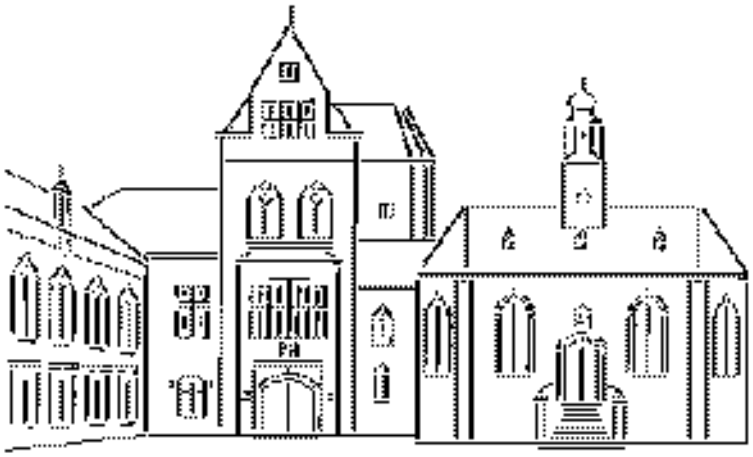
Dagstuhl Seminar on Ubiquitous Computing

September 9-14, 2001

The International Conference and Research Center for Computer Science at Schloss Dagstuhl has a tradition of organizing seminars of high international standard on cutting-edge topics in computer science. The idea of the seminars is to gather a group of 30-40 leading scientists and young promising researchers to jointly discuss key ideas and research directions in their field in the very special atmosphere of the castle.

Based on a proposal by the organizers *Gaetano Borriello* (Washington), *Hans-Werner Gellersen* (Lancaster), and *Friedemann Mattern* (Zurich), Dagstuhl host a Seminar on Ubiquitous Computing on September 9-14, 2001. The seminar will not follow the usual workshop formats but encourage a high degree of collaborative discussion and work among the participants from research backgrounds such as computer science systems, smart technologies, and human-computer interaction.

One of the objectives of the seminar will be to shed light on the development from the different angles that researchers investigate, and to foster a community that cuts across computer science disciplines and neighboring fields of research.



Dagstuhl Seminar on Ubiquitous Computing - Background and Motivation

Processors are becoming so small and inexpensive that they will be embedded in almost everything. Everyday objects will be infused with computational power, enabling them as information artifacts and smart devices. Most of these new emerging smart devices will be small and therefore highly mobile; some might even be wearable and be worn much as eyeglasses are worn today. Low-cost transceivers will allow to interconnect these devices in spontaneous ways, and to link them into the global information infrastructure. Connected together and exchanging appropriate information, these smart devices will then form powerful systems enabling new emerging functionalities.

When the world is populated with small computing devices that typically do their work in the background, without explicit user intervention, information and computational services will become continuously available, wherever the action is. Moreover, embedded sensors and actuators will enable smart devices and computing to become contextually embedded in real-world situations. This will give rise to situated computer applications that blend with the real tasks people care about instead of introducing computer-centric tasks of high complexity.

Ubiquitous computing therefore induces a paradigm shift in the way we use computers: Instead of bringing the world into the computer (the Virtual Reality paradigm), computational power is now brought to the objects of the physical world. Eventually, the vision of Ubiquitous Computing induces a new way of thinking about computers in the world, one that takes into account the natural human environment and allows the computers themselves to vanish into the background.

Over the last years, established research communities have begun to relate their fields to the vision of ubiquitous computing, and new communities have emerged to investigate specific perspectives of the development. Researchers begin to consider the enabling technologies and infrastructures required, the new applications and services that may emerge, and the interfaces and human interaction models for ubiquitous computing.

The growing ubiquitous computing community is fed from different classical areas, mostly from within computer science, but also from electrical engineering, material science, product design, and some other disciplines. Hence, insights currently evolve from many different perspectives, but often in parallel and with little interaction.

The Dagstuhl seminar should provide an opportunity to improve this situation by bringing scientists from various relevant disciplines together to jointly discuss the challenges, opportunities, and pertinent research themes of ubiquitous computing. Many participants have their roots in the classical computer science system domains (distributed and mobile computing, networking, architecture, middleware), others will be interested in technologies for smart devices (such as embedded and wearable computing, perception, or knowledge processing), and some will be concerned with application domains and human factors (such as context-aware computing, domestic applications, human-computer interaction, and design).

Participants

Larry Arnstein	University of Washington, Seattle WA, USA
Michael Beigl	TecO, Karlsruhe, Germany
Gaetano Borriello	University of Washington, Seattle WA, USA
Clemens Cap	University of Rostock, Germany
Keith Cheverst	Lancaster University, U.K.
Joelle Coutaz	CLIPS-IMAG, Grenoble, France
Anind K. Dey	Intel Research, Berkeley CA, USA
Elgar Fleisch	University of St. Gallen, Switzerland
Hans-Werner Gellersen	Lancaster University, U.K.
Anatole Gershman	Accenture Technology Labs, Northbrook IL, USA
Fritz Hohl	Sony, Stuttgart, Germany
Lars Erik Holmquist	PLAY/Interactive Institute, Göteborg, Sweden
Jason Hong	University of California, Berkeley, USA
Antonio Krüger	DFKI Saarbrücken, Germany
Spyros Lalis	ICS-FORTH, Heraklion, Greece
Marc Langheinrich	ETH Zurich, Switzerland
Peter Ljungstrand	PLAY/Interactive Institute, Göteborg, Sweden
Toshiyuki Masui	Sony Computer Science Laboratories, Tokyo, Japan
Friedemann Mattern	ETH Zurich, Switzerland
Joe McCarthy	Accenture Technology Labs, Northbrook IL,USA
Günter Müller	University of Freiburg, Germany
Christian Müller-Schloer	University of Hannover, Germany
Yasuto Nakanishi	University of Electro-Communications, Tokyo, Japan
Kurt Partridge	University of Washington, Seattle WA, USA
Joachim Posegga	SAP, Karlsruhe, Germany
Calton Pu	Georgia Institute of Technology, Atlanta GA, USA
Kurt Rothermel	University of Stuttgart, Germany
Bernt Schiele	ETH Zurich, Switzerland
Albrecht Schmidt	Lancaster University, U.K.
Jean Scholtz	National Institute of Standards and Technology, Gaithersburg MD, USA
Burkhard Stiller	ETH Zurich, Switzerland
Norbert Streitz	GMD IPSI, Darmstadt, Germany
Theo Ungerer	University of Augsburg, Germany
Roy Want	Intel Research, Santa Clara CA, USA
Andreas Zeidler	Darmstadt University of Technology, Germany
Thomas Ziegert	T-Nova, Darmstadt, Germany

Prof. Larry Arnstein

Research Assistant Professor
Department of Computer Science & Engineering
University of Washington, Box 352350
Seattle, WA 98195-2350
USA

Web: *www.cs.washington.edu/homes/larrya*
E-mail: *larrya@cs.washington.edu*
Tel:+1.206.685.9138
Fax: +1.206.543.2969

Biography

Larry Arnstein joined the University of Washington, Department of Computer Science & Engineering as an Assistant Research Professor in September of 1999 from the Stratos Product Development Group, LLC, a product design consulting firm in Seattle. Prior to Stratos, Larry had been the Director of Consulting Services for Cadence Design Systems in Japan where he lived with his wife for four years after Graduating with a PhD from Carnegie Mellon University, Department of Electrical and Computer Engineering in 1993. Larry's a research focus at the time was on design tools and methodologies for integrated circuits. Prior to his graduate work, Larry was an IC designer and then sales representative for the Hewlett-Packard Company. He earned his Bachelors degree in Computer Engineering from Case Western Reserve University in 1985. His current research focus is on the application of emerging ubiquitous computing technologies to problems in bioinformatics. Larry is a member of the ACM and IEEE Computer Society and is affiliated with the Cell Systems Initiative program within the department of Bioengineering.

Research Interests

The biology lab workbench is a place where information is both created and needed. Yet, due to the need for lab workers to remain focused on the task at hand rather than on interfacing with computer systems, the workbench remains a largely computer-free zone. Most biologists split their time between the physical lab environment and an often remote traditional office environment where information can be accessed and disseminated in a digital form. One result of this division is that the details of experimental procedures and outcomes are not adequately digitized, leading to inefficiency and lost opportunity. Our thesis is that any view of the laboratory of the future demands that digital and physical worlds become integrated. We start with the goal of capturing the details of experimental activity for use in a variety of important applications, while providing the ease-of-use, flexibility and extensibility needed to penetrate the laboratory research environment. This research program investigates the applications, programming tools, computing devices, and middleware technologies required for the lab of the future.

See *labscape.cs.washington.edu*

Recent Publications

Arnstein, L. F., Sigurdsson, S., Borriello, G., Labscape: *Experiment Capture in the Biology Laboratory*, Technical report

Arnstein, L. F., Sigurdsson, S.,, Franza, R., *Ubiquitous Computing in the Biology Laboratory*, Journal of Lab Automation (JALA). vol 6, no. 1, March 2001

Arnstein, L. F., Sigurdsson, S., *Position Paper for the HCI 2001 Workshop on Building the Ubiquitous Computing User Experience*

See *labscape.cs.washington.edu* under documents for links to electronic copies.

Dr. Michael Beigl

Telecooperation Office (TecO)
University of Karlsruhe
Vincenz-Priessnitz-Str. 1
76131 Karlsruhe
Germany

Web: *www.teco.edu/~michael*
E-mail: *michael@teco.edu*
Tel: +49 721 6902 59
Fax: +49 721 9663418

Biography

Michael Beigl is Senior Research Assistant at the University of Karlsruhe, from where he obtained both his MSc (1995) and PhD (2000) degrees in computing. Michael Beigl joined the University's Telecooperation Office (TecO), a computer science unit conducting collaborative projects in applied telematics, in 1995 as technical lead of the group's ubiquitous computing effort. He is now senior researcher and manager of the TecO.

Research

Michael Beigl leads the TecO Ubiquitous Computing research group at the faculty of Informatics. His interests evolve around people at the center of communication and information technology, with specific interest in novel information appliances and artefacts, in mobile and ubiquitous networks, human-computer interaction and in context awareness. Questions addressed in his research are: How should such computer be integrated into the environment and everyday objects (digital artefacts), how can all these small artefacts work together (communication & networks) and form one interface (HCI), in what way differs interaction in such environments from today known human-computer interaction (e.g. context-awareness, implicit HCI) and what are then the implications for an overall interface and for systems providing such an interface.

These questions are subject to many application centered research projects, most notably Smart-Its and MediaCup. Both projects provide insights into the augmentation of digital artefacts with sensing, processing, and communication capabilities, and into the provision of an open infrastructure for information exchange among artefacts. One of the artefacts studied is the MediaCup itself, an ordinary coffee cup invisibly augmented with computing and context-awareness. A more general approach is taken in the Smart-Its project. A Smart-Its is a small piece of electronic that will be small and unobtrusive enough to have them post hoc attached to any kind of artefact. The objective is to develop a configurable awareness device that integrates core sensors and perception techniques but that can be dynamically re-configured to compute context specific to an artefact. Smart-Its are connected through a network supporting loosely-coupled spatially-defined communication.

The Smart-Its project is a collaboration between European research institutes and funded by the EU through the Dissappearing Computer initiative. Research areas investigated by TecO are digital artefacts design (hard- and software co-design, sensor nodes), operating systems, networks and higher-level communcation and energy issues. For further information see *smart-its.teco.edu* and *mediacup.teco.edu*.

Recent Publications

Michael Beigl, Hans-Werner Gellersen, Albrecht Schmidt. *MediaCups: Experience with Design and Use of Computer-Augmented Everyday Objects*, Computer Networks, Special Issue on Pervasive Computing, Elsevier, Vol. 35, No. 4, March 2001, Elsevier, p. 401-409

Lars Erik Holmquist, Friedemann Mattern, Bernt Schiele, Petteri Alahuhta, Michael Beigl and Hans-W. Gellersen: *Smart-Its Friends: A Technique for Users to Easily Establish Connections between Smart Artefacts*, Ubicomp 2001, to be published

Michael Beigl: *Memoclip: A location based Remembrance Applicance*, 2th International Symposium on Handheld and Ubiquitous Computing (HUC2000), Bristol, UK, Sept. 25-27, 2000 and Personal Technologies Vol. 4 No. 4 2000, Springer Press, pp. 230-234

Prof. Gaetano Borriello

Department of Computer Science and Engineering
University of Washington
Box 352350 [express mail add: 114 Sieg Hall]
Seattle, WA 98195-2350
USA

Web: *www.cs.washington.edu/homes/gaetano*
E-mail: *gaetano@cs.washington.edu*
Tel: +1206 685 9432
Fax: +1 206 543 2969

Biography

Gaetano Borriello is a faculty member of the University of Washington's Department of Computer Science and Engineering. He is currently on a two-year leave to establish a new research center for Intel Corporation adjacent to the University of Washington campus. His research at UW and the mission of the new laboratory are closely aligned, both focusing on solutions that will make embedded computing devices distraction-free by making them highly decoupled and reconfigurable without human intervention. Dr. Borriello will return to his position at the University of Washington upon completing a 2 year assignment with Intel.

Gaetano Borriello received his BS degree in Electrical Engineering from the Polytechnic Institute of New York (1979), his MS degree in Electrical Engineering from Stanford University (1981), and a Ph.D. in Computer Science from the University of California at Berkeley (1988). He also spent four years at the Xerox Palo Alto Research Center from 1980-84 where he developed the first completely integrated Ethernet controller. He joined the UW faculty in 1988 where he served as Associate Chair from 1998 to 2000. He was awarded an NSF Presidential Young Investigator Award in 1988 and a UW Distinguished Teaching Award in 1995.

Research Interests

His research interests are in the design, development, and deployment of computing systems with particular emphasis on mobile and ubiquitous devices and their application. He has a wide range of interests that can be classified in embedded system design, development environments, user interfaces, and networking. They are unified by the goal of making new computing and communication devices that make life simpler by being as invisible as possible to their owners, being highly specialized and thus highly efficient for the task at hand, and able to exploit their connections to each other and the greater world-wide networks.

His most recent research accomplishments include the development of the Chinook design system for heterogeneous distributed embedded processors which has led to the formation of a company, Consystant Design Technologies, to commercialize the ideas. He has served on numerous conference program committees and will be program chair of the 2002 edition of the Ubiquitous Computing Conference in Goteborg, Sweden. Recently, he participated in a study, called "Embedded, Everywhere", commissioned by the Computer Science Technology Board of the National Research Council on Networked Systems of Embedded Computers (Em-nets).

Web sites:

www.cs.washington.edu/homes/gaetano
portolano.cs.washington.edu
labscape.cs.washington.edu
www.intel.com/research

Prof. Clemens Cap

Institut für Technische Informatik
Universität Rostock
Albert Einstein Strasse 21
Room Number 111
D - 18051 Rostock
Germany

Web: *wwwtec.informatik.uni-rostock.de/IuK/staff/clemens.html*
E-mail: *cap@informatik.uni-rostock.de*
Tel: +49 - 381 - 498 3390
Fax: +49 - 381 - 498 3440

Biography

Clemens H. Cap was born in Innsbruck, Austria. He studied mathematics, computer science and physics at the University of Innsbruck, where he obtained his Masters and his PhD with honors. He was senior research assistant in Innsbruck and Zurich and obtained the venia legendi (habilitation) in computer science at the University of Zurich. From 1992 to 1997 he was assistant professor for Formal Methods in Computer Science at the University of Zurich. In 1994 he was substitute during the temporary vacancy of an associate professorship at the University of Mannheim. Since 1997 he is full professor (with tenure) at the University of Rostock and Heinz Nixdorf Chair for Information and Communication Services.

Research Interests

Clemens Cap leads the group for Information and Communication services at the University of Rostock.

His research interests encompass system architecture for distributed and ubiquitous applications, Internet applications and services, system security and applications of formal specification techniques. He has conducted a number of research projects with national, international and industrial funding, and participated in the European Fifth Framework Program. A detailed list of research projects can be found at:
wwwtec.informatik.uni-rostock.de/IuK.

His teaching activities cover introductory courses on computer systems and networks as well as advanced courses in communication, security, distributed systems and the Internet.

He is a consultant of the technology transfer startup Unagon (*www.unagon.com/*) and member of the board of SOHnix AG (*www.sohnix.de/*).

Recent Publications

C. H. Cap, N. Maibaum und L. Heyden, *Extending the Data Storage Capabilities of a Java-based Smartcard*, Proceedings of the 6th IEEE Symposium on Computers and Communications ISCC 2001, IEEE Communications Society, Hammamet, July 2001.

I. Sedov, M. Haase, C. H. Cap, D. Timmermann, *Hardware Security Concept for Spontaneous Network Integration of Mobile Devices*, Proceedings of the Workshop on Innovative Internet Computing, 21.- 22. Juni 2001, Ilmenau, Springer LNCS 2060.

A. Müller, P. Forbrig und C. H. Cap, *Model-Based User Interface Design Using Markup Concepts*, Proceedings of the DSVIS2001 (Design, Specification and Verification of Interactive Systems), Glasgow, June 2001.

F. Siegemund, C. H. Cap und A. Heuer, *Einsatz von mobilen Agenten und XML zur Angebotsrecherche im Business-to-Consumer Commerce*, Zeitschrift Wirtschaftsinformatik, Nr. 2 / 2001, Themenheft *Agententechnologien.*

Dr. Keith Cheverst

Department of Computing
Lancaster University
Lancaster, LA14YR
Engalnd, U.K.

Web: *www.comp.lancs.ac.uk/computing/staff/kc.html*
E-mail:*kc@comp.lancs.ac.uk*
Tel: +44 1768 594539
Fax: +44 1768 593608

Biography

Keith Cheverst graduated from Lancaster University in 1992 to become a Research Assistant with Lancaster's Computing Department. He obtained his Ph.D. in 1999 with a thesis on group support for mobile distributed groupware applications. Shortly afterwards, he took up a lectureship with the Computing Department at Lancaster.

Research Interests

Keith's research interests include distributed systems support for mobile and context-aware systems, mobile distributed groupware/CSCW applications and the human factors issues associated with context-aware computing.

GUIDE

The EPSRC funded GUIDE project has developed, deployed and evaluated a mobile context-aware system for supporting visitors to the city of Lancaster.

For more information, see *www.guide.lancs.ac.uk/*

CASCO

The aim of the CASCO project is to explore the design space of Context-Aware Support for Cooperation and to investigate the human factors issues that arise from the sharing of personal context in different domains.

For more information, see *www.comp.lancs.ac.uk/computing/staff/kc/CASCO.html*

Digital Care

This project, which is part of the IRC EQUATOR project, is concerned with investigating how the use of ubiquitous technologies can support those in care.

For more information, see *www.equator.ac.uk/projects/DigitalCare.html*

Recent Publications

Cheverst, K., N. Davies, K. Mitchell and A. Friday, *Experiences of Developing and Deploying a Context-Aware Tourist Guide: The GUIDE Project.* In: Proc. of MOBICOM 2000, Boston, ACM Press, pp 20-31. August 2000.

Cheverst, K. and G. Smith, *Exploring the notion of information push and pull with respect to the user intention and disruption.* In: Proc. of International workshop on Distributed and Disappearing User Interfaces in Ubiquitous Computing (CHI 2001). Seattle, U.S., April 2001.

Cheverst, K., G. Smith, N. Davies, K. Mitchell and A. Friday, *The role of shared context in supporting cooperation between city visitors.* In: COMPUTERS & GRAPHICS, Vol. 25, No. 4, pp 555-562, 2001.

Cheverst, K., N. Davies, K. Mitchell and C. Efstratiou.: *Using Context as a Crystal Ball: Rewards and Pitfalls.* In: Personal Technologies Journal, Vol. 3 No. 5, pp 8-11, 2001.

Cheverst, K., N. Davies, K. Mitchell, *Investigating Context-aware Information Push vs. Information Pull to Tourists.* In: Proc of Mobile HCI 2001: Third International Workshop on Human Computer Interaction with Mobile Devices, (IHM-HCI 2001) Lille, France, September 2001.

Prof. Joëlle Coutaz

CLIPS-IMAG
385 rue de la Bibliothèque
BP 53
38041 Grenoble cedex 9
France

Web:*iihm.imag.fr/*
E-mail: *Joelle.Coutaz@imag.fr*
Tel: +33 4 76 51 48 54
Fax: +33 4 76 44 66 75

Biography

Joëlle Coutaz has studied computer science at University Joseph Fourier (Grenoble, France) where she obtained her doctorate in 1970 and Thèse d'Etat in 1988 in which she set the foundations of software engineering for HCI. She is professor at University Joseph Fourier since 1973 and the founder in 1990, and director, of the HCI Group at laboratory CLIPS (Communication Langagière et Interaction Personne - Système). She is the author of the PAC model, a conceptual software architecture model for interactive systems. She is a member of the editorial board of the ACM Transactions On Computer Human Interaction (TOCHI) and has been involved in the ACM CHI conference as paper and panel chair. J. Coutaz was vice chair of the Working Group 2.7 of IFIP. In France, she is the founder of the working groups CSCW and Multimodal man-machine communication of the national programme PRC Man-Machine Communication. J. Coutaz has been involved in the ESPRIT BRA/LTR projects AMODEUS1 and AMODEUS2 (1989-1995), which promoted a multidisciplinary approach to HCI.

Research Interests

Joëlle Coutaz core interests concern multimodal interaction and software architecture modeling for interactive systems. More recently, Joëlle Coutaz has investigated the concept of plasticity of user interfaces, the notion of context of use, as well as the design and implementation of artifacts that blend the physical and the virtual. Her participation in three ongoing European projects illustrates these interests.

GLOSS (Framework V, FET, Disappearing Computer, started in Jan. 2000, *www.gloss.cs.strath.ac.uk*)

This project will enhance natural interaction with physical architectural environments by providing location-sensitive user interactions through a cohesive movement/activity map supported by networks of information. GLOSS will develop a framework for technology to adapt to the user by understanding where information is presented and how it should be presented, where devices are controlled and how they should be personalised, and when this should all occur, in a integrated information landscape that varies from outdoor to indoor activities, public to private spheres, home and work environments.

FAME (Framework, V R&D, starting date September 2001)

The goal of this project is to construct an intelligent agent to facilitate communication among people from different cultures who collaborate on solving a common problem. This agent will provide three services: 1) facilitate human to human communication through multimodal interaction including vision, speech and object manipulation, 2) provide the appropriate information relevant to the context, and 3) make possible the production and manipulation of information blending both electronic and physical representations.

CAMELEON (Framework V, R&D, starting date October 2001)

The goal of this project is to build methods and environments supporting the design and development of plastic user interfaces, i.e., user interfaces capable of adapting to different contexts of use (such as different locations and different devices) while preserving usability.

Recent Publications

J. Coutaz. *Architectural Design for User Interfaces*, The Encyclopedia of Software Engineering, 2nd edition, J. Marciniak Ed., Wiley & Sons Publ., to appear

J. Crowley, J. Coutaz, F. Bérard. *Things that See*, Communication of the ACM, Vol 43 (3), March 2000, pp. 54-64

D. Thevenin, J. Coutaz. *Plasticity of User Interfaces: Framework and Research Agenda*. In Proc. Interact 99, Edinburgh, A. Sasse & C. Johnson Eds, IFIP IOS Press Publ., 1999, pp.110-117.

G. Calvary, J. Coutaz, D. Thevenin, *A Unifying Reference Framework for the Development of Plastic User Interfaces*, in Proc. Engineering HCI, Kaufman, 2001, to appear.

G. Calvary, J. Coutaz, D. Thevenin. *Supporting Context Changes for Plastic User Interfaces: a Process and a Mechanism*, Proc. HCI-IHM 2001, to appear

T.C. N. Graham, L. Watts, G. Calvary, J. Coutaz, E. Dubois, L. Nigay. *A Dimension Space for the Design of Interactive Systems within their Physical Environments*, Proc. DIS 2000, 17-19 August 2000, ACM Publ. New York, pp. 406-416.

Dr. Anind Day

Intel Berkeley Laboratory
Intel Research
Suite 412, 2020 Milvia Street
Berkeley, CA 94704-111
USA

Web: ***www.cc.gatech.edu/~anind/***
E-mail: ***anind@cc.gatech.edu***
Tel: +1 510 549 4690
Fax: +1 510 549 4692

Biography

Anind Dey studied Computer Engineering at Simon Fraser University from 1988 to 1993 where he received his Bachelors degree. He then moved to Georgia Tech where he received a Masters degree in both Aerospace Engineering (1995) and Computer Science (2000). He was a member of the Future Computing Environments group from 1995 to 2000. He completed his Ph.D. in 2000, with a dissertation on an infrastructure to support the building of context-aware applications. He worked as a research scientist at Georgia Tech until July of 2001, when he took a position at the new Intel Berkeley Laboratory in Berkeley, California. He will soon become an Adjunct Assistant Professor at the University of California at Berkeley to completely fill any potential spare time he may have.

Research Interests

Anind Dey's research interests lie in the area of human-computer interaction, as it applies to ubiquitous computing. This includes the desiging of infrastructures for ubiquitous computing to support both programmers and end-users, investigating privacy and security issues, novel interaction techniques, ambient displays, programming environments, evaluation techniques for ubiquitous computing systems, distributed sensor networks and gadgets of all sorts.

He has spent the last 4 years or so working on the Context Toolkit, a software toolkit that supports programmers in building context-aware applications. The goal of this toolkit was to make it easier to build context-aware applications by making sources of contextual input as easy to use as sources of regular input, such as a keyboard and a mouse, for example. The widget and interactor concepts that are used successfully with graphical interface design was applied to the design of context-aware applications for this purpose. The toolkit supports seamless collection of context data from heterogenous software and hardware sensors, persistent storage for that data grouped into logical entities of people, places and things, and mechanisms for delivering real-time and historical context to distributed applications. These applications can then adapt their behavior based on the received context.

For more information, see ***www.cc.gatech.edu/fce/contexttoolkit***

Recent Publications

Dey, A.K., Salber, D. Abowd, G.D. *A Conceptual Framework and a Toolkit for Supporting the Rapid Prototyping of Context-Aware Applications*, anchor article of a special issue on Context-Aware Computing, to appear in the Human-Computer Interaction (HCI) Journal, Vol. 16, 2001.

Dey, A.K. *Providing Architectural Support for Building Context-Aware Applications*, Ph.D. thesis, December 2000, Dr. Gregory D. Abowd (advisor), College of Computing, Georgia Institute of Technology.

Dey, A.K., Abowd, G.D., Wood, A. *CyberDesk: A Framework for Providing Self-Integrating Context-Aware Services*, Knowledge Based Systems, Vol. 11 (1), September 1998, pp. 3-13.

Abowd, G.D., Dey, A.K., Brotherton, J., Orr, R.J. *Context-awareness in Wearable and Ubiquitous Computing*, Virtual Reality Society International Journal, Vol. 3, 1999, pp. 200-211.

Dey, A.K., Abowd, G.D. *CybreMinder: A Context-Aware System for Supporting Reminders*, in the Proceedings of the 2nd International Symposium on Handheld and Ubiquitous Computing (HUC2K), September 25-27, 2000, pp. 172-186.

Prof. Elgar Fleisch

Institute of Information Management
University St. Gallen
Muller-Friedbergstrasse 8
CH-9000 St. Gallen
Switzerland

Web: ***www.iwi.unisg.ch***
E-mail: ***elgar.fleisch@unisg.ch***
Tel: +41 71 224 2420
Fax: +41 71 224 2777

Biography

Elgar Fleisch studied a mixture of business administration and computer science in Vienna, Austria and became a research assistant at the Institute of Advanced Studies in 1992. He obtained his Ph.D. in 1994 with a thesis on adaptive systems in production scheduling. From 1994 to 1996 he worked as a post-doc at the Institute of Information Management, University St. Gallen, Switzerland (IWI-HSG). 1996 he founded a Philadelphia, U.S.A. based professional services company. End of 1997 he came back to St. Gallen where finished 1999 his Habilitation-thesis. Since 2000 he is Assistant Professor at the University of St. Gallen and Vice Director of IWI-HSG.

Research Interests

Elgar Fleisch co-leads the Institute of Information Management. In this function he overseas the institute's research work in the areas of Business Networking and Knowledge Management. Together with Prof. Friedemann Mattern he also runs the M-Lab. His research interests cover the impact of Ubiquitous Computing on products, services, business processes, businesses and users. His main projects in the area of ubiquitous computing are:

M-Lab

The M-Lab is a joint project of the University of St. Gallen and ETH Zurich. It identifies and creates effective business applications for smart things in the area of business-to-business - from the idea through to the prototype. Within this area its interest centers on the fields of life sciences, retail, automotive and logistics. Its goal is to build up a critical mass of highly qualified researchers and practitioners in the field of applied ubiquitous computing. For more information, see ***www.m-lab.ch***

Processes and applications of cutting edge identification technologies in logistics

Within the project a RFID based system for cool chain management is implemented at a Cargo Distribution Center in Austria. A special focus is put on process changes and benefits that are achieved through the solution. The project is funded by the Austrian Ministry for Transport, Innovation and Technology.

Recent Publications

Fleisch, E., *Ubiquitous Computing in der Logistik: Architektur und betriebswirtschaftliche Auswirkungen*, appears in: Proceedings of WI 2001, Augsburg 2001

Österle, H., Fleisch, E., Alt, R., *Business Networking: Shaping Enterprise Relationships on the Internet*, 2nd Edition, Springer, Berlin etc. 2001

Fleisch, E., *Das Netzwerkunternehmen, Strategien und Prozesse zur Steigerung der Wettbewerbsfähigkeit in der Networked Economy*, Springer, Berlin etc. 2001

Fleisch, E., *Von der Vernetzung von Unternehmen zur Vernetzung von Dingen*, appears in: Schögel (Ed.), Roadm@p to E-Business, Thexis, St. Gallen 2001

Fleisch, E., Mattern, F., Österle, H., *M-Lab, The Mobility and Ubiquitous Computing Lab, A Joint Initiative of ETHZ and HSG*, Project Motivation and Proposal, St. Gallen 2001, www.m-lab.ch

Prof. Hans-Werner Gellersen

Department of Computing
Lancaster University
Lancaster LA1 4YR
U.K.

Web: *www.comp.lancs.ac.uk/~hwg/*
E-mail: *hwg@comp.lancs.ac.uk*

Biography

Hans Gellersen holds an MSc and PhD in computing, both from University of Karlsruhe, Germany. Having obtained his first degree, he became Research Assistant at Karlsruhe's Telematics Insitute in 1992 where he later helped create the Telecooperation Office in 1994. Following completion of his PhD he was director of the Telecooperation Office from 1996 to 2000 and managed numerous European projects and industrial collaborations in the area of distributed interactive systems. In this time he became increasingly active in the emerging ubiquitous computing community, and in 1999 organized and chaired the First Symposium on Handheld and Ubiquitous Computing (HUC, now continued as UBICOMP). Since March 2001, Hans Gellersen is Chair in Interactive Systems at Lancaster University to lead Ubiquitous Computing research at Lancaster's Computing Department. This involves him currently in the European initiave "The Disappearing Computer" as project co-ordinator, and in the UK Equator research programme on "Technical Innovation in Physical and Digital Life".

Research Interests

I am interested in Ubiquitous Computing from an Interactive Systems perspective, and specifically in computer-based systems that "take the real world into the loop" to support the situatedness of technology use. This spans a variety of research themes:

- context-aware computing: augmentation of computer systems with the ability to obtain and use situational context, for instance based on sensor integration
- situated and disaggregated user interfaces: employing the physical environment as interface
- computer-augmented artefacts: enabling non-computational artefacts as soft media

Current and recent related projects include:

- TEA, a European project that investigated multi-sensor context-awareness for mobile devices, and specifically mobile phones (*www.teco.edu/tea/*).
- Mediacup, an exploration of everyday artefacts augmented with sensing, processing and communication (*mediacup.teco.edu/*).
- Smart-Its, a Lancaster-led project in the Disappearing Computer initiave, investigating embedded technology for augmentation of everyday artefacts with collective context-awareness (*www.smart-its.org/*).
- Domestic Environments (*www.equator.ac.uk/projects/Domus.html*), a collaboration with the Royal College of Arts on technological design for the home based on cultural probes into how individuals feel about their private spaces.
- Web Visitor Awareness, an investigation of ambient display and augmented reality techniques to support the host-visitor relationship in the Web.

Recent Publications

H.W. Gellersen, A. Schmidt and M. Beigl: *Multi-Sensor Context-Awareness in Mobile Devices and Smart Artefacts*. To appear in Mobile Networks and Applications.

H.W. Gellersen: *Where Computation and Artefacts Meet*. In: INFORMATIK/INFORMATIQUE, 5/2001.

L.E. Holmquist, F. Mattern, B. Schiele, P. Alahuhta, M. Beigl and H.W. Gellersen: *Smart-Its Friends - A Technique for Users to Easily Establish Connections between Smart Artefacts*. Proc. Ubicomp 2001, Atlanta, Sept. 2001, Springer-Verlag.

A. Schmidt and H.W. Gellersen: *Visitor Awareness in the Web*. Proc. WWW10, Hongkong, May 2001, ACM Press.

Dr. Anatole Gershman

Director of Research
Accenture Technology Labs
3773 Willow Road
Northbrook, IL 60062
USA

Web: *www.accenture.com/xd/xd.asp?it=enWeb&xd=services\technology\people\Anatole_V_Gershman.xml*

E-mail: *anatole.v.gershman@accenture.com*

Biography

Anatole Gershman joined Accenture Technology Labs in 1989 and in 1997 became its overall Director of Research. Under his leadership, research at the laboratories is focusing on early identification of potential business opportunities and the design of innovative applications for the home, commerce and work place of the future. These include electronic commerce, high-performance virtual enterprise, knowledge management, and human performance support. To achieve these goals, the laboratories are conducting research in the areas of ubiquitous computing, human-computer interaction, interactive multimedia, information access and visualization, intelligent agents, and simulation and modeling. Prior to joining Accenture, Anatole spent over 15 years conducting research and building commercial systems based on Artificial Intelligence and Natural Language processing technology. He held R&D positions at Coopers & Lybrand, Cognitive Systems, Inc., Schlumberger, and Bell Laboratories. In 1997, Anatole was named among the top 100 technologists in the Chicago area by Crain's Chicago Business. In 2000, Industry Week named Anatole one of the "R&D stars to watch." Anatole studied Mathematics and Computer Science at Moscow State Pedagogical University and received his Ph.D. in Computer Science from Yale University in 1979.

Research Interests

The development of the infrastructure for ubiquitous computing is progressing rapidly, yet the applications that will be built on this new infrastructure remain largely ill defined. What will we do with these emerging capabilities? Full-color stock quotes on your heads-up display? Stereo sports scores? We believe that the new kinds of services will result from three primary capabilities of ubiquitous devices:

Ubiquitous Devices as Service Channels

Perhaps most obviously, mobile and embedded devices represent a new, constantly present, personal service channel. While this certainly opens up a new marketing channel for existing services, more interesting are the new kinds of services that will make sense. Once we can assume an always present, always-on channel, access to a person goes away as a constraint. So now services can, in effect, casually tap on your shoulder and whisper in your ear rather than blare random aimed at thousands. But what should these new services whisper? And how will this newfound access be managed across competing interests?

Ubiquitous Devices as Sensors

Today's mobile devices are essentially deaf, dumb, and blind. Service providers depend upon users to enter all necessary information. Consequently the services available today are essentially those that can be delivered despite these rather drastic limitations. Over time, however, ever more powerful mobile and embedded devices will become equipped with a variety of sensors. Geopositioning capabilities will inform devices of their location. Biometrics will identify the user. Tagging and tracking technologies will identify the objects around them. In short, ubiquitous devices will begin to open their eyes and as a result we will begin to see services that don't depend upon the user to establish, interpret, and communicate their own situation.

Ubiquitous Devices as Effectors

The mobile commerce trend is not happening in a vacuum. Just as millions of people are acquiring mobile phones, millions of objects of various kinds - kiosks, displays, cars, appliances - are now acquiring wireless capabilities of their own. Ubiquitous computing is becoming a reality. We believe an area of great opportunity lies in the interaction between these trends. In particular, the mobile device, by virtue of its presence on one's person, has the chance to be the user interface for the myriad of intelligent objects we find around us. Today we can point a phone at a soda machine and buy a Coke. Soon we will be able to point to a far larger array of objects and receive supporting services. In effect, the mobile device becomes a "remote control to the world".

These capabilities - the ubiquitous device as service channel, sensor, and effector - can be combined to change the way we think about services.

Dr. Fritz Hohl

Sony International (Europe) GmbH
Heinrich-Hertz-Str. 1
D-70327 Stuttgart
Germany

E-mail: hohl@sony.de
Tel: +49 711 5858-701
Fax: +49 711 5858-468

Biography

Fritz Hohl received his diploma degree in Computer Science in 1995. From 1995 to 2000 he worked as a research assistant at the Institute of Parallel and Distributed High-Performance Systems at the University of Stuttgart, Germany. In this time he focused on mobile agent security on which he made his Ph.D. in 2001. Later on, he initiated the Nexus project, which focuses on a platform for location-aware applications. Having joined Sony's Advanced Technology Center Stuttgart in 2000, he currently works in the EU IST project YOUNGSTER where he concentrates on context-support for mobile services. He is the author and co-author of 15 research publications in the area of distributed systems, mobile agents, location-aware and context-aware systems.

Research Interests

Fritz Hohl's current research interests lie in the area of context services and of open platforms in general that integrate the real with the digital world.

Youngster

The aim of the European Union funded project "Youngster" is twofold. First, an innovative, open active Mobile Service Platform (MSP) will be developed that offers:

- accessibility from anywhere by a wide range of devices and networks
- personalized and highly adaptive delivery of services
- support of community functions
- support of context-aware features (including location-awareness)

Second, a new generation of enhanced mobile services will be developed using the Mobile Service Platform. As the aimed target group consists of young people, the implemented services will be specifically tailored to the need of youngsters. As it can be anticipated that the current business models will not be ideal for the target group, new business models will be examined as young people cannot afford premium services. To verify the services and the platform a field test will be conducted in Norway. The results of the trials will be evaluated and success will be assessed in terms of the response of the young people who participate and the use that they make of the services. The Youngster consortium consists of the Heriot-Watt-University (United Kingdom), NRK (Norway), Siemens (Germany), Sony (Germany), Steria (France), Telenor (Norway), and T-Systems (Germany). More information can be found under www.ist-youngster.org.

Some Relevant Publications

Fritz Hohl. *Sicherheit in Mobile-Agenten-Systemen*. Ph.D Thesis, April 2001, Institute for Parallel and Distributed High-Performance Systems, University of Stuttgart. elib.uni-stuttgart.de/opus/volltexte/2001/893/

Mandato, D.; Kovacs, E.; Hohl, F.; Amir-Alikhani, H. *CAMP: a context-aware mobile portal.* In: Proceedings of the Workshop on Service Portability and Virtual Customer Environments 2000, 2001, pp. 52 -61.

Baumann, Joachim; Hohl, Fritz; Rothermel, Kurt; Schwehm, Markus; Straßer, Markus; Theilmann, Wolfgang: *The Future of Mole.* In: in "Mobility, Mobile Agents and Process Migration - An Edited Collection", Springer Verlag, to appear.

F. Hohl, U. Kubach, A. Leonhardi, K. Rothermel, M. Schwehm (1999): *Next Century Challenges: Nexus - An Open Global Infrastructure for Spatial-Aware Applications*, Proceedings of the Fifth Annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom'99), Seattle, Washington, USA, August 15-20, 1999, T. Imielinski, M. Steenstrup, (Eds.), ACM Press, 1999, pp. 249-255.

Dr. Lars Erik Holmquist

PLAY research studio
Interactive Institute
Box 620
SE-405 30 Goteborg
Sweden

Web: *www.viktoria.se/~leh/*
E-mail: *leh@interactiveinstitute.se*
Tel: +46 31 773 55 33
Fax: +46 31 773 55 30

Biography

Lars Erik Holmquist is founder of the PLAY research group in Gothenburg, Sweden. The group was founded at the Viktoria Institute but is now part of the Interactive Institute, a national research institute in interaction design and new media. Lars Erik Holmquist received his master's degree in Computer Science in 1996 and his Ph.D. in Informatics in 2000, both at Gothenburg University. He has led many research projects in topics such as mobile communication services, user interface design, and information visualization. He has published extensively on the topics of novel human-computer interaction and ubiquitous computing, and is the general chair for the UbiComp 2002 conference.

Research Interests

I am interested in novel user interfaces for ubiquitous computing, such as physical user interfaces, ambient information displays, etc. I have also worked with information visualisation, in particular for hand-held devices. Right now my main interest is in combining some aspects of information visualization and ambient media with emerging display technologies such as color-changing materials. This approach was demonstrated recently at the SIGGRAPH 2001 conference. There, we used computer graphics projections as a sort of "dynamic paintings" to show various types of information in the style of various modern artists. For instance, an abstract composition reminiscent of the painter Mondrian was in fact a display of the weather conditions in six different cities. We also showed some preliminary experiments with using color-changing textiles as a computer graphics display.

Some Relevant Publications

Holmquist, L.E., Falk J. and Wigström, J. (1999) *Supporting Group Collaboration with Inter-Personal Awareness Devices.* Journal of Personal Technologies, 3(1-2), Springer.

Holmquist, L.E., Redström J. and Ljungstrand, P. (1999) *Token-Based Access to Digital Information.* Proc. First International Symposium on Handheld and Ubiquitous Computing (HUC) '99, Springer Verlag.

Björk, S., Holmquist, L.E., Redström, J., Bretan, I., Danielsson, R., Karlgren, J. and Franzén, K. (1999) *WEST: A Web Browser for Small Terminals.* Proc. ACM Conference on User Interface Software and Technology (UIST) '99, ACM Press.

Skog, T., Holmquist, L.E., Hallnäs, L. and Redström, J. (2001) *Informative Art.* Emerging Technologies presentation at SIGGRAPH 2001, Los Angeles, USA.

Holmquist, L.E. and Melin, L. (2001) *Using Color-Changing Textiles as a Computer Graphics Display.* In Abstracts and Applications of SIGGRAPH 2001, Los Angeles, USA, ACM Press.

Jason Hong

525 Soda Hall
Computer Science Division
UC Berkeley
Berkeley, CA 94720-1776
USA

Web: ***www.cs.berkeley.edu/~jasonh***
E-mail: ***jasonh@cs.berkeley.edu***
Tel: +1 510 643 7354

Biography

Jason I. Hong is a Computer Science doctoral student in the Group for User Interface Research (GUIR) at the University of California at Berkeley. His research interests lie at the intersection of Human-Computer Interaction and Systems, specifically in building and evaluating applications that utilize multimodal interaction, in constructing smart spaces that leverage context-aware computing, and in enhancing day-to-day information management activities.

Research Interests

The focus of my research lies at the intersection of Human-Computer Interaction and Systems. I am specifically interested in these areas:

- Context-aware computing
- Multimodal interaction
- Ubiquitous computing system infrastructures
- Sensemaking in a ubiquitous computing environment

With respect to applications, I am interested in the exploration and design of novel ways of supporting people in everyday activities. This comes with a strong emphasis on critical evaluation of such applications to gain a deeper insight as to the strengths and shortcomings of the technology, to see how it will potentially impact our lives for better or for worse. With respect to infrastructures, I am interested in developing the software frameworks and toolkits to greatly simplify the task of building these applications so that they are scalable, reliable, and extensible. The goal is to lower barriers to entry for designers and developers while simultaneously raising the ceiling to allow rich and diverse kinds of interactions to be built.

See ***www.cs.berkeley.edu/~jasonh/research*** for more information.

Recent Publications

Hong, J., and Landay, J. *An Infrastructure Approach to Context-Aware Computing*. Human-Computer Interaction, 2001, Vol. 16. (To appear)

Abowd, G.D., Atkeson, C.G., Hong, J., Long, S., Kooper, R., and Pinkerton, M.. Cyberguide: *A Mobile Context-Aware Tour Guide*. Baltzer/ACM Wireless Networks, Vol. 3. 1997.

Dr. Antonio Krüger

Universität des Saarlandes
Postfach 151150
66041 Saarbrücken
Germany

Web: *www.dfki.de/~krueger/*
E-mail: *krueger@cs.uni-sb.de*
Tel: +49-681-302-4137
Fax: +49-681-302-4136

Biography

Antonio Krüger received a Diploma in computer science and economics at Saarland University in 1995. Afterwards he joined the Saarbrücken Cognitive Science Programm and finished it with a doctoral degree in 1999.

He was early involved in several artificial intelligence projects at the German Research Center for AI (DFKI GmbH), and more recently at the AI Lab of Saarland University (Chair of Prof. Dr. Dr. hc Wolfgang Wahlster), where he is holding the position of a senior researcher at the time being.

Antonio Krüger's past and recent interests include work on intelligent graphics generation ("Smart Graphics"), especially for mobile devices. Furthermore he is interested in intelligent navigation and information systems in mobile and ubiquitous computing scenarios.

Research Interests

Antonio's main research areas are Artificial Intelligence and Computer Graphics. More recently he transfered ideas from both fields to mobile and ubiquitous computing. He is equally interested in the technical challenges that arise from this combination and the human factors that have to be respected.

In the last five years he worked especially on the automated abstraction of 3D-graphics under consideration of communicative goals. This included the generation of abstracted graphics for small screen and mobile devices.

More recently he applied the results of his research to a mobile navigation system for pedestrians (REAL) that adapts to the technical constraints of the hardware (clip-on glasses, PDA) but also to the cognitive restrictions of the user (time-pressure, limited working memory). Another focus of this research was the seamless switch between indoor- and outdoor-navigation tasks.

Antonio's broad interdisciplinary interests lead to joint work with cognitive psychologists on the semantics of way descriptions. He was also involved in the design of new hardware components (infrared sender, 3D-pointing device).

He believes that the accurate adaption of hardware and software to the cognitive limited resources of users will play a central role in the success of ubiquitous computing.

Further information can be obtained from: *w5.cs.uni-sb.de/irreal* and *w5.cs.uni-sb.de/arreal*

Recent Publications

Antonio Krüger, Jörg Baus, Andreas Butz: *Smart Graphics in Adaptive Way Descriptions for Pedestrians*, Proceedings of Advanced Visual Interfaces (AVI) 2000, Palermo, ACM Press, 2000.
www.dfki.de/~krueger/publications/avi00.ps.gz

Andreas Butz, Jörg Baus, Antonio Krüger: *Augmenting Buildings with Infrared Information*, Proceedings of the International Symposium on Augmented Reality (ISAR), IEEE Computer Society Press, 2000.
w5.cs.uni-sb.de/~krueger/building.ps.gz

Andreas Butz, Jörg Baus, Antonio Krüger, Marco Lohse: *Hybrid Indoor Navigation System*, Proceedings of International Conference on Intelligent User Interfaces (IUI), ACM Press, 2001.
w5.cs.uni-sb.de/~krueger/hybrid-iui.ps.gz

Christian Kray, Jörg Baus, Hubert Zimmer, Harry Speiser, Antonio Krüger: *Two path prepositions: along and past*, Proceedings of the Conference on Spatial Information Theory (COSIT), 2001.
w5.cs.uni-sb.de/~krueger/cosit01.ps.gz

Further publications can be obtained from: *www.dfki.de/~krueger/publications.html*

Dr. Spyros Lalis

Institute for Computer Science
Foundation for Research and Technology Hellas
Vassilika Vouton
GR-71110 Heraklion, Crete
Greece

E-mail: *lalis@ics.forth.gr*
Tel: +3081 391697
Fax: +3081 391601

Biography

Dr. Spyros Lalis received a Diploma in Computer Engineering and a doctorate in Technical Sciences from the Swiss Federal Institute of Technology Zurich (ETHZ). Since 1997 he is Research Associate at the Institute for Computer Science of the Foundation for Research and Technology Hellas (FORTH). From 1997 he was Visiting Assistant Professor at the Computer Science Department of the University of Crete. Since 2000 he is Visiting Assistant Professor at the Computer and Communications Engineering Department of the University of Thessaly.

Interests

His interests include Programming Languages and Systems, Software Engineering, Distributed and Parallel Systems, Network Computing, Ubiquitous and Pervasive Computing, and Economies of Electronic Services/Goods.

Activities

He is the author of the Concurrent Oberon system, an extension of the Oberon workstation operating system (developed at the Swiss Federal Institute of Technology by Niklaus Wirth and Jurg Gutknecht) with support for lightweight threads and object-oriented distributed computing. He is coordinator of 2WEAR, a recently initiated project in the area of ubiquitous computing (more info at *2wear.ics.forth.gr*).

In brief, the goal of 2WEAR is to develop an architecure for a dynamic 'personal' system consisting of several wearable and portable devices that can be freely added and removed, and which can exploit features of the surrounding computing infrastructure, en passant. Distribution of functions and services, seamless communication between components residing on different devices (and the environment), and dynamic discovery, extensibility and adaptation are key properties of the system. The 2WEAR project is funded under the FET/Disappearing Computer research initiave of the EC (*www.disappearing-computer.net*).

References

A short paper presenting first thoughts about the vision and goals of the 2WEAR project can be found at: *istevent.cec.eu.int/sessiondata/Summary_241_sumeng_pdf.pdf*.

Marc Langheinrich

Department of Computer Science
ETH Zurich (Federal Institute of Technology)
Haldeneggsteig 4, IFW D 48.2
CH-8092 Zurich
Switzerland

Web: *www.inf.ethz.ch/~langhein/*
E-mail: *langhein@inf.ethz.ch*
Tel: +41 1 632 06 88
Fax: +41 1 632 16 59

Biography

Marc Langheinrich received a masters degree in computer science from the University of Bielefeld, Germany, in 1997. Starting in the fall of 1995, he spent a year as a Fulbright Scholar at the University of Washington, where he also completed his thesis work in the fields of information retrieval and software agents. In the fall of 1997 he joined NEC Research in Japan where he has been working on projects involving personalization and electronic commerce. Since October 1999 he is a research assistant in the Distributed Systems Group at the ETH Zurich, Switzerland.

Research Interests

Marc's main research interest lie at the intersection of privacy and ubiquitous computing. It is easy to imagine that in a world full of invisible sensory systems, comprehensive digital dossiers could be easily and inconspicuously collected. This poses several challenges to the design of ubiquitous systems: Which communication protocols ensure adequate levels of privacy protection? How can user interfaces be structured to provide users with control over their personal information? And how feasible is a comprehensive protection in a world of countless "smart" devices?

The Platform for Privacy Preferences Project (P3P)

As part of the Platform for Privacy Preferences Project (P3P), Marc is chairing the APPEL Subgroup at the World Wide Web Consortium (W3C). P3P is emerging as an industry standard providing a simple, automated way for users to gain more control over the use of personal information on Web sites they visit. At its most basic level, P3P is a standardized set of multiple-choice questions, covering all the major aspects of a Web site's privacy policies. Taken together, they present a clear snapshot of how a site handles personal information about its users. P3P-enabled Web sites make this information available in a standard, machine-readable format.

For more information, see *www.w3.org/P3P*

Recent Publications

Oliver Kasten, Marc Langheinrich: *First Experiences with Bluetooth in the Smart-Its Distributed Sensor Network.* Workshop on Ubiquitous Computing and Communications, In: Proceedings PACT 2001, Oct. 2001.

Marc Langheinrich: *Privacy by Design – Principles of Privacy-Aware Ubiquitous Systems*. In: Proceedings of Ubicomp 2001, September 30 - October 2, 2001, Atlanta, GA.

Friedemann Mattern, Marc Langheinrich: *Allgegenwärtigkeit des Computers - Datenschutz in einer Welt intelligenter Alltagsdinge.* In: G. Müller, M. Reichenbach (Hrsg.): Sicherheitskonzepte für das Internet, Springer-Verlag, pp. 7-26, Mai 2001

Marc Langheinrich: *P3P - Ein neuer Standard für Datenschutz im Internet*. In: digma - Zeitschrift für Datenrecht und Informationssicherheit, Schulthess-Verlag, 1. Jahrgang, Heft 1, April 2001 (in German).

Marc Langheinrich, Friedemann Mattern, Kay Römer, Harald Vogt: *First Steps Towards an Event-Based Infrastructure for Smart Things.* In: Ubiquitous Computing Workshop (PACT 2000), October 15-19, 2000, Philadelphia, PA.

Yuichi Koike, Tomonari Kamba, Marc Langheinrich: *The Age of Personalization: P3P Conception and Usage*, Nikkei Internet Technology Magazine, Cover Story. Issue 1/2000. Tokyo, December 1999, pp. 129-139 (in Japanese).

Lorrie Cranor, Marc Langheinrich, Massimo Marchiori, Joseph Reagle: *The Platform for Privacy Preferences 1.0 (P3P1.0) Specification*, W3C Candidate Recommendation, December 15, 2000.

Peter Ljungstrand

PLAY research studio
Interactive Institute
Box 620
SE-40530 Goteborg
Sweden

Web: ***www.playresearch.com***
E-mail: ***peter.ljungstrand@interactiveinstitute.se***
Tel: +46 31 7735543
Fax: +46 31 7735530

Biography

Peter Ljungstrand is a researcher at the PLAY research group in Göteborg, Sweden, where he has been active since the group started in 1998. He is a Ph.D. student in informatics at Göteborg University, with an academic background in informatics as well as in electrical engineering. He was one of the organizers of the recent CHI 2001 workshop on Distributed and Disappearing User Interfaces In Ubiquitous Computing, and he is also co-organizing the Designing Ubiquitous Computing Games workshop at UbiComp 2001.

Research Interests

While I have a technical background, I have a user-centered research approach. My main research interests address novel user experiences that can be realized using ubiquitous computing. I want to understand what new classes of user interfaces in ubiquitous computing can be designed and created. I also want to consider the impact they can have on people's everyday life, and to research how people can relate to and perceive an environment saturated with embedded technology, in a meaningful way. I am especially interested in social issues emerging from the use of novel technologies.

A recent research project is Pirates! - a mobile, multi-user, context-aware computer game that runs on PDAs in a wireless network and is experienced in physical space. The game uses mobile terminals to take advantage of, and rely upon, players' mobility as an intrinsic part of the game. Unlike most computer games, the experience depends just as much on social interaction with people in the real world as on the computer-mediated game elements.

I am also active in the Smart-Its research consortium, together with ETHZ, Lancaster University, TecO and VTT. The goal of Smart-Its is to realize a testbed for everyday ubiquitous computing applications, using large amounts of tiny embedded sensors in an ad-hoc network. These sensors will be attached post-hoc to everyday items, to augment and enhance their ordinary capabilities. My role in this project is to develop and evaluate meaningful user scenarios and applications.

Recent Publications

Ljungstrand, P. and Hård af Segerstad, Y. *Instant Messaging with WebWho*. Forthcoming in International Journal of Human-Computer Studies, Academic Press.

Björk, S., Falk, J., Hansson, R., & Ljungstrand, P. *Pirates! - Using the Physical World as a Game Board*. Paper at Interact 2001, IFIP TC.13 Conference on Human-Computer Interaction, July 9-13, Tokyo, Japan.

Ljungstrand, P., Redström, J. and Holmquist, L. E. Webstickers: *Using Physical Tokens to Access*, Manage and Share Bookmarks to the Web. In: Proceedings of Designing Augmented Reality Environments (DARE) 2000, ACM Press, 2000.

Redström, J., Ljungstrand, P. and Jaksetic, P. *The ChatterBox: Using Text Manipulation in an Entertaining Information Display*. In: Proceedings of Graphics Interface 2000, Montréal, Canada.

Redström, J., Dahlberg, P., Ljungstrand, P. and Holmquist, L.E. *Designing for Local Interaction*. Proc. Managing Interactions in Smart Environments (MANSE) '99, Springer Verlag, 1999.

Dr. Toshiyuki Masui

Sony Computer Science Laboratories, Inc.
3-14-13 Higashi-Gotanda
Shinagawa, Tokyo 141-0022
Japan

Web: *www.csl.sony.co.jp/person/masui.html*
E-mail: *masui@acm.org*
Tel: +81-3-5448-4380
Fax: +81-3-5448-4273

Biography

Toshiyuki Masui is a senior researcher at Sony Computer Science Laboratories, Inc. Preveously he spent ten years at Sharp Corporation, and at Sony he is developing various systems for improving the efficiency of using computers, including the predictive text input system called POBox. POBox is used as the standard text input method for many of Sony's products, like cellular phones and PDA's. He has been doing a variety of user interface research in the areas of Information Visualization, Mobile Information Systems, Information Retrieval, Predictive Interfaces, and Input Systems. Masui has a doctorate in computer science from University of Tokyo.

Research Interests

Real-World GUI (RWGUI)

Although the age of information appliances is around the corner, current remote control devices are too awkward, and we cannot use sophisticated equipments without using computer-like terminals. We propose a new simple input device called the FieldMouse, which enables us to perform flexible interaction with real-world objects. FieldMouse is a device which consists of an ID recognizer and a motion sensing device. Using a FieldMouse, various GUI tools like buttons, menus, sliders, and others can be used on any surface and objects, just like using a mouse on a desktop computer. Users can control or program various information appliances as easily as using graphical terminals.

Other research topics are:

- Efficient Text Input Methods
- Real-World Programming
- Information Visualization
- Information Retrieval
- Predictive Interfaces / PBD

Recent Publications

Toshiyuki Masui, Itiro Siio. *Real-World Graphical User Interfaces*. In Proceedings of the International Symposium on Handheld and Ubiquitous Computing (HUC2000), pp.72-84, September 2000.

Toshiyuki Masui. *Real-World Programming*. In Proceedings of Designing Augmented Reality Environment (DARE2000), pp.115-120, April 2000.

Itiro Siio, Toshiyuki Masui, Kentaro Fukuchi. *Real-world Interaction using the FieldMouse*. In Proceedings of the ACM Symposium on User Interface Software and Technology (UIST'99), pp.113-119, November 1999.

Toshiyuki Masui. *POBox: An Efficient Text Input Method for Handheld and Ubiquitous Computers*. In Proceedings of the International Symposium on Handheld and Ubiquitous Computing (HUC'99), pp. 289-300, September 1999.

Toshiyuki Masui. *Integrating Pen Operations for Composition by Example*. In Proceedings of the ACM Symposium on User Interface Software and Technology (UIST'98), pp.211-212.

Toshiyuki Masui. *LensBar - Visualization for Browsing and Filtering Large Lists of Data*. In Proceedings of InfoVis'98, October 1998, pp.113-120.

Toshiyuki Masui. *An Efficient Text Input Method for Pen-based Computers*. In Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI'98), Addison-Wesley, April 1998, pp.328-335.

Prof. Friedemann Mattern

Department of Computer Science
ETH Zurich (Federal Institute of Technology)
Haldeneggsteig 4, IFW D 49.2
CH-8092 Zurich
Switzerland

Web: *www.inf.ethz.ch/~mattern/* and *www.inf.ethz.ch/vs/*
E-mail: *mattern@inf.ethz.ch*
Tel: +41 1 632 05 36
Fax: +41 1 632 16 59

Biography

Friedemann Mattern obtained his Ph.D. from the University of Kaiserslautern, Germany, in 1989. From 1991-1994 he was Professor of computer science at Saarland University, and from 1994-1999 Professor of practical computer science and distributed systems at Darmstadt University of Technology. In July 1999 he was appointed full Professor at the ETH Zurich. Professor Mattern established a ubiquitous computing laboratory at ETH Zurich and conducts several research projects in this area.

Research Interests

Friedemann Mattern leads the distributed systems research group at the department of computer science. His research interests encompass infrastructures for ubiquitous computing, models and concepts for distributed computations, Internet applications, and programming of parallel and distributed systems. Two recent projects are Smart-Its and the M-Lab:

Smart-Its. *www.inf.ethz.ch/vs/res/proj/smartits.html*
The Smart-Its project is conducted under the European Union's Disappearing Computer initiative within the Future and Emerging Technologies programme. Its goal is to develop unobtrusive, deeply interconnected smart devices – called Smart-Its – that can be attached to everyday items in order to support new functionality. The Smart-Its project is conducted in cooperation with the Perceptual Computing and Computer Vision Group (ETH), the Computing Department at Lancaster University (U.K.), TecO (Germany), PLAY (Sweden), and VTT (Finland). The main objective of our group is to develop a hardware prototype based on Bluetooth and to evaluate infrastructures for interconnected embedded systems.

The M-Lab *www.m-lab.ch*
The M-Lab is a joint project of the University of St. Gallen and ETH Zurich. It identifies and creates effective business applications for smart things in the area of business-to-business – from the idea through to the prototype. Within this area its interest centers on the fields of life sciences, retail, automotive and logistics. Its goal is to build up a critical mass of highly qualified researchers and practitioners in the field of applied ubiquitous computing. Industrial project partners are among others SAP, Novartis, Volkswagen, Swisscom, Paul Hartmann.

Recent Publications

Friedemann Mattern: *The Vision and Technical Foundations of Ubiquitous Computing.* To appear in Upgrade, October 2001

Friedemann Mattern: *Ubiquitous Computing - Der Trend zur Informatisierung und Vernetzung aller Dinge*. In: Der Weg in die mobile Informationsgesellschaft, 6. Deutscher Internet-Kongress, dpunkt-Verlag, September 2001

Lars Erik Holmquist, Friedemann Mattern, Bernt Schiele, Petteri Alahuhta, Michael Beigl, Hans-W. Gellersen: *Smart-Its Friends: A Technique for Users to Easily Establish Connections between Smart Artefacts.* In: Proc. Ubicomp 2001, Springer-Verlag, September 2001

Friedemann Mattern, Marc Langheinrich: *Allgegenwärtigkeit des Computers - Datenschutz in einer Welt intelligenter Alltagsdinge*. In: G. Müller, M. Reichenbach (Hrsg.): Sicherheitskonzepte für das Internet, Springer-Verlag, pp. 7-26, Mai 2001

Marc Langheinrich, Friedemann Mattern, Kay Römer, Harald Vogt: *First Steps Towards an Event-Based Infrastructure for Smart Things.* In: Ubiquitous Computing Workshop (PACT 2000), October 15-19, 2000, Philadelphia, PA

Dr. Joe McCarthy

Accenture Technology Labs
3773 Willow Road
Northbrook, IL 60062
USA

Web: *www.accenture.com/xd/xd.asp?it=enWeb&xd=services\technology\people\Joseph_F_McCarthy.xml*
E-mail: *mccarthy@cstar.accenture.com*

Biography

Joe McCarthy is a Senior Researcher with Accenture Technology Labs, where he has been exploring answers to the following question: how can technology help to create, maintain and enhance relationships in the real world? While many researchers are developing technology to support distributed groups and relationships in the virtual world, Joe is more interested in exploring how technology can help support physically co-located groups. In particular, he is investigating how such support can be provided by an active environment: a physical space that can sense and respond appropriately to the people and activities taking place within it.

Prior to joining Accenture in 1996, he was a member of the faculty at the University of Hartford and spent a number of years as an independent consultant. Joe holds a Ph.D. in Computer Science from the University of Massachusetts, an M.S. in Computer Science from RPI, and a B.A. in Philosophy from Ripon College.

Research Interests

The following is a brief description of three of Joe's projects relating to ubiquitous computing:

Ubiquitous Peripheral Displays (UniCast, GroupCast, OutCast): An exploration of a future where video displays will be everywhere, permeating all of our environments, at home, at work, or in public spaces with a special focus on what kinds of content are appropriate in what kinds of contexts.

PocketWatch Tools (PocketWatch, ActiveMap, EventManager): A suite of tools for creating greater awareness of the location and activities of colleagues within a workgroup, with an aim to provide more opportunities for the kind of informal communication that is increasingly crucial to the success of project- and team-oriented work.

MusicFX: A fitness center environment that knows who is working out, what they like to listen to, and dynamically adjusts the music to best suit the group of exercisers at any given time.

See also: *www.accenture.com/xd/xd.asp?it=enWeb&xd=services\technology\people\Joseph_F_McCarthy.xml*

Recent Publications

McCarthy, Joseph F., Tony J. Costa, Edy S. Liongosari. *UniCast, OutCast & GroupCast: Three Steps toward Ubiquitous Peripheral Displays*. To appear in UBICOMP 2001, Atlanta.

McCarthy, Joseph F. *Active Environments: Sensing and Responding to Groups of People*. Journal of Personal and Ubiquitous Computing 5(1):75-77.

McCarthy, Joseph F., Theodore D. Anagnost. *EventManager: Support for the Peripheral Awareness of Events*. In Peter Thomas, Hans W. Gellersen (Eds.) Handheld and Ubiquitous Computing. Proceedings of the Second International Symposium (HUC 2000), Bristol, UK, September 2000. Lecture Notes in Computer Science, Vol. 1927, Springer-Verlag, Heidelberg, pp.227-235.

McCarthy, Joseph F., Eric S. Meidel. *ActiveMap: A Visualization Tool for Location Awareness to Support Informal Interactions*. In Hans W. Gellersen (Ed.) Hand-held and Ubiquitous Computing. Proceedings of the First International Symposium (HUC '99), Karlsruhe, Germany, September 1999. Lecture Notes in Computer Science, Vol. 1707, Springer-Verlag, Heidelberg, pp. 158-170.

McCarthy, Joseph F., Theodore D. Anagnost. *MusicFX: An Arbiter of Group Preferences for Computer Supported Collaborative Workouts*. In Proceedings of the ACM 1998 Conference on Computer Supported Cooperative Work (CSCW '98), Seattle, pp. 363-372.

Prof. Günter Müller

Telematik
University of Freiburg
Friedrichstr. 50
79098 Freiburg
Germany

Web: *www.iig.uni-freiburg.de/%7Emueller/*
E-mail: *mueller@iig.uni-freiburg.de*
Tel: +49 761 203-4964
Fax: +49 761 203-4929

Biography

1976	PhD at University of Duisburg (Semantics of Database Systems)
1977/78	IBM/USA "Postdoc" at Research Laboratory San José, California (System R group)
1978	IBM Deutschland GmbH (Decision Support Systems)
1983	Venia Docendi for Applied Computer Science at the University of Vienna
1985	Founder and Manager of the European Networking Research Center, IBM Heidelberg
1987	Director IBM Europe (Open Networks)
1990	Freiburg University as Founding Director of the Institute of Computer Science and Social Studies and Professor of Telematics
1992/93	Guest scientist at NTT Research, Japan (Security in Telecommunications)
1994	Proposal for Collegium "Security in Communication Technology" of the Gottlieb Daimler und Karl Benz Foundation accepted
1995	Guest scientist at Harvard University, John F. Kennedy School (Security-Regulation for Internet)
1995	Member of the Baden-Württemberg State Parliament's Commission of Enquiry on "Development, Opportunities and Effects of new Information and Communication Technologies in Baden-Württemberg" and of the German Parliament's Commission of Enquiry on "Multimedia". Member of the Scientific Advisory Council of Daimler-Benz
1997/98/00/01	Consultant at Hitachi Security and Electronic Commerce Systems, Yokohama
1998	Guest scientist at the International Computer Science Institute (ICSI), California, USA
1999	DFG proposal (German Research Council) accepted to establish Key Program "Security in Information Technology"; Alcatel guest professor at Darmstadt University (1 year)
2000	Scientific expert adviser at the Federal Government's Conference on "Progressive Governance in the 21. Century"; Technology expert of Ministry of Economics, Berlin
Editor	Wirtschaftsinformatik (WI), Praxis in der Kommunikationstechnik (PIK), Jahrbuch der Telekommunikation, Journal of Universal Computer Science (J-UCS), several Special Issues on Security

Recent Publications

Müller, G.: *Privacy Protecting Addressing in Spontaneous Networks*, Research Report Hitachi SDL Lab 0801, Yokohama, September 2001. Submitted for journal publication.

Müller, G., Rannenberg, K.: *Multilateral Security in Communications*, Volume 3: Technology, Infrastructure, Economy, Addison Wesley 1999

Damker, H., Reichenbach, M., Müller, G.: *Personal Reachability Management in a Network World*, in: IEEE, IWNA98, Kyoto, 1998, pp. 5-3 - 5-9

Müller, G.: *Building Blocks for Secure Systems, in: Japanese Science and Technology Review*, Ministry of Science and Technology, April 1998

Müller, G.: *The Freiburg Communications Assistant Enabling Decentralization and Privacy in Mobile Communications Systems, in: Technology Summit*, Vol. 1., Speakers' Papers, 7th World Telecommunication Forum, Geneva, 3-11 October 1995, pp. 245-249

Prof. Christian Müller-Schloer

Institut für Technische Informatik - Rechnerstrukturen und Betriebssysteme
Universität Hannover
Appelstr. 4
D-30167 Hannover
Germany

Web: *www.irb.uni-hannover.de*
E-mail: *cms@irb.uni-hannover.de*
Tel: +49 511 762 19730/31
Fax: +49 511 762 19733

Biography

Christian Müller-Schloer graduated in 1975 in EE at the Technische Universität Munich where he also received his PhD in 1977. From 1977 through 1990 he was a member of the Siemens Corporate Research Laboratories for Applied Computer Science, Munich. From 1980 - 1982 he was a member of the Siemens Research Laboratories in Princeton, NJ, U.S.A. He is the author of more than 70 papers and three books. Since 1991 he is a Professor at the University of Hanover and director of the Institut für Technische Informatik - Rechnerstrukturen und Betriebssysteme (IRB, Institute of Computer Engineering - Computer Architecture and Operating Systems).

His working experience includes: CAD systems for telecommunications networks, cryptography, VLSI design, RISC processors, workstation architect special purpose simulation multiprocessors, Artificial Life, system design and simulation.

The institute's current main research areas are

- Modeling and simulation of complex heterogeneous technical systems (discrete and continuous), especially embedded control and distributed systems. Virtual prototyping. Real time simulation.
- Ubiquitous Computing
- Educational Technology

Current Activities in Educational Technology and Ubiquitous Computing at IRB

IRB is involved in several cooperation projects in the area of Educational Technology and Ubiquitous Computing. General objective is the utilization of multi media technologies for applications in an academic environment, predominantly for the improvement of teaching. We are working on contents (PROMISE and WWR) as well as on new infrastructure (IMPRESS and I&U Spaces).

PROMISE (1999 - 2001) is a content-oriented project at the universities of Hannover, Braunschweig and Clausthal (PROMISE - Project-oriented multimedia-based learning in EE and CS). We are working on two subprojects:

- Learning module for a systems software course: Starting from an existing UNIX seminar and lecture based on Powerpoint and Interleaf lecture notes, an electronic lecture has been developed. It can be used for presentations as well as for selfstudy.
- Integration of simulation in presentation and selfstudy modules: We will make our multi-domain simulation system ClearSim_MultiDomain available in this context which allows for the modeling and simulation of heterogeneous mechatronic systems - including software and RTOS - (Virtual Prototypes) like cars or telecommunication devices.

WWR (2001 - 2004) is a large cooperation project, sponsored by BMBF, with the objective, to develop electronic multi-media learning modules for the field of computer engineering. The modules are standardized and can be retrieved from a common database. IRB is responsible for 4 learning modules: system software, computer architecture/pipelining, embedded systems and system design. We are especially working on the possibility to integrate simulation into electronic presentations.

IMPRESS (Intelligent Multimedia Presentation System: The objective of the research project is to develop a system that makes possible the simple reusing of multimedia presentations. Computers, operating systems and application programs used today have different data formats that are not always compatible with each other. That makes difficult, often impossible to reuse a multimedia presentation once created or a teaching/learning module. The system will consist of a multimedia database, platform-independent presentation modules and a set of programs for designing and creating of database contents, data structure and presentation layout. These programs must also man-

age presentation modules, parameters and user's profiles. With tools such as XML, Java or PHP for developing of presentation modules it will be possible to reuse multimedia presentations and teaching/learning modules in the form of printout, for display on a PC or a PDA without any additional transformation. The system will be accessible over the Internet.

I&U Spaces aims at building and using a local ubiquitous computing environment on (a part of the) the campus of the University of Hannover. It serves as a testbed for a variety of PhD projects on infra-structure, services and applications in a modern university. The project is centered around the new 3000 m^2 Computer Engineering Building at the University of Hannover housing 4 Computer Engineering institutes. It is equipped with a multimedia lecture hall and a multimedia seminar room, a 100 Mbit / 1 Gbit LAN, a WLAN, Bluetooth islands and current technology laptops, notebooks, PDAs, handhelds as well as PCs, workstations and servers.

The infrastructure will be based on a Java/Jini service architecture. We are especially interested in the idea of virtual associative communication spaces (like JavaSpaces or T Spaces). Questions to be answered are the following: Are existing solutions feasible and stable? Do they perform? Is a single communication space sufficient or is a hierarchy of related spaces necessary? Can the paradigm of tuple space communication be used also for innovative GUIs? How can information stored in an associative space be presented to the user?

We explore the feasibility of the infrastructure by implementing and testing a few services and applications. Scenarios typical for a university environment are:

- Information kiosk or electronic pinboard: large wall mounted displays, touch sensitive screen, user recognition through Java button. User adaptive information offering.
- Information kiosk with local user interaction via PDA/laptop.
- Interactive lecture support based on PDAs with dynamic interaction between lecturer and students. Inclusion of task assignments and simulations in a lecture.
- Ad hoc communication between (accidentally) neighboring devices.

Recent Publications

Bruns, Müller-Schloer: "*An Integrated System-Level Modelling and Simulation Environment for Embedded Control Systems*", ESM 99 Warschau, June 1-4,1999 , pp. 247 - 251

H. Krisp, C. Müller-Schloer: "*Towards a High Level System Design Using UML and Java*", 3. Intern. UML-Konferenz York, U.K., Oct. 2000

C. Müller-Schloer, P. Mähönen: "*The UbiCampus Project: Applying Ubiquitous Computing Technologies in a University Environment*", Proc. IDMS 2000, October 2000, University of Twente, Springer pp 297-303

H. Krisp, J. Bruns, S. Eilers, C. Müller-Schloer: "*Multi-Domain Simulation for the Incremental Design of Heterogeneous Systems*", Proc. ESM 2001, Prague, June 2001, pp. 318-322

Müller-Schloer, C.: "*Ubiquitous Computing: Auf dem Weg zur dritten Generation der Computernutzung*", APS+PC-Nachrichten 2/01 in Client-Server-Computing, August 2001

Dr. Yasuto Nakanishi

Graduate School of Information Systems,
Univ. of Electro-Communications,
Chofugaoka1-5-1, Chofu City,
Tokyo, 182-8585,
Japan

Web:*naka1.hako.is.uec.ac.jp*
E-mail: *naka@is.uec.ac.jp*
Tel:+81 424 43 5653
Fax: +81 424 43 5682

Biography

Yasuto Nakanishi studied mechanical engineering and computer science at Tokyo University and obtained Dr.Eng. He became a research associate in Univ. of Electro-Communications in 1998.

Research Projects

1. CAMS

Many researches have been exploring how to provide awareness information to help distributed collaborators work together smoothly. Especially with the wide spread of mobile phone, some researches have been studying how to give meaningful awareness information to anyone, anywhere in order to facilitate making contact among each other in the mobile environment.

We also developed such a messaging service, CAMS (Context Aware Messaging Service), using location information and schedule information [1][2]. According to the callee's communication context (schedule, location, and available media), our system selects the most suitable telephone number or e-mail address, and redirects each incoming message dynamically. It also writes the schedule and the location information of the users into a HTML file and they share the file on the WWW.

The system consists of a control server with a database for the scheduler, a CTI server, a mail server, and a WWW server. For delivering messages dynamically, the control server updates the settings of the CTI server that has a software PBX and the forwarding lists of the mail server.

For guessing the context of communication and changing the settings adequately, the control server uses the user's location information detected with PHS and the schedule information that the user entered. Each user carries a PHS and a PDA. To obtain location information about each user, the control server posts a cgi message every fifteen minutes to a map database service on the WWW. Together with the service, we can utilize the location detection service of PHS that NTT DoCoMo offers through the WWW. Each user registers rules beforehand about which means of communications is appropriate under what conditions. We use two kinds of rules: ones about locations and ones about types of work at those locations. We prepared a schedule-input form for each user according to the rules. A user inputs a schedule by selecting the time and work contents.

Users share schedules, location information, and available communication devices with each other. When users access our WWW server, a server-side script queries the database in the control server and returns the result as a HTML file, which shows schedule, location information, and available media about all members (see Figure). In the current mobile environment, whether a message arrives appropriately depends on the context of the addressee and on his/her decision. Knowing information about the addressee enables the sender to select the timing or media of communication.

2. An Experiment for CAMS with Small Office Workers

We conducted an experiment with a group of Small Office workers for two months in Tokyo (1999/11-1999/12) and evaluated our system on the basis of interviews and communication log analysis. We interviewed users. Their main opinions about the dynamic message redirection are as follows, 1) It is comforting to know that a call made with our system will not disturb the addressee, 2) It is convenient that a call is forwarded to my PHS just with going out simply carrying a PHS. The users' opinions about the sharing communication contexts are as follows, 1) Knowing the communication context is useful for deciding when to make a call. However, it did not promote to write e-mail instead of calling, 2) Knowing where all the members are raises the team rapport. The analysis of the telephone log showed that the number of unconnected calls decreased and that this system promoted changes in the timing of communication but did the medium of communication.

3. An Experiment for CAMS with Home Office Workers

We conducted the new experiment with a group of home office workers for four weeks in Tokyo (2000/9-2000/10) evaluated our system on the basis of interviews and communication log analysis. The group is comprised of women aged 33 to 36 with children working at home. The experiment users in our previous system were small office workers and the users in this experiment were home office workers. The previous users shared location names where they were, schedules and available communication devices on WWW. However, privacy is clearly an issue of concern when working within the confines of a private home, and we redesigned our system for them. They desired to share simply that each member is at home or not and that each member is working at home or not. As for the home office workers, the distinction between working time and private time would be more vague than small office workers. It was very popular to share both whether users were at their home office and whether they were working at their desks in their office.

4. iCAMS

Users of CAMS pointed out that our system was adaptable for the callees but was not adaptable for callers. We have developed a dynamic address book on WWW for cellular phone, iCAMS (CAMS for i-mode that is a service of NTT DoCoMo) [3]. It sorts an address book using location information and schedule information. It sorts the name list of other members in near order of positions and sorts addresses of the callee according to her current location and schedule. Our system is a WWW server with a database that manages location information and schedule information of users.

Whenever a user accesses to the server, it writes a CHTML file that sorts other users in near order of positions with using latest location information of users. It shows also that others members are moving or not and that which direction they are. When the user clicks a name of another user, the server writes a CHTML file about her situation. It displays telephone numbers and e-mail addresses of the selected user. Those are also sorted by registered rules about locations and schedules. We are going to have an experiment with a group of students for two months in Tokyo (2001/9-2001/10).

Project URL: *www.hako.is.uec.ac.jp/cams/*, *naka1.hako.is.uec.ac.jp/*

CAMS for small office workers.

CAMS for home office workers.

iCAMS

Recent Publications

Yasuto Nakanishi, Takayuki Tsuji, Minoru Ohyama, Katsuya Hakozaki, *Context Aware Messaging Service: a Dynamical Messaging Delivery using Location Information and Schedule Information*, Journal of Personal Technologies, Vol.4, No.4, pp.221-224, 2000.

Yasuto Nakanishi, Takayuki Tsuji, Minoru Ohyama, Katsuya Hakozaki, *Development and Evaluation of Context Aware Messaging Service using Location Information and Schedule Information*, Proceedings of the 7th International Workshop on Mobile Multimedia Communications, 3B-5-1 - 3B-5-7, 2000.

Kazunari Takahashi, Takayuki Tsuji, Yasuto Nakanishi, Minoru Ohyama, Katsuya Hakozaki, *iCAMS : Mobile Communication Tool using Location Information and Schedule Information*, IPSJ DICOMO2001, pp.513-518, 2001. (in Japanese)

See also: *naka1.hako.is.uec.ac.jp/e/epapers.html*

Kurt Partridge

Department of Computer Science and Engineering
Box 352350
University of Washington
Seattle, WA 98105
USA

Web: *www.cs.washington.edu/homes/kepart/*
E-mail: *kepart@cs.washington.edu*
Tel: +1 206 543-5143
Fax: +1 206 543-2969

Biography

Kurt Partridge received a B.S. in Electrical Engineering and Computer Science from the University of California at Berkeley in 1992, and a M.S. in Computer Science from the University of Washington in 1995. He has previously worked at Microsoft Research, Xerox PARC, Daimler-Benz Research and Technology, Hewlett-Packard Labs, and the Rockwell International Science Center. He has worked on problems in ubiquitous computing, safety-critical software engineering, and hardware design and automation.

Research Interests

Kurt Partridge is investigating intrabody signaling, a communications technology that sends imperceptible low-power electrical signals through the human body. Unlike other short-range communication mechanisms, intrabody communication is limited to situations where both transceivers are very close to the person. Kurt's recent activities include the implementation of a 56 kbps transceiver, and a study of the performance when varying body coupling mechanisms, electrode size, body position, and several other factors. He expects to complete his PhD in 2002.

Recent Publications

Partridge, K., Dahlquist, B., Veiseh, A., Cain, A., Foreman, A., Goldberg, J., Foreman, A., Borriello, G.: *Empirical Measurements of Intrabody Communication Performance under Varied Physical Configurations*, UIST 2001, to appear.

Rosencrantz, M., Partridge, K.: *Walk-up Keyboard: An Efficient Low Overhead Interface for Transient Workers*, CHI Student Poster, CHI 2001.

Partridge, K., Arnstein, L., Borriello, G., and Whitted, T.: *Fast Intrabody Signaling*, Demonstration at Wireless and Mobile Computer Systems and Applications (WMCSA), Monterey, CA, December 2000.

Dr. Joachim Posegga

SAP Corporate Research
Vincenz-Priessnitz-Str. 1
D-76131 Karlsruhe
Germany

Web: *www.teco.edu/~posegga/*
E-mail: *posegga@gmx.net*
Tel: +49 721 69020
Fax: +49 6227 78-33907

Biography

Joachim Posegga received his diploma in computer science in 1987 from the University of Kaiserslautern. He then worked for two years for the R&D Division of AEG Informationstechnik in Konstanz on pattern recognition techniques.

In 1988 he joined the Department of Computer Science at Karlsruhe University as a research assistant and PhD student. His main research interests were Deduction System and formal methods. He moved to the Department of Artificial Intelligence at the University of Edinburgh as a visiting researcher in 1990 and came back to Karlsruhe in 1991. He received his PhD from the University of Karlsruhe in 1993 with a thesis covering the relation between Binary Decision Diagrams and Tableau-based calculi.

In 1995 he joined the IT security research branch of Deutsche Telekom, where he was in charge of several security-related research projects on Java security, Java smart cards, and Jini.

Since 2000 Joachim Posegga is in charge of security activities of SAP Corporate Research; his focus is Mobile Security for wireless networks (GSM, 3G), secure mobile transactions, and smart card technology.

Recent Publications

Roger Kehr, Joachim Posegga, Roland Schmitz, and Peter Windirsch: *Mobile Security for Internet Applications*. Arbeitskonferenz Kommunikationssicherheit 2001, Springer LNCS, Springer-Verlag, 2001.

Scott Guthery, Roger Kehr, and Joachim Posegga: *How to turn a GSM SIM into a Web server - Projecting Mobile Trust onto the World Wide Web*. In: Josep Domingo-Ferrer et. al., editor, Proc. CARDIS 2000, Kluwer, 2000.

Günter Karjoth and Joachim Posegga: *Mobile Agents and Telcos' Nightmares*. Annales des Telecomunication, special issue on communications security, 2000.

Joachim Posegga: *Secure Mobile Commerce: A Plug an Pay Approach.* Proc. Micro.tec 2000, EXPO, Hannover, September 2000, VDE Verlag.

Roger Kehr, Joachim Posegga, and Harald Vogt: *PCA - The Personal Card Assistant*. In Rainer Baumgart, editor, CQRE-Secure, Springer Verlag, 1999.

Dr. Calton Pu

CCB, room 269
Georgia Tech, Atlanta
GA 30332-0280
USA

Web: *www.cc.gatech.edu/~calton/*
E-mail: *calton.pu@cc.gatech.edu*
Tel: +1-404-385-1106
Fax: +1-404-385-2295

Biography

Calton Pu was born in Taiwan, but grew up in Brazil. He received his PhD from University of Washington in 1986 and served on the faculty of Columbia University and Oregon Graduate Institute. Currently, he is holding the position of Professor and John P. Imlay, Jr. Chair in Software at the College of Computing, Georgia Institute of Technology. He is leading the Infosphere project, part of the DARPA Information Technology Expedition program. Infosphere is a joint project between Georgia Tech and OGI, plus a number of other collaborators. Infosphere builds on his previous and ongoing research interests. First, he has been working on next-generation operating system kernels to achieve high performance, adaptiveness, security, and modularity, using program specialization, software feedback, and domain-specific languages. This area has included projects such as Synthetix, Immunix, Microlanguages, and Microfeedback, applied to distributed multimedia and system survivability. Second, he has been working on new data and transaction management by extending database technology. This area has included projects such as Epsilon Serializability, Reflective Transaction Framework, and Continual Queries over the Internet. His collaborations include applications of these techniques in scientific research on macromolecular structure data, weather data, and environmental data, as well as in industrial settings. He has published more than 30 journal papers and book chapters, 100 conference and refereed workshop papers, and served on more than 40 program committees, including the co-PC chair of SRDS'95, co-general chair of ICDE'97, and co-PC chair of ICDE'99. He has served as an associate editor of IEEE TKDE, DAPD, and IJODL. His research is currently funded by NSF, DARPA, Intel, and other sources.

Research Projects

Infosphere Project

URL: *www.cc.gatech.edu/projects/Infosphere*

OBJECTIVE

The Infosphere project will develop concepts, techniques, and tools for the next generation systems software in pervasive computing environments. Systems software for such environments must support end-to-end quality of service (QoS) for users and developers, for example, in terms of performance, availability, maintainability, and survivability. The core abstraction is called Infopipe, which supports information flow through a variety of environments with these QoS properties. These pervasive computing environments include high speed networks such as the Next Generation Internet on one end of spectrum, and limited bandwidth wireless connections on the other end. These environments are also characterized by continuous changes that demand stable and responsive systems software adaptation. Infopipe software will support the generation and composition of code to support information flow through these changing environments. Infosphere focuses on the challenges of bringing fresh information from a variety of sensors to new applications such as personalized fresh information delivery for mission-critical operations in urban terrain.

APPROACH

Infosphere contains two major areas of research. The first area, closer to the users, is the set of next generation information-driven applications making full use of fresh information in a pervasive computing environment. Examples of these new applications include real-time sensor-based remote control, networked embedded systems, real-time decision support, ubiquitous personal guidance, micro-region weather forecasting and virtual presence. These services will support real world applications such as precision farming through rough weather and rescue missions in remote areas or hostile territory. To fulfill this vision, proper systems software must support and control the information flow from sensors to applications. The design and construction of this systems software, called Infopipe, is the subject of our second and main area of research.

The design of Infopipes leverages on our experience from the Quasar and Continual Queries (CQ) projects at OGI, as well as the Event Channel and Aware Home projects at Georgia Tech. Quasar project has built and released systems software tools supporting broad-sense quality of service (QoS) using adaptive resource management techniques based on Microfeedback. Continual Queries project has built and released software tools supporting Internet scale information update monitoring and filtering. Event Channel software supports publish/subscribe communications at the middleware level. Aware Home is a real-time sensor laboratory. Infopipes will support QoS properties declared by users. The system will manage resources according to these QoS declarations and competition for these resources. The information-driven applications will use Infopipes as underlying communications infrastructure, and CQ concepts and software as filtering stages aware of application semantics.

In addition to Quasar, CQ, and Event Channel software, Infopipes also will use specialization and domain specific language (DSL) techniques, software, and tools developed in the Synthetix project. An Infopipe will be described by DSL microprograms that declare its input and output type (syntax and semantics), as well as QoS attributes, constraints, and trade-offs. Using these DSL microprograms, the automated generation and composition of Infopipe software will leverage on specialization tools to simplify and speed up the resulting software. Infopipe composition includes the computation of the QoS properties supported by the composite Infopipe, calculated from the QoS properties of the component Infopipes.

The next generation information-driven applications such as precision farming and rescue missions in rough weather depend on timely delivery of fresh information from sensors to information utilities such as micro-region weather forecast models, and finally to end users. Stale sensor information would be of little use in weather prediction. Applications such as Aware Home (a real-time sensor laboratory), real-time decision support, and virtual presence will help us evaluate Infopipe software and tools for Infopipe software generation. The evaluation will include the software generation process, the effectiveness of generated Infopipe software, and the satisfaction of QoS properties by Infopipes such as efficiency, availability, and survivability.

Recent Publications

Dylan McNamee, Jonathan Walpole, Calton Pu, Crispin Cowan, Charles Krasic, Ashvin Goel, Perry Wagle, Charles Consel, Gilles Muller and Renauld Marlet, *Specialization tools and techniques for systematic optimization of system software*, ACM TOCS, Vol. 19, No. 2, May 2001, Pages 217-251

Prof. Kurt Rothermel

Dept. Distributed Systems
University of Stuttgart
Breitwiesenstraße 20 - 22
D-70565 Stuttgart
Germany
Web: *www.informatik.uni-stuttgart.de/ipvr/vs/personen/rothermel.html*
E-mail: *Kurt.Rothermel@informatik.uni-stuttgart.de*
Tel: +49 711 7816 434
Fax: +49 711 7816 424

Biography

Kurt Rothermel received his doctoral degree in Computer Science from Stuttgart University in 1985. From 1986 to 1987 he spent a sabbatical at the IBM Almaden Research Center in San Jose, and joined IBM's European Networkting Center in 1988. He left IBM in 1990 to become a Professor for Computer Science back at Stuttgart University.

Research Interests

Kurt Rothermel leads the Distributed Systems Research Group at the Department of Distributed Systems. His current interests focus on infrastructures for ubiquitous computing, distributed systems, communication protocols, in particular location aware systems.

Nexus-Project

Spatial-aware systems know the position of the objects they model, e.g. the positions of their users. A wide area of new applications arises, if it is additionally possible to augment the real world models by virtual objects, such as, for example, "Virtual Post-Its". The objective of Nexus is to develop generic system functions, which support spatial-aware systems and an augmented model of the real world. These functions will allow to create an augmented world model, to integrate existing and new information services into this model and to interact with it. Changes in the real world, e.g. position changes, are observed by sensor systems and propagated to the model, which will be updated accordingly. The Nexus project started in November 1998 with funding from the Government of Baden-Württemberg. Since January 2000 it is a research group of the DFG. See *www.nexus.uni-stuttgart.de/*

Canu Project: Communication in Ad Hoc Networks for Ubiquitous Computing

In the CANU project the challenges of communication in ad hoc networks are addressed with respect to ubiquitous computing scenarios. The context-awareness of ubiquitous computing applications is manifested in a model of the environment. This model is called "experience" reflecting the perception and interaction of a node with its environment. The exchange of such model data between nodes as well as querying information of other nodes via the experience decouples the application from various information sources, e.g. sensors, user input, model updates with other nodes. Currently the focus of CANU is on designing an appropriate generic structure of the experience along with basic algorithms, e.g. information diffusion for model updates or routing of queries to a location offering the most current state of the information. Another objective of CANU is the investigation of the influence of such a generic information exchange model to application architectures.

Recent Publications

A. Leonhardi, K. Rothermel. *A Comparison of Protocols for Updating Location Information*. In Batzer Cluster Computing Journal, Special Issue on Spatial Location in Networking, 2001, to appear

F. Hohl, U. Kubach, A. Leonhardi, K. Rothermel, M. Schwehm. *Next Century Challenges: Nexus - An Open Global Infrastructure for Spatial-Aware Applications*. In Proceedings of the Fifth Annual International Conference on Mobile Computing and Networking (MobiCom '99), pp. 249-255, Seattle, WA, USA, August 1999

A. Leonhardi, U. Kubach, K. Rothermel, A. Fritz. *Virtual Information Towers - A Metaphor for Intuitive, Location-Aware Information Access in a Mobile Environment*. In Proceedings of the Third International Symposium on Wearable Computers (ISWC'99), pp. 15-20, San Fransisco, CA, USA, October 1999

U. Kubach, K. Rothermel. *An Adaptive, Location-Aware Hoarding Mechanism*. In Proceedings of the 5th IEEE Symposium on Computers and Communications (ISCC 2000), pp. 615-620, Antibes, France, July 2000

U. Kubach, K. Rothermel. *Exploiting Location Information for Infostation-Based Hoarding*. In Proceedings of the 7th Annual International Conference on Mobile Computing and Networking (MobiCom 2001), Rome, Italy, July 16-21, 2001

Prof. Bernt Schiele

Department of Computer Science
ETH Zurich (Federal Institute of Technology)
Haldeneggsteig 4, IFW B26.1
CH-8092 Zurich
Switzerland

Web: *www.vision.ethz.ch/schiele/* und *www.vision.ethz.ch/pccv/*
E-mail: *schiele@inf.ethz.ch*
Tel: +41 1 632 06 68
Fax: +41 1 632 15 96

Biography

Bernt Schiele is assistant professor at the computer science department of ETH Zurich (Swiss Federal Institute of Technology). He studied computer science at the University of Karlsruhe, Germany. He worked on his master thesis in the field of robotics in Grenoble, France, where he also obtained the "diplome d'etudes approfondies d'informatique". In 1994 he worked in the field of multi-modal human-computer interfaces at CMU, Pittsburgh, PA, USA in the group of Alex Waibel. In 1997 he obtained his PhD from INP Grenoble, France under the supervision of Prof. James L. Crowley in the field of computer vision. The title of his thesis was "Object Recognition using Multidimensional Receptive Field Histograms". Between 1997 and 1999 he was been with the group of Prof. Alex Pentland at the MIT Media Laboratory, Cambridge, MA, USA.

Research Overview

Perceptual Computing in general and Computer Vision in particular have great potentials to change the way we interact with computers and how machines such as robots perceive the outgoingworld. Over the last three decades significant progress has been made in computer vision. Robustness of perception and vision algorithms however is a notorious problem and one of the major bottlenecks for industrial applications. At the same time there is little doubt that in the next decades small and inexpensive sensors will be developed and embedded in many devices. Our hypothesis is that the integration of multiple features and sensors facilitates robustness in environments of realistic complexity.

The research themes of our group are consequently concerned with the development of methods for the integration of different vision models and sensor modalities. A first research focus is the robust combination of different visual cues and models in the context of object recognition and classification. As a second research focus we develop vision systems since any vision algorithm and in particular integration should be always evaluated from a complete system's perspective. As a third research direction, multi sensor integration methods are applied to the areas of ubiquitous and wearable computing.

A main focus is therefore to propose methods which are robust and general enough to be used for real-world applications such as ubiquitous and wearable computing. At the same time I am convinced that "sensory augmented computing" (as I call it) may fundamentally change the way we interact with computers [3,4].

As pointed out earlier there is little doubt that future computing devices may have access to a multitude of sensors including cameras. Such sensors may be for example part of many small ubiquitous devices attached to everyday objects such as personal belongings, goods in a store, or parts of a processing chain. In the context of the European project "Smart-Its: Interconnected Embedded Technology for Smart Artifacts with Collective Awareness" we develop perception methods for distributed perception and collective context-awareness. The developed devices - dubbed Smart-Its - can be thought of as the nerve endings to a situated computing backbone serving as a platform for context-aware applications, appliances and artifacts. The "distributed systems" group headed by Prof. Mattern is one of five partners in this project.

The polyproject "Wearable Computing" is a joint effort of five groups at ETH. In this project a highly configurable wearable computer platform is developed. Different sensors (such as cameras and microphones) are used to model and recognize the current context in which the wearer of the system is acting. Such context information will be used to dynamically configure the system. An important challenge is to achieve an optimal compromise between availability of functionality and the consumption of the limited resource battery power. Also it is expected that context-awareness will allow to implement more natural human-computer interactions.

References

Sensory-Augmented Computing: Wearing the Museum's Guide. Bernt Schiele, Tony Jebara, and Nuria Oliver. IEEE Micro, pp 44-52, May/June 2001.

An Interactive Computer Vision System - DyPERS: Dynamic Personal Enhanced Reality System. Bernt Schiele, Nuria Oliver, Tony Jebara and Alex Pentland. In ICVS'99 International Conference on Vision Systems.

Sensory Augmented Wearable Computing and its Potential for Human-Computer Interaction. Bernt Schiele. In HCII, August 2001.

Visual contextual awareness in wearable computing. Thad Starner, Bernt Schiele and Alex Pentland. In ISWC, IEEE International Symposium on Wearable Computing, October 1998.

Recognition without Correspondence using Multidimensional Receptive Field Histograms. Bernt Schiele and James L. Crowley. IJCV - International Journal of Computer Vision. 36(1), p 31-50, January 2000

Albrecht Schmidt

Computing Department
Lancaster University
Lancaster, *UK*
LA1 4YR

Web: *www.comp.lancs.ac.uk/~albrecht/*
E-mail: *albrecht.schmidt@acm.org*
Tel: +44 (0) 1524 593786
Fax: +44 (0) 1524 593608

Biography

Albrecht Schmidt received an MSc in Computing from Manchester Metropolitan University (UK) in 1996; in 1997 he finished his Master in computer science at the University of Ulm (Germany). As a research assistant he was working towards a PhD at TecO, University of Karlsruhe (Germany) from 1998 to 2001. He changed to Lancaster University (UK) where he is in now the final year of his PhD. Albrecht Schmidt is working in the area of situated interaction and context-awareness in the research field of ubiquitous computing.

Research Interests

Albrecht Schmidt is interested in the use of sensors to gain context, models and mechanisms to distribute and provide context, and the resulting implications for human computer interaction.

Albrecht Schmidt had a leading role in hard- and software development for the European project 'Technology for Enabling Awareness (TEA)'. In the project a component that can supply context information to mobile devices, such as mobile phones, PDAs, and wearable computers was developed. The context is calculated from a number of different sensors (e.g. light, acceleration, temperature, microphones, touch) using a microcontroller.
www.teco.edu/tea/

He was also working on further projects such as 'Aware Goods' and 'Implicit Human Computer Interaction in Wearable Computing'. These projects that were conducted in cooperation with SAP research explored the uses of context in business applications.

Currently Albrecht Schmidt is involved in the project 'Smart-Its' that envision small-scale smart devices that can be attached to mundane everyday artefacts to augment these with a "digital self". *www.smart-its.org/*

Recent Publications

A. Schmidt, K.A. Aidoo, A. Takaluoma, U. Tuomela, K. Van Laerhoven and W. Van de Velde, *Advanced Interaction in Context*, Proc. of First International Symposium on Handheld and Ubiquitous Computing (HUC99), Karlsruhe, Germany, September 1999, LNCS 1707, Springer-Verlag, pp. 89-101.

A. Schmidt, M. Beigl and H.W. Gellersen, *There is more to context than location*, Computer & Graphics 23(6), December 1999, pp. 893-901.

A. Schmidt, *Implicit Human-Computer Interaction through Context*, Personal Technologies 4(2&3), June 2000, pp. 191-199.

A. Schmidt, A. Takaluoma and J. Mäntyjärvi, *Context-Aware Telephony over WAP*, Personal Technologies 4(4), December 2000. pp. 225-229.

A. Schmidt, and K. Van Laerhoven, *How to Build Smart Appliances?*, IEEE Personal Communications 8(4), August 2001.

Dr. Jean Scholtz

Visualization and Usability Group
National Institute of Standards and Technology
100 Bureau Drive, MS 8940
Gaithersburg, MD 20899
USA

E-mail: *Jean.Scholtz@nist.gov*
Tel: +1 301-975-2520

Biography

Dr. Scholtz has a PhD in Computer Science from the University of Nebraska - Lincoln where her main interests were in human-computer interaction. Dr. Scholtz was on the Computer Science faculty at Portland State University where she established a masters' track in Human -Computer Interaction. She worked as a usability professional at Intel focusing on usability and user requirements for desktop video products. She also was a consultant, working for UserWorks, Inc. Currently, Dr. Scholtz is a Computer Scientist at the National Institute of Standards and Technology (NIST) where she is concerned with the evaluation of interactive systems. She has been on detail for the past several years to the Defense Advanced Projects Research Agency (DARPA) where she managed the Ubiquitous Computing efforts.

Research Interests

Ubiquitous Computing (DARPA). *www.darpa.mil/ito/research/uc/index.html*
This exploratory work funded five universities and focused the efforts on the following areas: Invisible User Interfaces, Virtual Information Space Interaction, Task Mobility, Nomadic Data Access, Adaptable Architectures for Vastly Diverse Devices. This work is currently being supplemented by funded from over 20 industrial organizations.

Remote Assessment of Web Sites for Usability (NIST). *www.nist.gov/webmetrics*
The objective of the NIST Web Metrics Testbed is to explore the feasibility of a range of tools and techniques that support rapid,remote, and automated testing and evaluation of website usability. The prototypes are used to support the usability engineering research of the Visualization and Usability Group (VUG). As part of the Information Access Division of the Information Technology Laboratory at the National Institute of Standards and Technology, VUG encourages industry to use and/or commercialize its ideas.

Industry Usability Reporting Project (NIST). *www.nist.gov/iusr*
In October of 1997, the U.S. National Institute of Standards and Technology (NIST) initiated an effort to increase the visibility of software usability. Cooperating in the IUSR project are prominent suppliers of software and representatives from large consumer organizations. The goals of the initiative are:

- Encourage software suppliers and consumer organizations to work together to understand user needs and tasks.
- Develop a common usability reporting format for sharing usability data with consumer organizations.
- Conduct a pilot trial to determine how well the usability reporting format works and to determine the value of using this format in software procurement.

Recent Publications

Scholtz, J. 2001. *Ubiquitous Computing in the Military Environment.* Aerosense, 2001. Orlando, Fl.

Scholtz, J. 2001. *Ubiquitous Computing.* The Future of Software. Winter 2000/2001 Issue. Vol. 1 (1), 41.

Mills, K. and Scholtz, J. 2001. *Situated Computing: The Next Frontier for HCI Research.* In John Carroll (Ed.) Human-Computer Interaction in the New Millennium. ACM Press: New York. 537-548.

Scholtz, J. (in press) *Ubiquitous Computing goes Mobile.* ACM Mobile Computing and Communications Review.

Prof. Burkhard Stiller

Computer Engineering and Networks Laboratory, TIK
Swiss Federal Institute of Technology, ETH Zurich
Gloriastrasse 35
CH - 8092 Zurich
Switzerland

URL: *www.tik.ee.ethz.ch/~stiller/*
E-mail: *stiller@tik.ee.ethz.ch*

Biography

Prof. Dr. Burkhard Stiller received his diploma degree in computer science and his doctoral degree from the University of Karlsruhe, Germany in October 1990 and February 1994, respectively. From January 1991 until September 1995 he has been a Research Assistant at the Institute of Telematics, University of Karlsruhe, being on leave in 1994/95 for a one-year EC Research Fellowship at the University of Cambridge, Computer Laboratory, England. From November 1995 until July 1999 he was with the Computer Engineering and Networks Laboratory TIK, Swiss Federal Institute of Technology ETH Zurich, Switzerland as a Research Associate and Lecturer for multimedia communications. Since August 1999 he is an Assistant Professor at the same institution in the area of Communication Middleware, where he is the co-head of the communication systems group.

Research Interests

Aside from a number of project management tasks and participation in national research projects of Germany, Switzerland, and the United Kingdom, Burkhard Stiller's primary research interests include architectures for multimedia communication subsystems, charging and accounting methods for the Internet, pricing schemes, Quality-of-Service (QoS) models, resource reservation, mobile communications and AAA (Authentication, Authorization, and Accounting), transport protocols, and tele-teaching.

The main objectives for reserach work on *charging packet-based network services and technology* are based on initial TIK contributions in this field, cover the Swiss projects CATI (Charging and Accounting Technology for the Internet) and ANAISOFT (Advanced Network and Agent Infrastructure for the Support of Federations of Workflow Trading Systems) as well as the 5th Framework European Union project M3I (Market Managed Multi-service Internet) and encompass the following ones. Within end-systems communication middleware needs to offer proper mechanisms to perform service-oriented charging in support of high-quality Internet transport services and content provisioning. Concerning the customer care side in addition, advanced middleware will hide the end-user completely from technological details, such as Integrated or Differentiated Services Internet, but will offer customer-oriented value-added services.

Once appropriate mechanisms are in place, efficienctly implemented, and flexible enough to back the wide range of services, the price setting for services and content needs to be investigated. They need to cover usage-sensitive approaches dealing with market-driven situations, competitive offers, and highly dynamic pricing schemes to identify user reaction and behavior depending on service prices. The characterization of demand and utilities, in a flow-based and aggregated fashion, and cost modeling will form the basis for incentive compatible and efficient pricing models applicable in a multi-provider Internet. Finally, the interconnection of Internet Service Providers (ISP) opens the area on handling, designing, and maintaining Internet Service Level Agreements (SLA). As traditional telecommunication SLAs can not be applied directly, a set of adapted and newly designed technical functions, buisness-oriented information, and contractual data need to be established for the interconnection of ISPs.

Major contributions on research work on *mobility and AAA (Authentication, Authorization, and Accounting)* work, mainly in the context of the 5th Framework European Union project Moby-Dick encompass the following areas. To define, implement, and evaluate an IPv6-based mobility-enabled end-to-end QoS architecture starting from the current IETF's (Internet Engineering Task Force) QoS models, Mobile-IPv6, and AAA framework requires a common architecture integrating QoS, IPv6 mobility, and AAA (out of the separate architectural approaches for each component currently provided by the IETF) with respect to wireless issues. The architecture in a testbed will comprise UMTS (Universal Mobile Telecommunications System), IEEE 802.11 Wireless LANs (Local Area Netorks), and Ethernet. In case the existing applications or the underlying architectures do not provide what is required, the necessary modification will be undertaken.

In addition, the definition of a suitable charging concept which will enable permanent mobile IP based sservices on a large scale, which is a strong requirement related to AAA, but currently not a formally established topic within the IETF.

Recent Publications

M. Karsten, J. Schmitt, B. Stiller, L. Wolf: *Charging for Packet-switched Network Communication - Motivation and Overview;* The Computer Communications Journal, March 2000, Vol. 23, No. 3, pp 290-302.

B. Stiler, P. Reichl, S. Leinen: *Pricing and Cost Recovery for Internet Services: Practical Review, Classification, and Application of Relevant Models;* Netnomics - Economic Research and Electronic Networking, September 2001, Vol.3, No.2, pp 149-171.

B. Stiller, J. Gerke, P. Reichl, P. Flury: *A Generic and Modular Internet Charging System for the Cumulus Pricing Scheme;* Journal of Network and Systems Management, September 2001, Vol.3, No. 9, pp 293-325.

B. Stiller: *A Survey of Charging Internet Services;* in "Management Aspects of IP", IEEE Book Series in Telecommunications Network Management, S. Aidarous, T. Plevyak (edts.), November 2001, to appear.

P. Reichl, B. Stiller: *Edge Pricing in Space and Time: Theoretical and Practical Aspects of the Cumulus Pricing Scheme;* 17th International Teletraffic Congress (ITC 2001), September 23-27, 2001, Salvador da Bahia, Brazil, to appear.

R. Haas, P. Droz, B. Stiller: *Distributed Service Deployment over Programmable Networks;* 12th IEEE/IFTP International Workshop on Distributed Systems: Operations and Management (DSOM 2001), Nancy, France, October 15-17, 2001, to appear.

Hasan, J. Jähnert, S. Zander, B. Stiller: *Authentication, Authorization, Accounting, and Charging for the Mobile Internet;* The Mobile Summit, September 10-12, 2001, Barcelona, Spain, to appear.

Dr. Dr. Norbert Streitz

Fraunhofer IPSI
Dolivostr. 15
D-64293 Darmstadt

Web: *www.ipsi.fraunhofer.de/~streitz*
www.ipsi.fraunhofer.de/ambiente
E-mail: *streitz@ipsi.fraunhofer.de*
Tel: +49 6151-869-919
Fax: +49 6151-869-963

Biography

Dr. Dr. Norbert A. Streitz (Ph.D. in physics, Ph.D. in psychology) is the manager of the research division "AMBIENTE - Workspaces of the Future" (*www.darmstadt.gmd.de/ambiente*) of the Integrated Publication and Information Systems Institute (IPSI) in Darmstadt which is one of the eight institutes of the German National Research Center for Information Technology (GMD) which was merged with the Fraunhofer organisation in August this year. He teaches also at the Technical University Darmstadt in the Department of Computer Science.

He has published 15 books and more than 90 technical publications. He is a regular member of the program committees of the relevant national and international conferences in Human-Computer-Interaction, Hypermedia, CSCW and CSCL, as well as Ubiquitous Computing and Augmented Reality. He is an associate editor of the journal ACM Transactions on Information Systems (TOIS) and one of the editors of the journal Personal and Ubiquitous Computing. He is often asked to present seminars and tutorials, invited talks and keynote speeches in Europe, the US, South America and Japan, and is a reviewer/consultant for the European Commission.

Research Interests

His general research interests are Computer-Supported Cooperative Work (CSCW), Human-Computer-Interaction (HCI), Hypertext/Hypermedia (HT/HM). Since 1997, he is also working on ubiquitous computing and augmented reality in the context of his ideas on Cooperative Buildings that are based on the integration of real and virtual worlds resulting in hybrid worlds. As part of this, he organized also the First and the Second International Workshops CoBuild'98 in Darmstadt and CoBuild'99 in Pittsburgh.

Together with his team in the AMBIENTE division, he developed the "Roomware" (*www.roomare.de*) concept and its first instantiation, the i-LAND environment, an interactive landscape for creativity and innovation. He is the initiator and coordinator of the R&D consortium "Future Office Dynamics (FOD)" (*www.future-office.de*), a joint activity with selected companies from German industry. One result of this cooperation is the Second Generation of Roomware components.

Since January 2001, he is the chair of the Steering Group of the EU-funded proactive initiative "The Disappearing Computer" (DC) with 16 projects (*www.disappearing-computer.net*) and also the project manager of the DC project "Ambient Agoras: Dynamic Information Clouds in a Hybrid World" (*www.Ambient-Agoras.org*).

Recent Publications

N. A. Streitz, P. Tandler, C. Müller-Tomfelde, S. Konomi (2001). *Roomware: Towards the Next Generation of Human-Computer Interaction based on an Integrated Design of Real and Virtual Worlds.* In: J. A. Carroll (Ed.), Human-Computer Interaction in the New Millennium, Addison Wesley, 2001, pp. 553-578.

N. A. Streitz, J. Geißler, T. Holmer, S. Konomi, C. Müller-Tomfelde, W. Reischl, P. Rexroth, P. Seitz, R. Steinmetz (1999). *i-LAND: An Interactive Landscape for Creativity and Innovation.* In: ACM Conference on Human Factors in Computing Systems (CHI'99) (Pittsburgh, PA, USA, May 15-20, 1999), pp. 120-127.

S. Konomi, C. Müller-Tomfelde, N. A. Streitz (1999). *Passage: Physical Transportation of Digital Information in Cooperative Buildings.* In: N. Streitz, J. Siegel, V. Hartkopf, S. Konomi (Eds.). Cooperative Buildings - Integrating Information, Organizations, and Architecture. Proceedings of the Second International Workshop (CoBuild'99) LNCS 1670, Heidelberg, Springer, 1999, pp. 45-54.

N. A. Streitz, J. Geißler, T. Holmer (1998). *Roomware for Cooperative Buildings: Integrated Design of Architectural Spaces and Information Spaces.* In: Streitz, N., Konomi, S., Burkhardt, H. (Eds.), Cooperative Buildings - Integrating Information, Organization, and Architecture. Proceedings of CoBuild '98, Darmstadt, Germany, LNCS Vol. 1370, Heidelberg, Germany, Springer, 1998, pp. 4-21.

Prof. Theo Ungerer

Institute of Computer Science
University of Augsburg
Eichleitnerstr. 30
D-86159 Augsburg
Germany

Web: *www.Informatik.Uni-Augsburg.DE/sik/* (German)
goethe.ira.uka.de/people/ungerer/ (English)
E-mail:*ungerer@informatik.uni-augsburg.de*
Tel: +49-821-598-2350 / 2351
Fax: +49-821-598-2359

Biography

Theo Ungerer studied mathematics and computer science at the Universities of Heidelberg and Zürich and at the Technical University of Berlin. He was scientific assistant at the University of Augsburg (1982-89 and 1990-92), visiting assistant professor at the University of California, Irvine (1989-90), professor of computer architecture at the University of Jena (1992-1993) and the Technical University of Karlsruhe (1993-2001). Since April 2001 he is Chair of Communication Systems at the University of Augsburg, Germany.

Research Interests

His current research interests are in the areas of processor architecture, embedded real-time systems, and ubiquitous systems. Currently his main research project is the *Komodo Project*, which investigates real-time Java based on a multithreaded Java microcontroller.

For more information on the Komodo Project see:

www.informatik.uni-augsburg.de/lehrstuehle/info3/research/komodo/indexEng.html

Recent Publications

S. Fuhrmann, M. Pfeffer, U. Brinkschulte, J. Kreuzinger, Th. Ungerer: *Real-time Garbage Collection for a Multithreaded Java Microcontroller*. 4th IEEE Int. Symposium on Object-oriented Real-time Distributed Computing (ISORC 2001), Magdeburg, May 2-4, 2001.

J. Kreuzinger, A. Schulz, M. Pfeffer, T. Ungerer, U. Brinkschulte, C. Krakowski: *Real-time Scheduling on Multithreaded Processors.* Symposium on Real-Time Computing Systems and Applications (RTCSA), Cheju Island, South Korea, December 2000, 155-159.

U. Brinkschulte, C. Krakowski, J. Kreuzinger, T. Ungerer: *A Multithreaded Java Microcontroller for Thread-Oriented Real-Time Event-Handling*. International Conference on Parallel Architectures and Compilation Techniques (PACT), Newport Beach, October 1999, 34-39.

J. Silc, B. Robic, Th. Ungerer: *Processor Architecture - From Dataflow to Superscalar and Beyond*. Springer-Verlag, Berlin, Heidelberg, New York 1999.

Dr. Roy Want

Intel Research
2200 Mission College Blvd
Santa Clara, CA 95052-8119
USA

Web: ***www.ubicomp.com/want***
E-mail: ***roy.want@intel.com***
Tel: 408 765 9204
Fax: 408 653 9861

Biography

Roy Want is a Principal Engineer at Intel Research in Santa Clara, California. His interests include ubiquitous computing, wireless protocols, hardware design, embedded systems, distributed systems, automatic identification and micro-electromechanical systems (MEMS).

Want received his BA in computer science from Churchill College, Cambridge University, UK in 1983 and continued research at Cambridge into reliable distributed multimedia-systems. He earned a PhD in 1988. While at Olivetti Research (1988-91) he developed the Active Badge, a system for automatically locating people in a building. He joined Xerox PARC's Ubiquitous Computing program in 1991 and lead a project called PARCTab, one of the first context-aware computer systems. At PARC Want managed the Embedded Systems group and earned the position of Principal Scientist. A more complete summary of his work can be found at ***www.ubicomp.com/want***.

Research Interests

Mobile computing, hardware design, electronic commerce, smart cards, distributed systems, multimedia systems, fast networking, location finding systems, cellular automata, extreme user interfaces, MEMS, electronic tagging.

Five most relevant papers for this workshop

"Bridging Real and Virtual Worlds with Electronic Tags", Roy Want, Ken Fishkin, Beverly Harrison, Anuj Gujar. Proceedings of ACM SIGCHI. May 1999, Pittsburgh, pp370-377 (supporting video available).

"Embodied User Interfaces for Really Direct Manipulation", Communications of the ACM, Sept. 2000, Vol.43 No.9, pp75-80, Ken Fishkin, Anuj Gujar, Beverly Harrison, Tom Moran and Roy Want.

"An Overview of the Parctab Ubiquitous Computing Experiment", IEEE Personal Communications, December 1995, Vol 2. No.6, pp28-43 Roy Want, Bill Schilit, Norman Adams, Rich Gold, David Goldberg, Karin. Petersen, John Ellis, Mark Weiser.

"Context-Aware Computing Applications", Bill Schilit, Norman Adams, Roy Want, Workshop on Mobile Computing, Dec 94, Santa Cruz

"The Active Badge Location System", Roy Want, Andy Hopper, Veronica Falcao & Jon Gibbons, ACM Transactions on Office Information Systems (TOIS) Vol. 10. N0. 1, Jan 1992 Pages 91-102

Andreas Zeidler

Database and Distributed Systems Research Group
Department of Computer Science
Darmstadt University of Technology
Wilhelminenstr. 7
64283 Darmstadt
Germany

E-mail: *az@informatik.tu-darmstadt.de*
Tel: +49 6151 16-6233
Fax: +49 6151 16-6229

Biography

Andreas Zeidler studied Computer Science at the Darmstadt University of Technology and became a Faculty Research Assistant in 1998 and is currently working on his Ph.D. and is, mostly, a nice guy.

Research Interests

As a member of the Distributed Systems Research Group Andreas Zeidler is focusing on infrastructures for ubiquitous/pervasive computing. Here, models and concepts for Internet based computing and RPC-less computation are of great interest. As part of this interest he visited the Hewlett-Packard cooltown research group earlier this year and there he worked for Tim Kindberg and John J. Barton on an infrastructure for small ("naïve") devices based on the notion of "content-oriented computing".

Other interests include user interface design, context aware applications, as well as security issues in pervasive computing.

Recent Publications

Roger Kehr and Andreas Zeidler: *Look Ma, My Homepage is Mobile!* In: Personal Technologies, Vol.4, No.4, 2000

Andreas Zeidler: *User Interface Design for Ubiquitous Computing - W@PNotes, an Example*, Report on ongoing research, CHI2001 Workshop on "Distributed and Disappearing User Interfaces for UbiComp", April 1st and 2nd, 2001, Seattle, USA.

Dr. Thomas Ziegert

T-Nova Deutsche Telekom Innovationsgesellschaft mbH
Technology center
Am Kavalleriesand 3
D-64295 Darmstadt
Germany

E-mail: *Thomas.Ziegert@t-systems.de*
Tel: +49 6151 83-18736
Fax: +49 6151 83-19758

Biography

Thomas Ziegert received his diploma and Ph.D. in computer science from the Dresden University of Technology, Germany, in 1995 and 1999. Until 2001 he worked at the aforementioned university as a researcher in the fields of mobile and ubiquitous computing.

In August 2001 he joined T-Nova Deutsche Telekom Innovationsgesellschaft mbH, Technologiezentrum, Darmstadt, Germany. His primary research interests include ubiquitous computing, mobile computing, traffic telematics, and mobile agents.

Research Interests

Ubiquitous computing, mobile computing, traffic telematics, and mobile agents.

Thomas worked in several projects including mobile computing middleware, mobile agents in traffic telematics and content adaptation for pervasive computing devices.

Recent Publications

Sven Buchholz, Thomas Ziegert, Alexander Schill and Albert Held: *Transaction Processing in a Mobile Computing Environment with Alternating Client Hosts*, 10th IEEE Workshop on Research Issues in Data Engineering - RIDE2000 in Conjunction with IEEE ICDE 2000, February 27-28, 2000, San Diego, CA, USA

Albert Held, Thomas Ziegert: *Service Mobility - A new Feature of Mobile Computing*, Integrated Computer-Aided Engineering, Vol. 6, No. 2, 1999, pp. 131-142

Alexander Schill, Albert Held, Thomas Ziegert, Thomas Springer: *A partitioning model for applications in mobile environments*, Proceedings of the Mobile Agents in the Context of Competition and Cooperation (MAC3) Workshop at Autonomous Agents 1999, pp. 34-41

Alexander Schill, Sascha Kummel, Thomas Springer, Thomas Ziegert: *Two Approaches for an Adaptive Multimedia Transfer Service for Mobile Environments*, Computers & Graphics, An International Journal, Vol. 23, No. 6, 1999, pp. 849-856