvap/

INTRODUCTION

The CVAP-group is active in computer vision and robotics with special focus on recognition of objects, places and actions as well as robotic manipulation, spatial mapping and navigation. The research aims at producing systems with generic cognitive abilities that can be applied in various domains such as perception for autonomous agents, search in large image and video repositories and advanced visualisation.

ONGOING RESEARCH/PROJECTS

Vision Systems
A general and long-term goal has been to develop systems that can acquire and “understand” visual information directly from the real world, i.e. “seeing” agents. Data is obtained actively by a fixating and foveating binocular head in terms of streams of video. The tasks of the system have so far been limited to detection of specific objects or classes of objects that have been learned and memorized. Specific problems that we have focused on during 05/06-06/07 deal with attention to combine bottom-up and top-down influences, the use of visual texture to identify materials, and the combination of low resolution peripheral and high resolution central cues in object recognition in real environments. This also includes problems on binocular gaze control and real-time computations. In newly started work the system is connected to robots capable of grasping and manipulating objects with the aim of studying object classification in view of the actions performed on them.

Visual Tracking and Labeling
The problem of tracking and labelling multiple people in motion has been a major research objective during the period. By employing a special setup consisting of four video cameras that together cover a wide area we have built a panoramic video that can depict e.g. the complete pitch in a football game. This device has been commercialized in a start up company (CogEye AB) founded by Eric Hayman, Stefan Carlsson and Josefine Sullivan. Together with software for cutting out standard format video this is now offered to TV companies as a tool for extracting highlights in sports events. Using the panoramic video we have developed algorithms for automatic tracking of individual and multiple players in a football game. The collection of tracks formed by individual players and multiple players coming together form an interaction graph depicting the activity of the game. Using prior information together with the constraints of the graph the system can label the individual nodes in the graph with identity of the players.

Robotics and Vision
In the robotics area, we have mainly focused on the research on service robots in domestic environments. One focus has been on visual recognition of objects where we investigated shape based methods. These methods currently attract only limited interest, since they involve difficult segmentation problems. Since it is well-known that object shape provides essential information about both classes of objects and object pose, these methods are interesting in robotic applications that require grasping and manipulation of objects. Here, we have primarily focused on objects with weak texture, such as fruits or uniformly colored man-made objects.

Another focus has been on path following, terrain servoing and mapping with mobile robots. We have investigated contour reconstruction and formation control based on limited sensor information. These, and similar applications in service robotics require that the position of the robot is accurately known. Faults affecting the localization system can thus have serious effects on the overall performance. This includes internal hardware and software faults, but external disturbances and faults from the surrounding dynamical and complex environment are even more common in service robotics applications.

In our work, we have also investigated methods for detecting faults affecting the localization system of a mobile robot. Problems of localization and navigation have been extensively studied.

Professors
Stefan Carlsson (from 2006),
Henrik Christensen (on part leave 2007),
Jan-Olof Eklundh (to 2006) emeriti,
Tony Lindeberg (on leave)

Other research personnel includes
1 associate professor, 2 assistant professors,
5 researchers and about 14 PhD students

Below: Automatic tracking and identification of all 22 players in a football game
ied in the robotics community, and there exist many reliable methods and robust implementations of such systems. We have developed a low complexity, flexible system for fault detection that does not need direct access to sensor data, nor modification of existing localization algorithms.

One key competence for a fully autonomous mobile robot system is the ability to build a map of the environment from sensor data and use it to localize. Natural landmark detection and incremental building of consistent maps for simultaneous localization and mapping (SLAM) has been one of the main research areas for the past several years. For large scale and complex environments especially regarding full 3D, the problem is still an open research topic. While our previous research relied on range sensors such as lasers or sonars, more recently the focus has shifted to use vision as the main sensor.

One of the objectives is also to make systems with robotic hands able to reason about graspable targets, to explore and investigate their physical properties thus make robotic hands grasp any object. This is currently accomplished through a combination of observing humans performing similar tasks and robot self-exploration where we continue our previous work on grasping and manipulation of objects in a domestic setting is a necessary skill for a truly useful service robot. In an uncontrolled environment, such as in a living room, knowledge of the world cannot be expected to be perfect. The environment can change over time and also be fragile. Designing hardware and control for such tasks - different each time and where information is incomplete - is difficult even for “simple” tasks such as pick up the remote, open the door, switch the light on, or fetch the cereal box.

To enable a more intuitive formulation of grasp control - as opposed to decentralized control of reference trajectories and torques - a conceptual framework for control design has been developed and integrated with an experience based system that learns from human demonstration. Unlike in the conventional program development process, for programming robots through demonstration the user does not have to be familiar with the syntax and semantics of the programming language. Most of the state-of-the-art robot programming systems are based on a single demonstration. One objective of our research has therefore been to study novel methods for learning robot tasks from multiple demonstrations or multiple observations.

CSC Doctoral Theses
• Martin Eriksson • John Folkesson • Carl-Magnus Fahlcrantz
• Ronnie Johansson • Staffan Ekvall

CSC Licentiate Theses
• Fredrik Furesjö • Elin Anna Topp • Daniel Aarno

Highlights
A. Maki, T. Uhlin and J.O. Eklundh received the “Most Influential Paper over the Decade Award” at the IAPR Conference on Machine Vision and Applications, Tokyo, 2005.

Foundation for Strategic Research Projects
2. CAS – Centre for Autonomous Systems

The Scientific Council Projects
1. Human-Machine Collaborative Systems
2. Event based classification of videosequences
3. Image descriptors and scale space theory for spatial and spatiotemporal recognition
4. Cognitive spatial research with multiple sensors COMPLEX

European Projects
1. MUSCLE. Multimedia Understanding through Semantics, Computation and Learning. J-O Eklundh (NOE)
2. PASCAL. Pattern Analysis, Statistical Modelling and Computational Learning. S. Carlsson (NOE)
4. MORVIS. Vision Technologies and Intelligent Maps for Mobile Attentive Interfaces in Urban Scenarios J-O Eklundh
5. COGNIRON. The cognitive robot companion H. Christensen (Strep)
6. NEUROBOTICS H. Christensen (Strep)
7. COSY. Cognitive Systems for Cognitive Assistants H. Christensen (IP)
8. EURON II. H. Christensen

STINT Institutional Grant between CVAP, CSC, KTH and CMP, Czech Technical University

International Contacts
The research groups have been very successful in organizing and collaborate with researchers from other countries within projects sponsored by the European Community. In the period covered in this report we have been coordinator in and participated in several European cooperative programs.

Visitors and Other Scientific Exchange
David Nister, Henrik Stewenius University of Kentucky
Michael Black, Brown University
Vaclav Hlavac, Vojtech Franc, Susana Kukelova, Jana Kostliva Czech Technical University
Alyosha Efros, Carneige Mellon University
Jim Little, David Lowe University of Washington
Ville Kyrki. Lappeenranta University of Technology
Magnus Egerstedt, Georgia Tech
CB – Computational Biology

Head: Anders Lansner
http://www.csc.kth.se/forskning/cb/

INTRODUCTION

CB’s research activities span from the design and evaluation of artificial neural network algorithms and computational neuroscience to mathematical modeling of biological nervous systems, the brain in particular.

HIGHLIGHTS

• In December 2005 OECD’s Global Science Forum decided to locate the International Neuroinformatics Coordinating Facility (INCF) in Stockholm.
• In December 2005 SSF decided to fund Stockholm Brain Institute (SBI). CBN is one of ten partners.
• In September 2006 SBI was established as a Berzelius Center by Swedish Science Council and Vinnova.
• Anders Lansner organized with Sten Grillner, Karolinska Institutet the “3rd Nordic Workshop in Neuroinformatics in Stockholm, Aronsborg, (September 2005).
• Erik Aurell co-organized June 16 - 19, 2005 Workshop Networks and Algorithms: complexity in Physics and Computer Science and was an invited lecturer in EPFL Summer Research Institute, I&C School of Computer and Communication Sciences (July 18, 2006).

Highlight – courses

Erik Aurell has developed and given the course 5A1396 Molekylärbiologins fysik (2005, 2006).
Jens Lagergren gives the course 2D1350 Algorithmic bioinformatics, Lars Arvestad gives the bioinformatics course for the Biotechnology program: www.csc.kth.se/utbildning/kth/kurser/2D1350/

CSC Doctoral Theses

• Pål Westermark • Christopher Johansson • Martin Rehn • Isaac Elias • Mikael Huss

CSC Licentiate Theses

• Mikael Huss • Martin Rehn • Anna Svantesson • Johannes Hjorth • Malin Sandström

RESEARCH THEMES

Computational biology and Neurocomputing

The Computational Biology and Neurocomputing (CBN) research group is focused on mathematical modelling and computer simulation of dynamical biological processes underlying information processing and control in the nervous system. The systems under study are mainly cortex, basal ganglia and spinal cord and phenomena at different levels, from intracellular biochemical signaling, over cellular and synaptic signal processing to dynamics of large-scale neuronal networks are studied. Several modelling projects are conducted in close collaboration with experimental researchers, for instance within the Stockholm Brain Institute (SBI), which was established in 2005 with funding from the SSF. The modelling of processes at the sub-cellular level include studies of the biochemical mechanisms behind biological learning and synaptic plasticity, with a focus on the cerebellum and basal ganglia. Two other projects concern modelling intracellular calcium oscillations observed in lamprey spinal cord neurons and glucose-insulin coupling in the pancreatic beta-cell.

At the cellular level the group is studying three different systems, the spinal cord, the entorhinal cortex, and striatum. The spinal cord work is aimed at improving the models of premotor interneurons involved in the swimming pattern generator network in the lamprey, a model system for studying vertebrate locomotion. In another project, the involvement of entorhinal cortex in working memory is studied by looking at nerve cell properties. This part of cortex is very interesting as it is positioned as a gateway between neocortex - the region of the brain responsible for higher cognitive functions, and the hippocampal system - one of the key components of the brain’s memory system.

For studies at the neuronal network level the group often combines a bottom-up approach based on data on cellular and synaptic properties with a more top-down approach for the study of global cortical memory network dynamics and psychological phenomena. The former uses mainly biophysically detailed multi-compartmental Hodgkin-Huxley type model neurons, while the latter employs more simplified connectionist type of models, that also serve as a basis for development of brain-inspired algorithms and architectures. Other network level projects deal with how synchrony arises in cortical networks of neurons in relation to epilepsy as well as the generation of synchrony in the striatum and the role of gap junctions between inhibitory interneurons this context.

Professors
Erik Aurell,
Jens Lagergren,
Anders Lansner

Other research personnel includes
3 associate professor; 1 assistant professors, 1 researcher and about 13 PhD students
The SPLIT simulator was previously developed by the group with the aim to support parallel simulation of biophysically detailed neuronal network models. It has recently been optimized for running on massively parallel cluster computers like the IBM Blue Gene. The scalability of this simulator running a network model of neocortex has been studied in collaboration with IBM. The largest simulation performed so far comprised 22 million neurons and 11 billion synapses and this is by far the largest simulation ever of its kind. It took 100 minutes to simulate one second of activity. The SPLIT simulator is also used to simulate the dynamic in large-scale network models of the lamprey spinal cord and of the olfactory bulb and cortex.

Publications: www.csc.kth.se/forskning/cb/cbn/publications/

Computational biological physics

Physics (CBP) moved to CSC and CB on October 1, 2006. CBP's research is concentrated on computational and physico-chemical models of gene regulation from the level of isolated switches to larger networks. The research is important for systems biology and analysis of gene regulatory networks.

We have earlier modelled the paradigmatic example of the lysogenic state of phage lambda, and currently we are pursuing whether similar models can be extended to more complex systems, in collaboration with a group at the Microbiology and Tumor Biology Center (MTC) at KI. On computational/theoretical biophysical approaches to gene regulation we pursue finding non-coding RNAs and their targets, to investigate the specificity and the relationship between structure and function of ncRNAs. The project is pursued together with Institut Pasteur (Paris, France). We also have an interest in issues on the interface between statistical physics and computation. Recent projects include a performance analysis of structured peer-to-peer systems in a dynamic environment (Krishnamurthy et al, IPTPS 2005).

Publications: www.csc.kth.se/forskning/cb/cbp/publications/

Computational Biology and Bioinformatics

The main interests of the CBB group are comparative genomics, gene regulation, and cancer progression. Our goal is to develop biologically relevant methods, by using advanced probabilistic modelling and algorithm design. In a genome, the genes evolve through nucleotide substitutions. The evolution of the genome is shaped by a multitude of evolutionary events acting at different organizational levels. Larger genome segments are affected by processes such as duplication, lateral transfer (where a segment of an organism’s genome is transferred to the genome of another organism), inversion, transposition, deletion and insertion. We have developed an integrated probabilistic model for gene duplications, gene losses, and sequence evolution together with analysis algorithms as well as tools based on this model. Lateral transfer is another evolutionary event that has gained a lot of our attention. We have developed parsimony algorithms for lateral transfer identification and are currently working on a probabilistic model that contains duplications, losses, and lateral transfers.

Regulatory elements, or transcription factor bindings sites, appear in clusters typically upstream of coding regions of the genes they take part in regulating. Identification of regulatory elements is an important step towards revealing regulatory networks. We have developed methods for genome wide identification of modules of regulatory elements as well as tree-based methods for identification of individual regulatory elements.

Chromosomal aberrations in solid tumours appears in complex patterns. It is important to understand how these patterns develop, the dynamics of the process, the temporal or even causal order between aberrations, and the involved pathways. We are interested in mathematical models, algorithms and automated tools that enable derivation of network models from various cancer data sets. A network consists of vertices representing chromosomal aberrations and directed edges, between such vertices, representing temporal and causal relations. We have developed, and applied, algorithms that can derive network models for cytotomic data and are in the process of extending these results to other data forms.

Publications: www.csc.kth.se/forskning/cb/cbb/publications/

INTERNATIONAL CONTACTS

CBN: The group has been successful in organizing and collaborating with researchers from other European countries within projects sponsored by the European Community, i.e. GOSPEL (27 partners) and FACETS (15 partners).

CBP: Important collaboration with the group of Massimo Vergassola at Institut Pasteur, Paris. We have good contacts with two groups in Helsinki (Nikko Ala, Arni Kupiainen),

CBM: Important collaboration with Alexander Schliep, Max Planck Institute for Molecular Genetics, Berlin. Michael Hallett, McGill University, Montreal: Bernard Moret, EPFL, Lausanne

VISITORS AND OTHER SCIENTIFIC EXCHANGE

CBN: Martin Rehn, was 6 months at Redwood Neuroscience Institute (RNI). Anders Lansner was invited speaker and organized a special session on “Computational Models of Biological Olfaction” at the 11th IS0EN Conference in Barcelona, Spain, April 2005.


Erik Aurell visited Santa Fe Institute and Brookhaven Nat’l Laboratory (March 2006). Aymeric Fouquier d’Herouel visited Institut Pasteur regularly. Maria Werner visited NBI (Copenhagen).

CBB: Jens Lagergren invited to CIPRES second annual meeting, Austin, Texas. Jens Lagergren visited Dannie Durand Carnegie Mellon University Jens Lagergren gave the following invited presentations

• BioinfoSummer 2005, ICE-EM Summer Symposium in Bioinformatics, Canberra, Australia, 2005
• 2nd Barbados Workshop on Genomics and Gene Regulation, Barbados, 2005, “cis-regulatory modules”
• “A Tree-based Gibbs motif Sampler for Unaligned Orthologous Upstream Sequences”

SPECIAL CONTRIBUTIONS TOWARDS THE SOCIETY

Popular science articles about Jens Lagergren, Lars Arvestad and Orjan Åkerborg in Biotech Sweden.
**TCS – Theoretical Computer Science**

Head: Stefan Arnborg  
http://www.csc.kth.se/tcs/

**Introduction**

The mission of the Theory Group at CSC is to develop and disseminate new, useful and interesting Theoretical Computer Science.

Among current topics are Computational Complexity, Algorithms, Cryptography, Logic and semantics, Computational Biology, Uncertainty Management and Human Language Technology. Thus, our topics originate in applications of Computer Technology, but we study them foremost from a mathematical and mathematical modelling perspective.

In the summer 2006, the bioinformatics group led by Jens Lagergren left TCS to join the newly formed Computational Biology group. During the academic year 2005/6, two senior researchers, Mads Dam and Dilian Gurov, and two doctoral students, Irem Aktug and Mika Cohen, joined the Theory Group.

**Highlights**

- Jakob Nordström is co-winner of Lewin best student paper award at STOC 2006.  
- Our Senior doctoral students presented four papers at ICALP 05.  
- Our Junior members got an honourable seventh position (silver medal) in the ACM ICPC world finals on April 7, 2005.  
- Best CSC teaching assistant 2005 (Green Dragon Prize): Magnus Rosell, CSC TCS.  
- Best CSC teacher year 2005 (Wooden Tie Prize): Stefan Nilsson, CSC TCS.  
- Fredrik Niemelä was awarded the Best Computer Engineering student prize at KTH in 2005, of those graduating in 2004.  
- One of the PhD theses passed in 2005 is written by Douglas Wikström. He investigates electronic voting systems based on public-key cryptography and zero-knowledge proofs, and a generalization of digital signatures.

**CSC Doctoral Theses**

- Joel Brynielsson • Klas Wallenius • Douglas Wikström • Robert Suzic • Mårten Trolin • Jonas Sjöbergh • Gustav Hast • Johnny Bigert

**CSC Licentiate Theses**

- Irem Aktug • Anna Palbom • Magnus Rosell • Johan Glimming • Robert Suzic • Mårten Trolin • Rafael Pass

One of the PhD theses passed in 2005 is written by Douglas Wikström. He investigates electronic voting systems based on public-key cryptography and zero-knowledge proofs, and a generalization of digital signatures.

The election protocols considered by Wikström are called mix-nets. A mix-net can replace a trusted party that collects the votes of all voters and then outputs the votes in sorted order without disclosing anything about which voter submitted which vote. An important contribution of Wikström’s thesis is the definition of security of mix-nets that formalizes this intuition.

A zero-knowledge proof allows a prover to convince a verifier that it holds a solution to a problem without giving any knowledge on how to construct the solution. There exists a zero-knowledge proof for any problem in NP. General results can be used to construct a voting system which is anonymous and still highly secure against cheating, i.e., voting secrecy and correctness are guaranteed. However, these solutions are very impractical. Wikström gives the first complete practical and provably secure (modulo the standard assumption that one-way functions exist) construction of a mix-net.

The generalization of digital signatures considered by Wikström is called hierarchical group signatures. Any signer can sign a message as for ordinary signature schemes. The special property of group signatures is that signatures produced by different signers are indistinguishable to everybody except the group manager who can always identify the producer of a valid signature using his special secret key. An application of group signa-
Douglas Wikström

Ongoing Research/Projects

Approximation Algorithms
The main topic of this project is to investigate to what extent the optimum value of important NP-complete problems can be approximated effectively. These investigations are naturally divided into two types of activities, namely to prove positive and negative approximation results. To get a positive result - an upper bound of the approximability - one constructs an algorithm, proves that it is efficient and approximates the problem within a certain accuracy. To get a negative result - a lower bound - one usually proves that approximating a given problem remains NP-hard.

Computational Complexity
The basic question of efficient computation is to determine the exact computational resources needed to solve a given computational problem. To get an exact bound both upper and lower bounds are needed. Upper bounds are usually proved by displaying an efficient algorithm together with an analysis of its performance. Lower bounds are usually established by mathematical proofs giving an estimate for the amount of resources needed. Proving a lower bound implies that one has to prove that any fast algorithm makes a mistake. This quantification over all algorithms seems to make the problem more difficult and progress on lower bounds is very far behind progress on upper bounds.

Computational Biology
We currently focus on genome evolution and gene regulation. In genome evolution, the goal is to find the genome level events that lead to the currently existing species. Examples of such events are duplications of genes, lateral transfers, and inversions of a segment of a genome. This activity moved to the department of Computational Biology in 2006.

Cryptography
One of the most useful cryptographic primitives is the pseudo-random number generator. This is a function that deterministically expands a short random seed to a longer, random “looking” string. Random looking means that no probabilistic polynomial time algorithm can distinguish between true random bits and the output of the generator. Basically, the best such an algorithm can do is to “guess” the source of its given input.

Decision Support
Our research aims at providing decision support tools for Command and Control and similar applications, focusing on decision theory, data fusion and knowledge representation.

Human Language Technology Group
The Human Language Technology (HLT) group at NADA performs research within all aspects of human language and computers. Here follows a description of each area:

• Reading, writing and learning processes
• Spell- and grammar checking
• Text filtering and categorization
• Text summarization
• Text extraction
• Text generation
• Information retrieval with HLT techniques
• Lexicon lookup and construction
• Tvärslå och tvärsök: Search/translation service for Scandinavian Languages.

Logic and Semantics
The logic and semantics group performs research on the use of formal techniques to specify and analyse the behaviour of programs and systems. Current research concerns fixed point logics and their application to component-based systems, security analysis using logics of knowledge, information flow analysis, testing and test generation, and protocols for large-scale distributed systems. The group is also currently involved in the EU project S3MS, Secure Software Services for Mobile Systems, where we study new techniques for program monitoring.

Visitors and Other Scientific Exchange
Numerous international and multidisciplinary collaborations are active, as can be seen in our publication lists and seminar announcements. TCS members have participated in several international and national assessments of research and education.
**HCI – Human-Computer Interaction**

Head: Kerstin Severinson-Eklundh  
http://hci.csc.kth.se/

**INTRODUCTION**

The HCI group at CSC, is an interdisciplinary research group in human-computer interaction which has its roots in the IPlab research group (1985-2005) and the CID competence centre (1995-2005). The group originally evolved from computer science, but now has members from fields as diverse as linguistics, psychology, anthropology, cinema studies, industrial design and communication.

Human-Computer Interaction, HCI, is a young research area which deals with the interaction between humans and computerized systems. The field is both multi- and interdisciplinary. Whereas early HCI was mainly influenced by cognitive psychology and computer science, the influences today are much more differentiated and include e.g. ethnology, sociology and design. The field is strongly related to information technology and its applications, but also more generally deals with the usability and usefulness of technology.

Nada was one of the first departments in Sweden with research and education in HCI. The research group IPlab (Interaction and Presentation Laboratory) started in 1985, and at that time focused on computer support for writing, graphical design and programming. In the 90’s the research activities grew and became more diverse, with computer-supported work as an important and lasting concern for the group.

In 1995 the group received funding from NUTEK/VINNOVA to start a competence center, CID (Center for User Oriented IT Design). The focus was on user centered development processes, and a number of projects were defined in collaboration with industrial partners and user groups.

In 1997 the HCI group engaged in the launch of The Graduate School of Human-Machine Interaction (HMI school), funded by SSF, and a collaboration with Linköping University. HMI and CID implied a strong growth of graduate education in HCI at Nada, both quantitatively and qualitatively. In 1997 a new professorship was established, and in 1998 HCI became an independent graduate subject.

The group is responsible for HCI education at CSC on all levels. Currently (2006) HCI:ers are involved in:

- about 30 undergraduate HCI courses at KTH and at Stockholm University
- Master’s education and Master’s projects
- Swedish master program in HCI
- Doctoral education
- About 20 externally funded research projects

**HIGHLIGHTS**

- Bo Westerlund, industrial designer and researcher in interaction design, received the Torsten Dahlin Scholarship in 2005. The scholarship is intended to promote research and development within the design field. Bo Westerlund has developed various workshop methods for the involvement of users in conceptual development.
- During 2005, Henrik Artman was appointed “docent” (associate professor) in HCI.
- During 2006, Olle Bälter was appointed “docent” (associate professor) in HCI.
- In January 2006 we arranged at the scene of the Opera school at KTH campus a play performance, “Faust in Hiroshima”, by the theatre group Klesidra from Rome, one of our partners in the EU Culture 2000 project Faust. About 100 spectators attended. The objective of the project is to raise the consciousness of the responsibility of scientists and engineers for the effect of their activities.

**From EU-project: “Could FAUST “Disinvent” the A-bomb?”, drama performance, live broadcast in three countries.**

**CSC Doctoral Theses in HCI**
- Gustav Taxén
- Ola Knutsson
- Maria Normark
- Jin Moen
- Minna Räsänen
- Helge Hüttenrauch
- Martin Hassel,

**CSC Licentiate Theses in HCI**
- Erik Markensten

**GRADUATE COURSES**

- Personal Information Management
  (Spring 2005, instructor: William Jones)
- History of HCI (spring 2005, instructor: Anders Hedman, Yngve Sundblad)
- Research Methods in Human-Computer Interaction
  (Spring 2006, instructors: Ann Lantz, Kerstin Severinson Eklundh)
Ongoing research

Some specific interests and competences of this HCI group are methods and practices of

- Computer support for writing and reading processes
- CSCW: Computer-supported collaborative work
- User oriented design and development
- Perceptual and multi-modal user interfaces
- Human-robot interaction
- Connected communities

Research Projects

- ARTUR - a multimodal ARticulation TUtoR
- Cogniron - The cognitive robot companion
- CommRob - Advanced behaviour and high-level multimodal communication with and among robots
- Computer-supported collaborative writing
- Convivio - Network of Excellence for people-centered design of interactive systems
- GLIO - Det gränsöverskridande lärandets innehåll och organisation
- FAUST - Could Faust disinvent the A.bomb?
- Human language technology group at NADA
- INSCAPE – Interactive Storytelling For Creative People
- MiCOLE - Multimodal collaboration environment for inclusion of visually impaired children
- Models for human interaction with mobile service robots
- MonAmI - Mainstreaming on Ambient Intelligence
- MAVB - Enabling technology via user centeredness and organizational development of the procuring organizations demands
- NEPOMUK - Networked Environment for Personalized, Ontology-based Management of Unified Knowledge, The Social Semantic Desktop
- Nomad - IT support for university students as nomadic workers and group learners
- ScandSum- Summarization network in Scandinavia
- Shared Representations and Collaborative Learning of Interaction Design
- The use of language tools for writers in the context of learning Swedish as a second language
- UsersAward - User certification of Workplace IT Support

Information about specific projects: http://hci.csc.kth.se/researchProjects.jsp


Publications

Previous publications of IPLab (up to 2005) as well as recent HCI publications can be found at the web site of the HCI group: http://hci.csc.kth.se/

A list of CID publications (1996-2005) can be found at: http://cid.nada.kth.se/publikationer/rapporter.html.

International Contacts

The HCI research group (formerly IPLab and CID) has been very successful in organizing collaborations with researchers from other countries within projects sponsored by the European Community. In the period covered in this report we coordinated 7 and participated in 24 other European cooperative projects and networks. Since 2003 we have also arranged yearly two-week Summer Schools in Europe for about 40 research students, in Rome, Split, Timisoara and Edinburgh. The HCI group also participates with a student project group and teachers in the Siena Design Project every year.

Visitors and Other Scientific Exchange

During the Spring semester 2005 and spring 2007, William Jones from the Information School, University of Washington, US was guest professor at IPLab.

HMI - The Graduate School for Human-Machine Interaction

During 1997-2005, IPLab and CID have hosted Stockholm’s part of the Graduate School of Human-Machine Interaction, funded by SSF. The goal of HMI was to improve Swedish competence by educating specialists in HMI, and bringing HMI research in Sweden to a high international level. The programme has been a collaboration with the University of Linköping and Stockholm University. Within the programme, more than 50 students have acquired a Ph.D. degree.
Media –
Media Technology and Graphic Arts

Head: Nils Enlund
http://xml.nada.kth.se/media/

Introduction
The department of Media Technology and Graphic Arts forms a multidisciplinary research group focused on technology and methods for supporting communication through various media over distances in time and space. The department is also responsible for the Master of Science and Bachelor of Science programs in Media Technology as well as for the specialization programs in Publishing Technology and in Business Development and Media Technology.

Highlights
The VINNOVA Centre of Excellence for Sustainable Communications. The department of Media Technology and Graphic Arts, in cooperation with the KTH department of Environmental Strategy Research, was awarded ten-year funding by VINNOVA (The Swedish Governmental Agency for Innovation Systems) for a Centre for Sustainable Communications. The new centre will investigate how the use of media technology can help creating and maintaining an environmentally, economically, and socially sustainable society. The centre started its activities at the end of 2006.

Opera on a virtual stage. In cooperation with the opera company Folkoperan, and coordinated by the Research Centre for Opera and Technology, the department of Media created virtual stage design and interactive effects for 27 public performances of Jean-Philippe Rameau’s opera Fedra in 2005. A shortened version for young people, Fedra and the Beast, was staged 32 times. An international symposium on New Technology in the Performance of Opera was arranged in conjunction with the performances.

Student awards. Peter Jakobsson received the Svenska spel research award for his MSc thesis on “Subversive gaming”. Johanna Hidén was awarded the KTH honors grant. Johanna Eriksson was elected by the KTH Students’ Union to receive the President’s prize for equality and diversity.

CSC Doctoral theses
• Inger Stjernqvist • Mats Andersson • Asta Cepaite
• Maria Enroth • Sanjay Nagaraj • Anders Bjurstedt

CSC Licentiate theses
• Anders Bjurstedt • Ulf Blomqvist • Thomas Mejtoft
• Emmi Enoksson

Research Projects
Research at Media Technology and Graphic Arts
Research at the department is covering a wide field of technology, production, and usage aspects of media. To a great extent, research projects are linked to the thesis work of PhD candidates. Below, some examples of projects during the period.

DigiNews is a EUREKA project designing and exploring newspaper-like media products as well as their production and distribution processes for consumer devices based on e-paper technology.

Gender Play: Intersectionality in Computer Game Culture, is financed by the Swedish Research Council (VR). In contrast to the white, straight, he-man masculinity of mainstream computer games, Gender Play takes the increasing production of “games for girls” as a point of departure. The project is a media ethnographic study of the construction of gender and its intersections with sexuality and ethnicity in and through the production and consumption of computer games (consisting of interviews with players and game producers, but also close playings/analyses of game worlds).
Media World 2020 is a research network and a “think tank” concerned with the multidisciplinary study of media development. The network is a cooperation between KTH, Stockholm, Uppsala, Gothenburg, and Mid Sweden Universities. Current research includes a study of news publishing strategies, and a study on media convergence in the Nordic countries.

Mediated cultural environments. With funding from the National Heritage Board of Sweden, the project explores the use of media technology and presence production in making cultural heritages accessible to a wider public. The cleaned-out nuclear research reactor at KTH is used as a test case.

MusicLessons is an EU financed project investigating the effects of broadband technologies on business models and regulatory frameworks, taking the transformation of the music industry as a point of departure. The project aims at deepening the understanding of how new technology will support new business models, and to identify new emerging and potential active roles for consumers functioning as content aggregators and distributors.

Prolearn is a Network of Excellence financed by the IST programme of the European Commission. Prolearn deals with technology-enhanced professional learning, and KTH is one of the 21 core partners. The mission of Prolearn is to bring together the most important research groups in the area of professional learning, as well as other key organisations and industrial partners, thus bridging the gap between research and education at universities and similar organisations, and training and continuous education that is provided for within companies.

T2F – The Print Research Program is a six-year multi-university program aiming at strengthening graphic arts technology research in Sweden. The program focuses on flexographic packaging printing, multicolor printing, prepress quality, production efficiency, and print as a communication medium. Within the T2F program, studies have been carried out on color reproduction, digital printing strategies, gravure printing developments, and consumer and producer media choice.

Technologies of Life: On Art, Science and New Media, financed by the Swedish Research Council (VR), explores encounters between art and science in contemporary bio-art (which refers to art that uses biological metaphors, models, materials or visualization technologies). The project investigates possibilities and difficulties in encounters between art and science by studying the limits, conditions and technologies of life in new media art.

TIDE – Tangible/Intangible Dynamics in the Digital Economy. The program, a cooperation between KTH and Stockholm University, explores how service providers may develop cost efficient and convenient service provision systems by combining Internet and personal-based elements catering to different categories of end users. Technology-based services from five different service sectors provide empirical data: financial services, home health care, travel services, music, and publishing.

Where News? is an industry funded project aiming at identifying major drivers of change in the news media markets and assessing their impact on consumers and on the media industry.

Visitors and Other Scientific Exchange

The department has an extensive and active national and international network of contact and cooperation.

Within the framework of the Linnaeus-Palme exchange program, we are exchanging teachers and researchers with Peking University, Beijing, China. During 2005-2006, assistant professors Wu Jing and Xu Jing have visited KTH and Daniel Pargman and Jenny Sundén have visited Peking University.

Nils Enlund has been appointed visiting professor at the University of Zagreb, Croatia.

Daniel Pargman has been on leave for part of the period, serving as assistant professor at the University College of Skövde, Sweden.

Sven Packmohr, PhD student at Osnabrück University, Germany, is a visiting researcher at KTH Media.

Professors
Nils Enlund, professor
Roger Wallis, visiting professor
Marko Turpeinen, professor (from Fall 2006)

Other research personnel includes
3 associate professors, 2 researchers and about 5 PhD students
INTRODUCTION

The Department of Speech, Music and Hearing, has been a prominent international centre of research in speech communication and music acoustics for more than 30 years. Since 2005, the department also includes the KTH Unit for Language and Communication, which is responsible for all language courses at KTH.

SPEECH AND HEARING GROUP

The research within the Speech and Hearing group, headed by Prof. Björn Granström and Prof. Rolf Carlson, covers basic research in speech analysis, synthesis and recognition, and in language technology areas such as multimodal spoken dialogue systems and communication aids for persons with disabilities. The aim is to understand spoken human-human interaction and how this knowledge can be used in human-machine interaction. Work on multimodal dialogue systems combines research in speech technology with linguistics, phonetics, cognitive science, psychology, and computer science. The group is engaged in numerous EU projects, and represents KTH on the boards of the International Speech Communication Association (ISCA) and the European Language and Speech Network (ELSNET). The department is active in organizing conferences, summer schools and workshops. The Centre for Speech Technology (CTT) at the department is a platform for co-operation between industry and academy within the strategic area of speech technology. Generously supported by VINNOVA and participating companies and organisations for ten years, CTT now continues with project funding in cooperation with its partners.

RESEARCH AREAS

Methods for automatic speech understanding:

A major goal is the development of state-of-the-art automatic speech recognition for Swedish, e.g. to be used for speaker-independent recognition of large vocabularies. Another objective is the development of robust, adaptive speech recognition, applicable also in noisy environments.

Principles of speaker characterisation:

This research direction includes the creation of models of speakers for use in systems for speaker verification, speech recognition with rapid speaker adaptation and individualized speech synthesis. It also includes the development of methods for fast speaker adaptation and utilisation of speaker coherence.

Speech production for multi-modal speech synthesis:

This field concerns the development of articulatorily motivated, highly natural multi-modal parametric synthesis for different voices, speaking styles and also the synthesis of non-verbal expressions. Included is a complete 3-D model of a face and speech organs that generate articulatory synthesis for use in ECAs, embodied conversational agents. This includes the modelling of non-articulatory facial gestures typical for interactive speech.

Language technology in interactive dialogue systems:

The research in this area concerns integrating speech technology in advanced interactive demonstrators and building multimodal conversational dialogue systems. This research deals with the creation of speech technology-motivated language and dialogue models for Swedish. It also includes the development and testing of data-driven solutions suitable for speech technology applications together with studies of robust linguistic analysis for spoken language, optimized for dialogue systems.

Creation of an infrastructure for speech technology development:

An important part of the activities is the creation of language resources, including tools, lexica, and speech and language databases.

Specific applications in speech and hearing:

The research aimed at aids for people with disabilities has a strong tradition in the group. Many speech based applications get their first use by this specific group of users. Another area is the development of new multimodal methods for second language acquisition utilizing speech technology.

HIGHLIGHTS

Ten leading international and Swedish speech researchers presented papers at Research challenges in speech technology - an international seminar celebrating the 60th birthdays of Rolf Carlson and Björn Granström, honouring their exceptional contributions and life-long commitment to the field of spoken language research and speech technology. The founder of the department, Gunnar Fant, became honorary doctor at the Trinity College in Dublin, for his long-time research in the field of speech communication. Jonas Beskow received the Chester Carlson Award for prominent research work in the IT field. His innovation enables the hearing impaired to have normal telephone conversations, by using the received speech signal to create a real-time visual animation of the speaker’s face and lip movements. Motivation: “For the outstanding achievement of giving the voice a face to improve communication between people and computers, for example in a dialogue system and between people, particularly the hearing-impaired and in noisy environ-
ments.” The start up companies SynFace and Veridict originating from the department were two of the ten winners in the VINN NU competition 2006. Also a Veridict proposal achieved the first prize in the competition Venture Cup Ost, 2006. Veridict presented a solution for speech recognition in very noisy environments. The focus for the technique is the application in heavy industry and emergency environments, for example major fires. Also, the EU project SYNFACE, coordinated by KTH, was prominently exhibited by invitation during the high-profile conference “ICT for an Inclusive Society” in Riga 2006, where a large number of Ministers of European countries adopted a Declaration on eInclusion, to provide political guidance for future action. At the IST event in Helsinki, the CHIL project, in which KTH is participating, was the winner of the IST 2006 Exhibit prize.

Projects

Currently the Speech and Hearing group is engaged in six EU projects, eight national projects and one international, industrial co-operation. These are listed on our web portal. A list of completed EU projects can be found in our 10 year report (http://www.speech.kth.se/ctt/publications/CTT_10_year_final_report.pdf).

Music Acoustics Group

The Music Acoustics group, headed by Prof. Sten Ternström, has three main research streams: the science of music performance, instrument acoustics, and technical vocology with musical and medical applications. There are five senior researchers, plus the famous emeriti Johan Sundberg and Erik Jansson. The group currently teaches six undergraduate courses, has five graduate students, and supervises numerous undergraduate final-year engineering projects. The Music Acoustics group is also proud to host the Director Musices of KTH, maestro Gunnar Julin, who directs the KTH orchestra, organises concerts and ceremonial music, and promotes musical activities at this technical university as a whole.

Research Areas

The group has a deeply rooted experimental approach, often using the paradigm of analysis-by-synthesis as applied to instrumental performance and the human voice. Emerging new interests include the modelling of sounds from everyday objects, the study of how emotions are encoded into sounds and gestures, and topics in electroacoustics such as spatial sound field reproduction. The group’s international collaborations span across motion analysis of disk-jockeys who do ‘scratching’, computer support in the teaching of music and of acoustics, making machines that can detect and communicate moods in music, systems that synthesise song, and many more. For the health care sector, the group studies the human voice and the objective assessment of voice function, both in everyday speech and in elite performers. Over the period 2005-2007, the group has participated in over a dozen EU and national projects. Current and recent projects in the Music Acoustics group are listed at http://www.speech.kth.se/music/music_research_topics.html

Highlights

In the period 2005-2007, Dr. Roberto Bresin represented KTH in the creation of a trans-European research roadmap for Sound and Music Computing (SMC). This roadmap is likely to shape coming FP7 calls for proposals on SMC from the European Commission. In this connection we also hosted the third SMC European summer school at KTH. The KTH campus was joined by the University College of Opera and the University College of Dance, providing new fertile grounds for the scientific study of the performing arts. In March 2006, Johan Sundberg’s 70th birthday was celebrated with a unique full evening concert, splendidly performed by colleagues who have co-authored scientific papers with him over the years. The near future includes an increasing involvement in issues of mobile music and sonic design, an extension of the group’s Sound and Music Computing facilities, and a continuing enhancement of the undergraduate course portfolio.

Violinist movements, studied in a collaboration with McGill University, Canada.

CSC Doctoral Theses

• Sofia Dahl • Rebecca Hincks • Anne-Marie Öster
• Giampiero Salvi • Eva Björkner • Per-Anders Jande
• Håkan Melin • Loredana Sundberg Cerrato

CSC Licentiate Thesis

• Gunilla Svanfeldt

Professors

Björn Granström, Speech Communication
Rolf Carlsson, Speech Technology
David House, Acoustic Phonetics (from 2007)
Sten Ternström, Music Acoustics

Other research personnel includes

4 associate professor, 2 assistant professors,
9 researchers and about 15 PhD students
EU- Projects

**Media Technology and Graphic Arts**

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**Theoretical Computer Science**

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**Computational Vision and Active Perception Laboratory, Centre for Autonomous Systems**

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**Computational Biology**

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**Human-Computer Interaction**

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**Centre for Parallel Computers**

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**Speech, Music and Hearing**

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<td>CHIL</td>
<td>04-01-01 07-08-31</td>
<td>Rolf Carlson</td>
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<td>Anders Askenfelt</td>
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<td>BRAIN TUNING</td>
<td>06-08-01 09-07-31</td>
<td>Björn Granström</td>
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<td>Mon AMI</td>
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<td>HaH</td>
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<td>MUSCLE</td>
<td>06-12-01 08-02-28</td>
<td>Björn Granström</td>
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Commercialization

During 2006 the School had a number of commercialization achievements which we would like to present. One result of our ten-year commitment to the Parallel and Scientific Computing Institute is the incorporation of Efield (www.efield.se), a spin-off business producing software originally developed at KTH in cooperation with Saab and Ericsson.

Two other spin-off businesses are Synface and Veridict, which have been awarded support from the Swedish Energy Authority initiative VINN-Nu, a competition for start-up companies which base their activities on research and development. The focus of Synface, www.synface.com, is the need for people with impaired hearing to be able to lip-read while speaking on the phone. Other targeted areas are lip-reading support for audio broadcasts (TV, radio, and web), public information systems and applications for the education and entertainment areas. In Veridict, Alexander Seward and Kåre Sjölander has developed technology for a voice interface for noisy environments. Both companies are based on the results of many years of research in the Department of Speech, Music, and Hearing.

By employing a special setup consisting of four video cameras that together cover a wide area, researchers at CVAP has built a panoramic video that can be used to depict e.g. the complete pitch in a football game. This device has been commercialized in a special start up company (CogEye AB) founded by Eric Hayman, Stefan Carlsson and Josephine Sullivan. Together with software for cutting out standard format video this is now offered to TV companies as a tool for extracting highlights in sports events.
Research and Competence Centers

**SUS – CENTRE FOR SUSTAINABLE COMMUNICATIONS, 2007–**

Head: Charlie Gullström  
www.csc.kth.se/sustain/

The Centre for Sustainable Communications, SUS, is one of 15 “VINNOVA Centres of Excellence” to be established within Sweden during 2007 with joint long-term financing by industry, society, academia and VINNOVA. The Centre of Excellence programme is characterised by multidisciplinary research in close partnership between industry, society and academia in the pursuit of innovative solutions to major problems.

SUS will develop innovative applications of media and communications technologies that can contribute, directly or indirectly, to sustainable development by enabling collaboration, interaction and communication exchange between people in different locations. Furthermore, the Centre will develop innovative user-oriented services, products, environments, business models, methods and tools.

The Centre hosted by CSC is a joint collaboration with the School of Architecture and the Built Environment, ABE. To perform interdisciplinary research and innovation, SUS will promote knowledge exchange related to media technology, telecommunications, information technology, transport systems, sustainability assessment, social and cultural sciences, architecture, design and planning.

Partners include Bonnier AB, Boverket (The National Board of Housing, Building and Planning), Ericsson, Joltid AB, TeliaSonera, Tidningsutgivarna (Swedish Newspapers Publishers’ Association), Stiftelsen Folkets Hubb (Community Hub Foundation), Sting (Stockholm Innovation and Growth), VTI (Swedish National Road and Transport Research Institute).

**SBI – STOCKHOLM BRAIN INSTITUTE, 2007–**

Head: Hans Forsberg  
http://www.stockholmbrain.se/

Stockholm Brain Institute, SBI, is a consortium for Cognitive and Computational Neuroscience, joining three leading Swedish Universities; Karolinska Institutet (host), Royal Institute of Technology and Stockholm University, in the endeavour to enhance the understanding of higher brain functions. It is a Strategic Research Center of SSF and a Berzelius Center of Swedish Science Council and Vinnova.

The objective for SBI is to apply a systems neurobiology approach to higher brain functions; from genes, cells and neural networks to cognitive functions and behaviour. This comprehensive approach requires a broad set of skills extending from neurobiology and neuroimaging to psychology and clinical epidemiology.

To achieve a coherent understanding, in which numerous factors vary independently, mathematical modelling provides a necessary tool. The CBN group at CSC hosts the computational and modeling platform of SBI.

The gathering of 10 high-level research groups from three universities, representing key scientific areas from life and medical sciences, behavioural sciences and technical sciences, has been tailored to meet the important challenge to study higher brain functions. SBI collaborates with industrial partners from the biomedical and biotechnology industry, for instance IBM and AstraZeneca.

**CAS – CENTER FOR AUTONOMOUS SYSTEMS, 1996–**

Head: Henrik Christensen  
http://www.nada.kth.se/cas/

Center for Autonomous Systems, CAS, is an interdisciplinary research center that performs research on autonomous systems. Autonomy here refers to systems that can perform user defined tasks in situations and environments that may not be fully controlled. The systems can hence act autonomously for longer or shorter periods of time. The introduction of autonomy into technical systems has a great potential in terms of providing added robustness, simplified usage and flexibility.

At CAS autonomy is considered in the context of complex technical systems, service robots and intelligent environments. Examples include mobile robots for domestic and field applications, multi-agent systems, active vision systems for environment modeling and recognition, object manipulation, grasping systems based on multiple sensors and different types of learning systems.
CAS is composed of four research groups from computer science, electrical engineering, applied mathematics and mechatronics. Thus, CAS integrates methods from mechanical engineering, control and estimation, mathematical modeling, computer perception and computer science in a holistic approach to systems engineering for autonomous systems.

Current themes for the research are cognitive systems, systems integration and the development of fully operational systems for realistic applications. In addition to basic research and systems integration the effort also involves close collaboration with industrial partners. The center was inaugurated August 1, 1996.

Head: Björn Engqvist
http://www.psci.kth.se/
Parallel and Scientific Computing Institute, PSCI, was created to improve the interaction between academia and industry and strengthen Swedish efforts in industrial applications of high performance computing. Typical projects in the PSCI research program are joint undertakings where application experts from the industrial partners, graduate students, post docs and senior scientists contribute. The criteria for a project include motivation by industrial needs, and theoretical development suitable for PhD thesis work. PSCI closed summer 2005, part of the research continuing within NA group and CIAM.

CID — Center for User Oriented IT Design, 1995–2005
Head: Yngve Sundblad
http://cid.nada.kth.se/
CID started in 1995 with NUTEK/VINNOVA support as a competence centre focused on interdisciplinary research and development in user-oriented IT design. It closed in the summer of 2005. Many of the activities continue within the HCI group, see page 28-29. The activities were conducted in close cooperation with industrial, governmental and user-group partners, about 40 over the ten years. The main research areas, User-oriented Design, Connected Communities, Forms of Interaction and Learning Environments, all deal with how to make interaction between people and computers, and between people via computers, broadly useful and powerful. A central methodology is to involve end users and other stakeholders in all development phases, from initial design ideas to the evaluation of the resulting systems in use. Examples are the Video Spaces projects for remote communication between working groups via video and Internet, where such diverse uses as between research groups, police call centre groups, school children and air passengers, and teachers, have been developed and studied, in cooperation with Ericsson, Vattenfall, Rågsvedskolan, Police authorities in Stockholm county, and small schools in Stockholm archipelago. Another example is the UsersAward activities for certification of IT systems on the floor at workplaces, conducted in close cooperation with trade union organisations. Further examples are the EU projects eRENA, KidStory, Shape and interLiving, with artists, elementary school children/teachers, museum visitors and intergenerational families.

Head: Björn Granström
http://www.speech.kth.se/ctt/
Center for Speech Technology, CTT, is a platform for cooperation between Swedish companies, non-commercial organizations and academic research within the strategically important area of speech technology. The vision which CTT strives to attain is the speech-based device with which the user can discuss and solve concrete problems by means of spoken dialogue. One of the center’s concrete goals is to develop, test and experiment system prototypes for dialogue and database management using spoken interaction. It has been generously supported by VINNOVA and participating companies and organisations for ten years, and is continuing financed mainly by project funding, many projects performed in cooperation with CTT partners.
Other Hosted Centers at CSC

PDC – The Center for Parallel Computers
Head: Lennart Johnsson
http://www.pdc.kth.se/

The Center for Parallel Computers carries out leading-edge research and development in software for computing, storage and collaboration in integrated distributed environments. PDC also operates leading-edge, high-performance computers on behalf of SNIC for the Swedish academic community and for local research groups having their own computing and storage resources but in need of an infrastructure for communication, storage, cooling and power, and systems administration support.

PDC also serves as the Swedish National Infrastructure for Computing’s (SNIC) main resource center for the Swedish academic community. PDC also operates systems for research groups having substantial computing resources of their own, and provides remote storage services to non-local research projects. Examples of local groups serviced in some way by PDC are the Stockholm Bioinformatics Center (SBC), the Stockholm Brain Institute (SBI), the theoretical chemistry groups of Hans Agren and Per Siegbahn and the Human Proteome Project (HPR). PDC operates over 1,000 nodes with a peak capacity of about 9 TF with about half of the nodes and the capacity belonging to the local research groups. PDC also operates a mass storage systems with a capacity of about 400 TB. PDC is co-located with the KTH Network Operations Center, KTHNOC.
KTHNoc - KTH Network Operation Center
Head: Peter Graham

KTHNoc is responsible for network operation, education, and research related to Internet Technologies. Network operation includes running the central nodes for the Swedish University Network, SUNET, and the Nordic University Network, NORDUnet since 1988. Education includes development and offering Internet routing courses. Research activities focus on routing protocols, techniques for blocking child pornography sites, end-to-end quality measurements and open source routers.

KTHNoc also operates a Local Internet Registry towards RIPE.

A Juniper routing course for network engineers from Swedish Universities in preparation for OptoSunet, Oct 2006

Computing Facilities

Systemgruppen
Head: Johan Berglund

Our mission
The mission of the systems staff, systemgruppen, is to provide students, faculty, and administrative staff with a work environment that is well matched to their computing requirements, tastes and habits. We are firmly convinced that a choice of computer platforms, rigorous and transparent security measures, and freedom from routine maintenance, best supports user creativity and productivity. It follows that the long-standing mission motto continues to be diversity and integration.

Computer systems
Leveraging the AFS distributed file system and Kerberos based authentication, we provide an integrated computing environment featuring Solaris 10, Windows XP, Mac OS X 10.4 and Red Hat Enterprise Linux 4. The system hosts about 900 computers, 100 network devices and 8000 user accounts, with services available in offices and computer labs, as well as remotely over the Internet. Numerous services are delivered by high performance LAN with gigabit ethernet to offices and computer rooms.

Current activities
The recent KTH reorganization into schools has required major changes, prompting the integration of the department of Speech, Music and Hearing (TMH) and the unit for Language and Communication into the CSC IT environment. A unified web site for the new organization has been designed and brought on line.

The network is evolving and diversifying: The population of identical and easily managed lab computers (one computer - many students) declines, while the number of faculty computers is growing. The faculty users and their tailored computer setups generate ever more complex support requests at a time of ever-increasing security pressure on systems and applications.

To allow for this increased flexibility, while maintaining a secure managed environment with low maintenance cost, new management procedures and security policies are carefully developed and deployed.

An expected development is the growing number of laptop users, with very different usage patterns compared to the desktop users. The laptop users prefer wireless networking and keep all files locally in order to get rapid and convenient access anywhere. Their storage needs are high and includes the use of laptops for e.g. music and photo collections. This has prompted installation of new LTO3 backup media to accommodate larger backup volumes.

Thoughts for the future
KTH strives to provide better integration, shorter time-to-market for new IT solutions, and stronger support for users that roam between different roles and workplaces. Together with colleagues at other schools we are opening the computer labs all over campus to students from all educational programs and courses.

A continuous process of evaluating goals and means for the IT environment is the key to meet the present and future needs of CSC faculty and students.
This first Bi-annual Report for CSC shows the figures for the year 2006. It has in general been only minor changes from 2005.

The total income amounts to 259 MSEK where one third relates to undergraduate education. The main sources are government grants, totaling 150 MSEK (57,8%) and external financing 100 MSEK (38,6%). The major external funding bodies are the Swedish research councils (27,3%) and the EU (26,9%). External research financing amounts to 67 MSEK in seven departments and PDC. In addition to this CSC has received external funds for operating costs for PDC and KTH-Noc, 26 MSEK. CSC has also received 6 MSEK from the Stockholm University for undergraduate and postgraduate education.

Staff is the major cost, 59,7% of total costs 265 MSEK, followed by KTH overhead 14,7% and costs for premises 12,3%.

### Sources of Income

- **Government grants for undergraduate education**: 86 151 kSEK (33,3%)
- **Government grants for research and postgraduate studies**: 63 402 kSEK (24,5%)
- **External financing**: 99 858 kSEK (38,6%)
- **Other**: 9 373 kSEK (3,6%)
- **Tot:** 258 783 kSEK (100,0%)

### External Financing

- **Swedish Research Councils**: 27 282 kSEK (8,1%)
- **EU**: 26 861 kSEK (26,9%)
- **Other Swedish Universities**: 16 818 kSEK (16,8%)
- **Strategic Foundations**: 11 549 kSEK (11,6%)
- **Other Government Agencies**: 11 082 kSEK (11,1%)
- **Other**: 6 266 kSEK (6,3%)
- **Tot:** 99 858 kSEK (100,0%)

### External Research Financing by Department

- **TCS**: 5 454 kSEK (8,1%)
- **CVAP**: 14 734 kSEK (21,8%)
- **CB**: 4 781 kSEK (7,1%)
- **NA**: 6 901 kSEK (10,2%)
- **PDC**: 6 113 kSEK (9,1%)
- **Media**: 3 460 kSEK (5,1%)
- **TMH**: 12 592 kSEK (18,7%)
- **HCI**: 13 412 kSEK (19,9%)
- **Tot:** 67 448 kSEK (100,0%)

### Costs

- **Staff**: 158 381 kSEK (59,7%)
- **Premises**: 32 626 kSEK (12,3%)
- **KTH overhead**: 39 108 kSEK (14,7%)
- **Other operating costs**: 23 156 kSEK (8,7%)
- **Depreciation Equipment**: 12 153 kSEK (4,6%)
- **Tot:** 265 425 kSEK (100,0%)
Historical Highlights

NADA

1962 Departement of Numerical Analysis, offshoot of Applied Mathematics.


Personnel: 6 staff members.

1979 Change of name: Numerical Analysis and Computing Science, NADA.

A four year master program in Mathematics and Computer Science starts at Stockholm University.

1982 Professor in Computer Science: Stefan Arnborg.

1983 A four year Program in Computer Science and Engineering (D) starts KTH.

Personnel: around 40 staff members.

1986 Professor in Computer Science - Computer Vision: Jan-Olof Eklundh.

1990 Professor Dahlquist retires. New Professor in Numerical Analysis: Björn Engquist

1992 Johan Hästad receives a personal chair in Theoretical Computer Science. KTHNOC transfers to NADA.

1993 Center for Parallel Computers (PDC) associated with NADA.

1995 Two Nutek Competence Centre starts: Centre for User oriented IT Design (CID) and Parallel and Scientific Computing Institute

1996 The SSF financed Centre for Autonomous Systems (CAS) hosted by NADA starts.

1997 Professor in Human-Computer Interaction: Kerstin Severinson-Eklundh.

1.5 year Master Program in Scientific Computing starts.

Personnel: around 160 staff members.


Human-Computer Interaction is established as an academic discipline.

The VR-CUBE is built and is the first of its kind in the world

2000 The department of Media Technology and Graphic Arts moves to NADA. Chair Professor: Nils Enlund.

Personnel: around 280 staff members.

Professor in Applied Numerical Analysis: Lennart Johnsson.

2002 Professor in Computer Science - Applied Science - at SU: Anders Lansner

Speech, Music and Hearing

1966 Professor in Speech Communication: Gunnar Fant

Founding members Johan Sundberg and Erik Jansson meet in the Speech Transmission Laboratory at KTH.

1979 Johan Sundberg receives a personal chair in Music Acoustics.

1983 The international Stockholm Music Acoustics Conference (SMAC) is created and hosted for the first time.

1987 Professor Gunnar Fant becomes emeritus. New professor in Speech Communication: Björn Granström

1993 The second SMAC takes place, to great fanfare. It is envisaged that SMAC will be repeated every ten (!) years.

1996 Professor in Speech Technology: Rolf Carlsson The Nutek Competence Centre for Speech Technology (CTT) starts.

1998 The KTH Voice Research Centre is formed, celebrated by four days of public international seminars.

2000 The group receives EU status as Marie Curie Training Site for graduate students, for four years.

2001 The Music Acoustics Group hosts the Pan-European Voice Conference PEVOC IV with some 300 participants. Johan Sundberg becomes emeritus.

2003 Sten Ternström is promoted professor in Music Acoustics.
KTH CSC Bi-annual Report 05/06 – 06/07 | 41

Media Technology and Graphic Arts

1985 A specialization program in Graphic Arts Technology with 16 students is established at the department of Production systems.

Nils Enlund is appointed professor of text and image processing on 20% of full time.

1991 The chair in text and image processing is made into a full time position. Nils Enlund resigns and Simo Karttunen is appointed professor.

1994 Simo Karttunen resigns. Nils Enlund returns as full time professor in Graphic Arts Technology.

Media Technology and Graphic Arts is established as an academic discipline.

1998 A specialization program in Business Development and Media Technology is established jointly with the Stockholm School of Economics.

1999 A 4.5 year integrated Master of Science program in Media Technology is established.

2000 A three year Bachelor of Science program in Media Technology is established in Haninge.

2000 The department of Media Technology becomes a research group within NADA.

2002 The Bachelor of Science program in Media Technology moves from Haninge to Stockholm.
The CSC Organization

As part of KTH’s organization, the school should have a clear organization and decision-making structure based on trusting coworkers and characterized by decentralization and delegation of decision-making. The organization is designed to contribute to the creation of: conditions for meeting future demands for rapid changes, for example new programs; attractive educational environments for students; attractive research environments; attractive working environment for employees; equality between women and men; high quality and effective use of resources in all areas of operations; good development opportunities for coworkers; good conditions for creative work and renewal; good possibilities for dialogue and collaboration between all units within the university and with external interests; good conditions for follow-up, evaluation and re-evaluation of priorities; sensitivity, flexibility and a well-developed climate for collaboration; clear distribution of responsibility within KTH; and finally uniform handling of different matters within KTH.

Board of Directors, Management, Dean, Pro-Dean, and Committees

The school operates undergraduate education, graduate education, research and development. The school is led by a Dean who reports directly to the President of KTH. The Dean is responsible for all activities at the school. Among the Dean’s duties are: to see that all activities are directed toward qualitative and other goals, and within the limits given for the school, paying special concern to the school’s finances; to actively pursue the creation of a creative and positive educational, research and working environment; and to conduct his or her leadership in observation of what is said about freedom of research in the Higher Education Act. As deputy for the Dean there is a Pro-Dean. Each school has a Board and a management group.

The Board of Directors

The Board of Directors for the school decides on the following matters: important matters concerning the school’s organization, development and operative plans, annual reports and accounts; higher-level questions concerning education; other matters of importance for the school judged by the Dean to be decided by the board.

Management group

The school has a management group. Before each important decision the Dean obtains management’s opinion in meetings. Management consists of the Dean, the Pro-Dean, those in charge of undergraduate and graduate education, department heads, and representatives from technical and administrative (finance and personnel) staff as well as one undergraduate student and one graduate student appointed by the student union.

Departments and Centers

The activities are run within departments or centers. These are led by appointed heads according to decisions made by the Dean, where tasks and delegation are specified through specific decisions. Establishment of centers, consortia and similar bodies connected to KTH are up to the school’s board to set up after consultations with the president. For each established center at the school there is to be a board with responsibility for activities, budget and accounts according to general administrative guidelines for centers at KTH.
**Reference Groups**

The board of school has appointed four reference groups to support the board and the Dean with proposals for development and improvement.

**JML - Equal opportunity, diversity and equal treatment**

CSC and NADA have for many years and in a variety of ways worked actively with equality issues, in order to maintain good competence. In order to further strengthen the work at the school, the board has appointed a reference group whose task is to produce a proposal for a policy regarding equal opportunity, diversity and equal treatment. The JML group works continuously with these questions, proposes activities and monitors reports. It includes representatives of students, graduate students, faculty and administrative staff.

**Working environment**

An important prerequisite for success is a good working environment where students and staff can develop and be satisfied. CSC and NADA have for many years and in a variety of ways worked actively with questions concerning the working environment in order to maintain high standard. In order to further strengthen that work, the board has appointed a reference group whose task is to produce a proposal for a working environment policy to propose measures to improve the students’ and staff’s working environment. The reference group includes representatives of students, graduate students, faculty and administrative staff.

**Pagod - Planning group for computer matters**

Pagod’s task is to plan for CSC’s computers, systems, networks and study environments. The group has representatives of faculty and system groups as well as students and graduate students. The task is to propose overall guidelines and directives to management and system group. This includes questions such as long-term development, requirements for functions within computer operations, service and user support, prioritization of investments.

**AHA - Administration, processing and assistance**

The AHA group identifies rules and routines that can be made more efficient to reduce frustration at unnecessary bureaucracy and to achieve a more effective and streamlined administration. It includes representatives of students, graduate students, and faculty in different leading roles.

**Administration and service shared by the school**

The Dean is responsible for the school’s administrative resources and its development as well as ensuring quality and efficiency in administrative work. At the Dean’s disposal the four reference groups develop and make the school’s support systems more efficient.

**Office of Education**

At the school there is an office of education to handle general questions associated to the school’s educational programs, from the recruitment of students to graduation, via student advising and following up of study results as well as the school’s internationalization. The dean has appointed a head of office to lead and be responsible for the office of education.

**Student office**

The school has a student office to support students and teachers in general questions concerning the school’s course offerings, from sales of course material and matters concerning examination to reporting of study results. The head director of studies is responsible for the student office.

**The system group and Delfi**

The school has a system group with responsibility for computer investments, computer support to students and staff, computer systems, software and computer rooms. There is a reception, Delfi, where students and staff can obtain daily help in computer-related questions and apply for access to the system. The Dean appoints a head for the system group to lead and be responsible for activities.
2005

Joakim Möller, Numerical Analysis, NA, KTH. Aspects of the Recursive Projection Method Applied to Flow Calculation

Martin Eriksson, Computer Science, CAS/CVAP, KTH. Video Based Analysis and Visualization of Human Action

Inger Stjernqvist, Media Technology and Graphic Arts, Media, KTH. Interaktiva medier i komplex/ Försäljning

Reynir Gudmundsson, Numerical Analysis, NA, KTH. A numerical study of the two-fluid models for dispersed two-phase flow

Stefan Hagdahl, Numerical Analysis, NA, SU. Hybrid Methods for Computational Electromagnetics in Frequency Domain

Johnny Bigert, Computer Science, TCS, KTH. Automatic and Unsupervised Methods in Natural Language Processing

Gustav Taxén, Human-Computer Interaction, MDI, KTH. Participatory Design in Museums

Gustav Hast, Computer Science, TCS, KTH. Beating a Random Assignment

Pål Westermark, Computer Science, SANS, KTH. Models of the Metabolism of the Pancreatic Beta-cell

Henrik Olsson, Numerical Analysis, NA, KTH. Model Order Reduction with Rational Krylov Methods

Sofia Dahl, Speech and Music Communication, TMH, KTH. On the beat: Human Movement and timing in production and perception of music

John Folkesson, Computer Science, CAS/CVAP, KTH. Simultaneous Localisation and Mapping with Robots

Ola Knutsson, Human-Computer Interaction, MIDI, KTH. Developing and evaluating language tools for writers and learners of Swedish

Daniel Appelö, Numerical Analysis, NA, KTH. Absorbing Layers and Non-Reflecting Boundary Conditions for Wave Propagation Problems

Maria Normark, Human-Computer Interaction, MIDI, KTH. Work and technology use in centers of coordination-reflections on the relationship between situated practice and artifact design

Rebecca Hincks, Speech and Music Communication, TMH, KTH. Computer Support for Learners of Spoken English

Carl-Magnus Fahlcrantz, Computer Science, CAS/CVAP, KTH. On the Evaluation of Print Mottle

Mats B. Andersson, Media Technology and Graphic Arts, Media, KTH. Allestädes närvarande kunskap – om Webbplatser som informativt stöd

Douglas Wikström, Computer Science, TCS, KTH. On the Security of Mix-Nets and Hierarchical Group Signatures

2006

Klas Wallenius, Computer Science, TCS, KTH. Generic Support for Decision-Making in Effects-Based Management of Operations

Sandy Sefi, Numerical Analysis, NA, KTH. Computational Electromagnetics: Software Development and High Frequency

Asta Cepaite, Media Technology and Graphic Arts, Media, KTH. Medieval hos informations- Producere och konsumenter

Jin Moen, Human-Computer Interaction, MDI, KTH. KinAesthetic Movement Interaction-Designing for the Pleasure of Motion

Andreas Atle, Numerical Analysis, NA, SU. Approximations of Integral Equations For Wave Scattering

Ronnie Johansson, Computer Science, CAS/CVAP, KTH. Large-Scale Information Acquisition for Data and Information Fusion

Christer Johansson, Numerical Analysis, NA, SU. Numerical Methods for Waveguide Modeling

Jonas Sjöbergh, Computer Science, TCS, KTH. Language Technology for the Lazy – Avoiding Work by Using Statistics and Machine Learning

Joel Brynielsson, Computer Science, TCS, KTH. A Gaming Perspective on Command and Control

Anne-Marie Öster, Speech and Music Communication, TMH, KTH. Computer-based speech therapy using visual feedback with focus on children with profound hearing impairments

Giampiero Salvi, Speech and Music Communication, TMH, KTH. Mining Speech Sounds, Machine Learning Methods for Automatic Speech Recognition and Analysis

Christopher Johansson, Computer Science, SANS, KTH. An Attractor Memory Model of Neocortex

Martin Rehn, Computer Science, SANS, KTH. Aspects of memory and representation in cortical computation
Maria Enroth, Media Technology and Graphic Arts, Media, KTH. Developing tools for sustainability Management in the graphic arts industry

Eva Björkner, Speech and Music Communication, TMH, KTH. Why so different? - Aspects of voice characteristics in operatic and musical theatre singing

Robert Suzic, Computer Science, TCS, KTH. Stochastic Multi-Agent Plan Recognition, Knowledge Representation and Simulations for Efficient Decision Making

Per-Anders Jande, Speech and Music Communication, TMH, KTH. Modelling Phone-Level Pronunciation in Discourse Context

Mårten Trolin, Computer Science, TCS, KTH. Electronic Cash and Hierarchical Group Signatures

Håkan Melin, Speech and Music Communication, TMH, KTH. Automatic speaker verification On site and by telephone: Methods, applications and assessment

2007

Isaac Elias, Computer Science, SANS, KTH. Computational Problems in Evolution Multiple Alignment, Genome Rearrangements, and Tree Reconstruction

Minna Räsänen, Human-Computer Interaction, MDI, KTH. Islands of Togetherness: Rewriting Context Analysis

Helge Hüttenrauch, Human-Computer Interaction, MDI, KTH. From HCI to HRI: designing Interaction for a Service Robot

Staffan Ekvall, Computer Science, CAS/CVAP, KTH. Robot Task Learning from Human Demonstration

Loredana Sundberg Cerrato, Speech and Music Communication, TMH, KTH. Investigating Communicative Feedback Phenomena across Languages and Modalities

Per-Olov Åsén, Numerical Analysis, NA, KTH. Stability of Plane Couette Flow and Pipe Poiseuille Flow

Sanjay Nagaraj, Media Technology and Graphic Arts, Media, KTH. The impact of consumer knowledge, information mode, and presentation form on advertising effects

Anders Bjurstedt, Media Technology and Graphic Arts, Media, KTH. Gravure vs. web-offset! The changing world of publication printing 1986-2006

Martin Hassel, Human-Computer Interaction, MDI, KTH. Resource lean and portable automatic text summarization

Mikael Huss, Computer Science, SANS, KTH. Computational modeling of the lamprey CPG – from subcellular to network level

Mika Cohen, Computer Science, TCS, KTH. Logics of Knowledge and Cryptography: Completeness and Expressiveness
**Licentiate Theses 05-06/06-07**

**2005**

Rafael Pass, Computer Science, TCS, KTH. Alternative Variants of Zero-Knowledge Proofs


Erik Markensten, Human-Computer Interaction, MDI, KTH. Mind the Gap

Mikael Huss, Computer Science, SANS, KTH. Computational models of lamprey locomotor network neurons

Mårten Trolin, Computer Science, TCS, KTH. Two Topics in Cryptography Lattice Problems and The Security of Protocols

Fredrik Furesjö, Computer Science, CAS/CVAP, KTH. Multiple Cue Object Recognition

Martin Rehn, Computer Science, SANS, KTH. Some computational aspects of attractor memory

Robert Suzic, Computer Science, TCS, KTH. Knowledge Representation and Stochastic Multi-Agent Plan Recognition

Johan Glimming, Computer Science, TCS, SU. Dialgebraic Semantics of Typed Object Calculi

Ester Appelgren, Speech and Music Communication, TMH, KTH. The influence of media convergence on strategies in newspaper production

Magnus Rosell, Computer Science, TCS, KTH. Clustering in Swedish-The impact of some Properties of the Swedish Language on Document Clustering and an Evaluation Method

Anna Svantesson, Computer Science, SANS, KTH. Mathematical Modelling and Analysis of the Pyrosequencing Reaction System

Anders Bjurstedt, Media Technology and Graphic Arts, Media, KTH. The European publication printing industry – an industry of profound changes

**2006**

Elin Olsson, Numerical Analysis, NA, KTH. Mass Conserving Simulations of Two Phase Flow

Alexei Loubenets, Numerical Analysis, NA, KTH. A New Finite Element Method for Elliptic Interface Problems

Anna Palbom, Computer Science, TCS, KTH. On Approximating Asymmetric TSP and Related Problems

Irem Aktug, Computer Science, TCS, KTH. State Space Representation for Verification

Ulf Blomqvist, Media Technology and Graphic Arts, Media, KTH. Mediated peer (to peer) learning

Johannes Hjorth, Computer Science, SANS, KTH. Information Processing in the Striatum – A Computational Study

Jesper Carlsson, Numerical Analysis, NA, KTH. Pontryagin Approximations for Optimal Design

Elin Anna Topp, Computer Science, CAS/CVAP, KTH. Initial Steps Towards Human Augmented Mapping

Mohammad Motamed, Numerical Analysis, NA, KTH. Phase Space Methods for Computing Creeping Rays

Magnus Strömgren, Numerical Analysis, NA, KTH. Some PDAE Aspects of the Numerical Simulation of a CO2 Heat Pump

Thomas Meijtoft, Media Technology and Graphic Arts, Media, KTH. Strategies in the digital printing value system

Emmi Enoksson, Media Technology and Graphic Arts, Media, KTH. Studies on image control for better reproduction in offset

Gunilla Svanfeldt, Speech and Music Communication, TMH, KTH. Expressiveness in virtual talking faces

**2007**

Malin Carlzon, Computer Science, KTHNOC, KTH. Improving BGP convergence Properties and web content Blocking using BGP

Daniel Aarno, Computer Science, CAS/CVAP, KTH. Intention Recognition in Human Machine Collaborative Systems

Thomas Sandholm, Computer Science, PDC, KTH. Managing Service Levels in Grid Computing Systems – Quota Policy and Computational Market Approaches

Malin Sandström, Computer Science, SANS, KTH. Early Information Processing in the Vertebrate Olfactory System – A Computational Study
List of Shortenings

ABE – School of Architecture and the Built Environment
AHA – Administration, Processing and Assistance group
BESK – The Binary Electronic Sequential Calculator
CAD – Computer Aided Design
CAS – Centre for Autonomous Systems
CB – Computational Biology
CBB – Computational Biology and Bioinformatics
CBN – The Computational Biology and Neurocomputing
CIAM – Strategic Research Center for Industrial and Applied Mathematics
CID – Centre for User Oriented IT Design
CSC – School of Computer Science and Communication
CVAP – Computational Vision and Active Perception Laboratory
ECTS – European Credit Transfer and Accumulation System
ELSNET – The European Language and Speech Network
ETH – Eidgenössische Technische Hochschule, Zurich
EU- European Union
EURON – European Robotics Research Network
GSLT – The National Graduate School of Language Technology
HCI – Human-Computer Interaction
HLT – The Human Language Technology
HMI – Human-Machine Interaction
HMI School – School of Human-Machine Interaction
HPR – Human Proteome Project
ICT – media & communications
INCF – Swedish Neuroinformatics Node of the International Neuroinformatics Coordinating Facilities
IPLAB – Interaction and Presentation Laboratory
ISCA – International Speech Communication Association
IST – Information Society Technologies
JML – Equal Opportunity, Diversity and Equal Treatment group
KCSE – Computational Science and Engineering Centre
KI – Karolinska Institutet
KTH – Royal Institute of Technology
KTHNOC – KTH Network Operations Center
KVA – Royal Swedish Academy of Sciences
MDI – Human-Computer Interaction
MEDIA – Media Technology and Graphic Arts
MTC – Microbiology and Tumor Biology Center
MWM – Media Workflow Management
NA – Numerical Analysis

NADA – Department of Numerical Analysis and Computer Science
NBI – Niels Bohr Institute (Copenhagen)
NORDUnet – the Nordic University Network
NTM – National Network in Applied Mathematics
NUTEK – The Swedish Agency for Economic and Regional Growth
OECD – Organisation for Economic Co-operation and Development
PAGOD – CSC Planning Group for Computer Matters
PDC – Center for Parallel Computers
PSCI – Parallel and Scientific Computing Institute
RIPE – European IP Networks
RNI – Redwood Neuroscience Institute
SANS – Studies of Artificial Neural Systems
SBC – Stockholm Bioinformatics Centre
SBI – Stockholm Brain Institute
SLAM – Simultaneous Localization and Mapping
SMAC – Music Acoustics Conference
SMC – Sound and Music Computing
SSF – Foundation for Strategic Research
STING – Stockholm Innovation and Growth
STINT – Swedish Foundation for International Cooperation in Research and Higher Education
SU – Stockholm University
SUNET – Swedish University Network
SUS – Center for Sustainable Communication
TCS – Theoretical Computer Science
TMH – Speech, Music and Hearing
UU – Uppsala University
UVAS – Uni-Verse Acoustic Simulator
VINNOVA – The Swedish Governmental Agency for Innovation Systems
VR – The Swedish Research Council
VTI – Swedish National Road and Transport Research Institute
WHO – World Health Organization