

PERVASIVE



2 0 0 4



GENERAL INFORMATION

Sponsors and Partners

Sponsors and Partners



BM für Verkehr Innovation und Technologie
<http://www.bmvit.gv.at>



SIEMENS
<http://www.siemens.de>



ONE
<http://www.one.at>



Forschungsförderungsfonds
<http://www.fff.co.at>



Land Oberösterreich
<http://www.ooe.gv.at>



Stadt Linz
<http://www.linz.at>



Stadt Wien
<http://www.wien.at>



ARS ELECTRONICA
<http://www.aec.at>

GENERAL INFORMATION

Table of Contents

Organisation



Institut für Pervasive Computing

Johannes Kepler Universität Linz
Altenberger Straße 69
A-4040 Linz
www.soft.uni-linz.ac.at

2-15

General
Information

16-19

Doctoral
Colloquium

10-25

Workshops
Tutorials

26-31

Sessions

32-34

Hot Spots

35-37

Videos

38-40

Demonstrations

41

Information
for Presenters

42-43

Social
Program



Österreichische Computer Gesellschaft

Wollzeile 1-3
A-1010 Vienna
www.ocg.at

General Contact



Alois Ferscha
Institut für Pervasive Computing
Johannes Kepler Universität Linz
Altenberger Str. 69
A-4040 Linz
Tel.: +43-732-2468-8556
Fax.: +43-732-2468-8426
Email: ferscha@soft.uni-linz.ac.at



GENERAL INFORMATION

Welcome

Friedemann Mattern, General Chair

ETH Zurich, Switzerland

Welcome to PERVASIVE 2004, the International Conference on Pervasive Computing!

We are living in exciting times - with processors and sensors being embedded into more and more everyday objects and with real-world objects that are able to communicate with each other and to interact with global networks and services, the vision of "smart appliances" and "smart spaces" is now becoming a reality.

The research challenges, efforts, and contributions in pervasive computing have experienced a breathtaking acceleration over the past couple of years, not only due to the technological progress, but also due to a shift of paradigms in computer science in general - issues such as context-awareness, autonomy, and everywhere interfaces are becoming more and more important. For this reason we started organizing the PERVASIVE conference series two years ago in Zurich as a premier forum for the presentation of the most recent and most advanced research results in all fundamental and applied areas of pervasive computing.

PERVASIVE 2004, taking place in the lively city of Vienna, is the second conference of this series. It will provide a forum for forward-thinking experts from industry and academia around the world to discuss topics ranging from ubiquitous computing architectures to ambient intelligence systems, from networked embedded systems to smart appliances and from new interaction models to social issues and emerging business scenarios.

Chairing an excellent array of international program committee members, my esteemed colleague Alois Ferscha has done an outstanding job of attracting the highest quality submissions worldwide and selecting the very best ones for presentation at PERVASIVE 2004. Sincere thanks to him and all the others who worked hard to make this event possible!

I hope that you will enjoy the conference and I wish you a great time in Vienna!

Friedemann Mattern, General Chair



GENERAL INFORMATION

Welcome

Alois Ferscha, Program Chair

Johannes Kepler Universität Linz, Austria

Much of what meant to be modern in the twentieth century emerged initially (and often somewhat dramatically) from the place where we have the pleasure to hold PERVASIVE 2004 – from Vienna. At the fin-de-siècle (the turn-of-the-century, around 1900) an amazing burst of creativity evolved from this city with contributions to linguistic philosophy (Wittgenstein), literature (Kraus, Kokoschka, Musil), psychoanalysis (Freud), music (Schönberg, Mahler, Berg), architecture and urban planning (Wagner, Olbrich, Loos) and applied arts (Klimt, Hoffmann, Moser) – to name a few.

It is a great honour to welcome you to the 2nd International Conference on Pervasive Computing – PERVASIVE 2004 – here in Linz and Vienna, Austria – short after another fin-de-siècle.

Pervasive Computing, at the confluence of technological progress and the growing availability of miniaturized and embedded information and communication technologies, is well on its way to define a whole new era of computing. Autonomous, ad-hoc networked, wirelessly communicating and spontaneously interacting computing devices and environments are appearing in great number. Information appliances and objects of everyday use have started to deliver services adapted to the person and the context of their use. The nature and appearance of computing has started to be hidden in the fabric of everyday life, invisibly networked, and augmenting environments to form a pervasive computing landscape, in which the physical world becomes merged with a "digital world".

With the call for papers for PERVASIVE 2004 we aimed at putting focus at the challenges posed by the emerging new models of computation and communication, the evolving new paradigms of interaction and coordination, and even the new styles of system design. In an overwhelming response, 278 submissions were received for consideration in the PERVASIVE 2004 program – 212 for the paper track, 49 for the hot spot paper track, and 17 for the video paper track. A program committee of 30 leading scientists, together with the help of external expert reviewers, shaped the PERVASIVE 2004 scientific program which you now hold in your hands. I am truly honored by having had the opportunity to work with such a fabulous group of scientists to select the very best contributions (12.7% acceptance), and to assemble a program that reflects the richness of pervasive computing research, but also the breathtaking and vibrant evolution this research area takes.

On behalf of all our conference chairs, the program committee, the reviewers, all the authors of submissions, the presenters, the organization teams at the University of Linz and the Oesterreichische Computer Gesellschaft, our Sponsors (The Austrian Ministry of Transport, Innovation and Technology together with the FIT-IT Embedded Systems Programme, Siemens, ONE, the province of Upper Austria and the cities of Linz and Vienna) and all the people who have helped in making this event happen, I am proud to present you PERVASIVE 2004. See the Doctoral Colloquium and get in touch with the communities best PhD candidates. Be part and actively involved in one of the seven topical workshops. Learn about the state of the art in one of the technical tutorials. Become inspired by outstanding key notes, delivered by Berhard Grainmann on "Brain Computer Interfaces" and by Hiroshi Ishii on "Tangible Bits". Find the most recent pervasive computing research results in the collection of high quality papers, technical notes, late breaking contributions (hot spot papers), video papers and live demonstrations. Aside the conference venue in this very historical place – the Hofburg palace – enjoy the City Hall reception on Wednesday evening, and the unique video night in the main festival hall of the University of Vienna later that evening. Use the opportunity for informal conversation on Thursday evening during the Conference Banquet at the marvelous Schönbrunn palace.

I wish to thank all the people and organizations for their selfless efforts to make all this happen!

To me, Pervasive Computing as a "modern" field of research in Computer Science is undergoing much the same process that the applied arts had to undergo at the fin-de-siècle: While well-behaved traditionalism clung to stability and the preservation of the status quo at around 1880 in Vienna, a group of some forty members of the art community "Künstlerhaus" (the establishment) seceded in spring 1897 and formed the progressive and forward-looking art community "Vienna Secession", with Gustav Klimt as their president. Driven by an extra-ordinary array of creative genius, the "Vienna Moderne" (1895-1930) evolved. The group soon created their own exhibition building, the Vienna Secession Building (after Joseph-Maria Olbrich), organized art exhibitions presenting their work, and issued a monthly journal, the "Ver Sacrum". Koloman Moser (1868-1918), one of the secessionists and later cofounder of the association of artists and craftsmen "The Wiener Werkstätte", a direct offshoot of the Vienna Secession, created the poster of the XIII. art exhibition of the Vienna Secession in 1902. In appreciation of the pioneering spirit of the "Vienna Secession" I have chosen the artwork of Kolo Moser to stand as a symbol for PERVASIVE 2004.

Alois Ferscha, Program Chair

General Information



The Vienna Secession Building



GENERAL INFORMATION

Conference Committee and Local Arrangements

General Chair

Friedemann Mattern, ETH Zurich, Switzerland

Program Chair

Alois Ferscha, Johannes Kepler Universität Linz, Austria

Doctoral Colloquium Chair

Gabriele Kotsis, Johannes Kepler Universität Linz, Austria

Workshop Chair

Albrecht Schmidt, Ludwig-Maximilians-Universität Munich, Germany

Video Chair

Horst Hörtnner, Ars Electronica Center, Austria

Tutorial Co-Chairs

Rene Mayrhofer, Johannes Kepler Universität Linz, Austria

Simon Vogl, Johannes Kepler Universität Linz, Austria

Publicity Co-Chairs

Karin Anna Hummel, University of Vienna, Austria

Rene Mayrhofer, Johannes Kepler Universität Linz, Austria

Program Committee

Gregory Abowd, Georgia Institute of Technology, USA
Michael Beigl, Universität Karlsruhe, Germany
Mark Billinghurst, University of Washington, USA
David De Roure, University of Southampton, UK
Anind Dey, Intel Research, USA
Elgar Fleisch, Universität St. Gallen, Switzerland
Hans Werner Gellersen, Lancaster University, UK
Lars Erik Holmquist, Viktoria Institute of Technology, Sweden
Horst Hörtnner, Ars Electronica Center, Austria
Tim Kindberg, HP Labs, USA
Gerd Kortuem, University of Lancaster, UK
Gabriele Kotsis, Johannes Kepler Universität Linz, Austria
Antonio Krüger, Saarland University, Germany
Marc Langheinrich, ETH Zurich, Switzerland
Max Mühlhäuser, Technische Universität Darmstadt, Germany
Joe Paradiso, MIT Media Lab, USA
Tom Pfeifer, TSSG, Waterford Institute of Technology, Ireland
Jun Rekimoto, Sony, Japan
Thomas Rist, DFKI, Germany
Tom Rodden, Nottingham University, UK
Anthony Savidis, ICS Forth, Greece
Bernt Schiele, ETH Zurich, Switzerland
Dieter Schmalstieg, TU Vienna, Austria
Albrecht Schmidt, Ludwig-Maximilians-Universität Munich, Germany
Vincent Stanford, NIST, USA
Thad Starner, Georgia Institute of Technology, USA
Adam Wolisz, Technical University of Berlin, Germany
Franco Zambonelli, University of Modena and Reggio Emilia, Italy
Albert Zomaya, The University of Sidney, Australia

Local Arrangements

Institut für Pervasive Computing, University of Linz: Monika Scholl, Sandra Derntl, Dominik Hochreiter, Rene Mayrhofer, Simon Vogl, Volker Christian, Hans-Peter Baumgartner, Clemens Holzmann, Stefan Oppl, Manfred Hechinger, Wolfgang Narzt

Oesterreichische Computergesellschaft: Eugen Mühlvenzl, Brigitte Breit, Sandra Leitner, Elisabeth Maier-Gabriel, Silke Pinter, Wolfgang Resch, Manuela Schendlinger, Thomas Walzer, Malgorzata Zagol, Renate Zöchling

Registration and Accommodation: Christiane Tronigger, Nethotels Vienna

GENERAL INFORMATION

Chairs

General Information

Doctoral Colloquium Chair

Gabriele Kotsis, Johannes Kepler Universität Linz, Austria

The Doctoral Colloquium of PERVASIVE 2004 is an excellent opportunity for PhD students from all over the world to present and discuss their research in the topical Pervasive and Ubiquitous Computing scene at the highest scientific level. 28 PhD students from Austria, China, Denmark, Finland, France, Germany, Iran, The Netherlands, Portugal, Spain, Switzerland, UK, and USA have been selected upon application to present, discuss and defend their work-in-progress or preliminary results in an international, agile and renowned audience of junior and senior researchers in the field.

I would like to thank the expert advisors, Michael Beigl, Elgar Fleisch, Lars Erik Holmquist, Friedemann Mattern, Max Mühlhäuser, Joe Paradiso, Tom Pfeifer, Dieter Schmalstieg, and Albrecht Schmidt, for their valuable feedback and I also would like to thank the students for their inspiring contributions. I would also like to thank my team at the Telekooperation Department and the involved staff at the Johannes Kepler University Linz for their support in organising the colloquium.

I hope, that both, students and advisors will enjoy their short visit to Linz, the two days of presentations and intense discussions and also the social programme we prepared.

Gabriele Kotsis, Doctoral Colloquium Chair



Workshop Chair

Albrecht Schmidt, Ludwig-Maximilians-Universität Munich, Germany

Pervasive 2004 is proud to have an outstanding workshop program accompanying the conference. We were fortunate to have many interesting and exciting themes proposed and we hope the selection made reflects major trends in current pervasive computing research. The overall aim of the workshops is to facilitate the exchange of ideas, to enable scientific discussion among experts, and to foster research communities on topics important to the field of pervasive computing.

We are thankful to the organizers of the workshops for putting ideas, time, and effort into creating such an impressive program. The contributions that will be presented by the participants at the workshops will give a foretaste of how pervasive computing can shape our future.

I wish all the participants and organizers an exciting and productive day of workshops in Vienna!

Albrecht Schmidt, Workshop Chair





GENERAL INFORMATION

Chairs



Video Chair

Horst Hörtner, Ars Electronica Center, Austria

Short videos as a presentation format of complex system designs and conceptual studies have been around in the applied arts communities for many years. They have turned out to be a feasible and attractive often graphically convincing way of presenting ideas that do not necessarily have physical implementations.

We are proud to present also in the frame of computer science applications video based styles of presentations. The nine short videos selected by a program committee subgroup out of seventeen very attractive submissions are to be presented in a marvelous and appealing environment: the main festival hall of the University of Vienna. I would be happy to welcome you at the PERVASIVE 2004 video night on April 21st 9pm to see the very best video papers accepted for PERVASIVE 2004.

Horst Hörtner, Video Chair



Tutorial Co-Chairs

Rene Mayrhofer, Johannes Kepler Universität Linz, Austria

Simon Vogl, Johannes Kepler Universität Linz, Austria

PERVASIVE 2004 proudly presents two tutorials on recent research areas in the field of Pervasive Computing, allowing the dissemination of skills, technologies and advanced concepts to the participants. Both tutorials give insight into up-to-the-minute topics in current research and we hope to match the interest of participants with this selection.

We owe great thanks to the tutorial presenters, who are willing to share their in-depth experience and present it to an interested audience. We wish all participants a stimulating time and hope the participation in the tutorials will provide new prospects for extending their research.

Rene Mayrhofer and Simon Vogl, Tutorial Co-Chairs

GENERAL INFORMATION

Sponsors

General Information

SIEMENS

Reinhold Achatz

Siemens AG, Head of Corporate Technology, Software & Engineering

„Within the next few years, Pervasive Computing will rigorously change the world of software, but more than that, also our personal lives.“

About SIEMENS Corporate Technology (www.siemens.com)

Approximately 60 percent of Siemens' sales of products, systems, and services are directly dependent on software – which largely explains why the company employs over 30,000 software developers. Supporting this gigantic effort is Corporate Technology's Software & Engineering Division. Its employees in Munich and Erlangen create new processes, methods and tools to further enhance the quality and capabilities of the company's software products. Current trends toward networking, distributed intelligence and the increasing use of software support in the service sector are expected to further increase the importance of software development in coming years.



ONE

Jorgen Bang-Jensen

CEO ONE

"Pervasive computing is for ONE a development into the future, bringing together computing and communication in a more human way. We believe that today's man machine interfaces must be simplified in order to really benefit from all future possibilities. It is our task to understand and explore these opportunities and this is the background for our co-operation with the Institute for Pervasive Computing at the Johannes Kepler University Linz."

About ONE (www.one.at)

In October 1998, the communications company ONE launched Austria's only nationwide GSM-1800 mobile telephony network. Besides mobile telephony, ONE also offers the Internet product i-ONE and the fixed-line solution f-ONE. At the end of March 2003, ONE had about 1,400 employees and more than 1.6 million customers (1.37 million mobile, 140,000 fixed line and 150,000 Internet customers).





GENERAL INFORMATION

Program at a Glance

	Sunday April 18, Linz Johannes Kepler University	Monday April 19, Linz Johannes Kepler University	Tuesday Apr 20, Vienna Radisson SAS + Vienna Marriott
09:00			
09:30		Doctoral Colloquium Session A4 & B4	Workshops W1-W7 Tutorial T1
10:00			
10:30		Coffee Break	Coffee Break
11:00	Opening Doctoral Colloquium Session A1 & B1	Doctoral Colloquium Session A5 & B5	Workshops W1-W7 Tutorial T1
11:30			
12:00			
12:30			
13:00	Lunch	Lunch	Lunch
13:30			
14:00	Doctoral Colloquium Session A2 & B2	Doctoral Colloquium Session A6 & B6	Workshops W1-W7 Tutorial T2
14:30			
15:00			
15:30	Coffee Break	Coffee Break	Coffee Break
16:00	Doctoral Colloquium Session A3 & B3	Doctoral Colloquium Session A7 & B7	Workshops W1-W7 Tutorial T2
16:30			
17:00			
17:30			
18:00			
18:30			
19:00			
19:30	Doctoral Colloquium		
20:00	Welcome Reception		
20:30			
21:00			
21:30			

GENERAL INFORMATION

Program at a Glance

General Information

Wednesday April 21, Vienna Hofburg Redoute Hall	Thursday April 22, Vienna Hofburg Redoute Hall	Friday April 23, Vienna Hofburg Redoute Hall	
Opening	Keynote Tangible Bits	Session 7 Architectures and Systems	09:00
Keynote Brain Computer Interfaces	Session 3 Near Body Interfaces		09:30
Coffee Break		Coffee Break	10:00
	Coffee Break		10:30
Session 1 Activity Recognition	Session 4 Software	Session 8 Algorithms	11:00
			11:30
			12:00
Lunch	Lunch	Lunch	12:30
			13:00
			13:30
Hot Spot & Video sketches	Session 5 Sensors	Session 9 New Interfaces	14:00
			14:30
			15:00
Coffee Break	Coffee Break	Closing	15:30
Session 2 Context Computing	Session 6 Security		16:00
			16:30
			17:00
			17:30
			18:00
			18:30
Reception Vienna City Hall	Conference Dinner Orangerie Schönbrunn Palace		19:00
			19:30
			20:00
			20:30
Video Night Main Festival Hall Univ. of Vienna			21:00
			21:30



GENERAL INFORMATION

On Site

Registration Desk

For the doctoral colloquium the registration desk is located at Johannes Kepler University Linz, Mensa Building, 2nd Floor, in front of rooms D and H.

Opening Hours: Sunday, April 18th, 10:00 - 17:00
 Monday, April 19th, 08:00 - 13:00

For the workshops and the tutorials the registration desk is located at Vienna Marriott Hotel, Parking 12a, in front of the Ball Room Sections B, C, and D. All workshop and tutorial participants must register at the desk before proceeding to their individual workshop rooms.

Opening Hours: Tuesday, April 20th, 08:00 - 14:00

The registration desk for the main conference is located at Redoute Halls, Hofburg Vienna, Entrance Josefsplatz. All conference participants who have not picked up their registration package during the Doctoral Colloquium or the workshops and tutorials have to present themselves at the registration desk prior to being allowed to attend the sessions.

Opening Hours: Tuesday, April 20th, 16:00 - 18:00
 Wednesday, April 21st, 08:00 - 17:00
 Thursday, April 22nd, 08:00 - 17:00
 Friday, April 23rd, 08:00 - 13:00

Coffee Breaks

At the doctoral colloquium and the workshops and tutorials, coffee breaks are offered in front of the lecture rooms.

At the main conference, coffee breaks are offered in the Small Redoute Hall next to the lecture room.

Lunch

Lunches are included in the respective registration fees and are served on Campus for the doctoral colloquium, in the hotels Vienna Marriott (workshops 1-3) and Radisson SAS (workshops 4-7 and tutorials) for workshop and tutorial participants. Registered participants will receive vouchers for lunch.

At the main conference, lunch buffets are offered on April 21st, 22nd, and 23rd in the Small Redoute Hall next to the lecture room. The name badges of participants serve as a voucher for lunch.

Smoking Policy

PERVASIVE 2004 is a smoking-free conference. At the doctoral colloquium and the workshops and tutorial sites, smoking is only permitted in designated smoking areas. At the main conference site, smoking is only permitted in the Small Redoute Hall or outside the building.

Mobile Phone Courtesy

Pervasive 2004 request that all mobile phones and other equipment with audible alarms be turned off in all sessions as a courtesy to the presenters and to the other attendees.

GENERAL INFORMATION

On Site

General Information

Internet over WLAN

WLAN at the doctoral colloquium: You will receive a coupon with login instructions to connect to the campus wide WLAN.

WLAN at the main conference: To login to the wireless network please configure your WLAN Interface using the information below:

Extended Service Set Identifier* (ESSID*): PERVASIVE2004

Mode**: Managed/Infrastructure/Client

Encryption: None

*Please note, the ESSID is case sensitive.

**Three names meaning the same.

IPv4 Internet: The Hofburg-Network provides DHCP service over the WLAN as well as over the Ethernet. To get your IPv4 addresses, please configure your Internet Interface so that the IP addresses are fetched directly from the DHCP server.

Internet Park

PCs with Internet connectivity are provided in the room Rauchsalon (room C on the map). Participants carrying their own portable equipment can use the available slots (RJ45) provided to connect their equipment. This service is open during Conference working hours.

Electricity Supply

Electricity in Austria is supplied at 220V. Please make sure that you bring your adaptors or transformer if needed. We cannot guarantee the availability of appropriate adaptors or transformers.

Photo Gallery

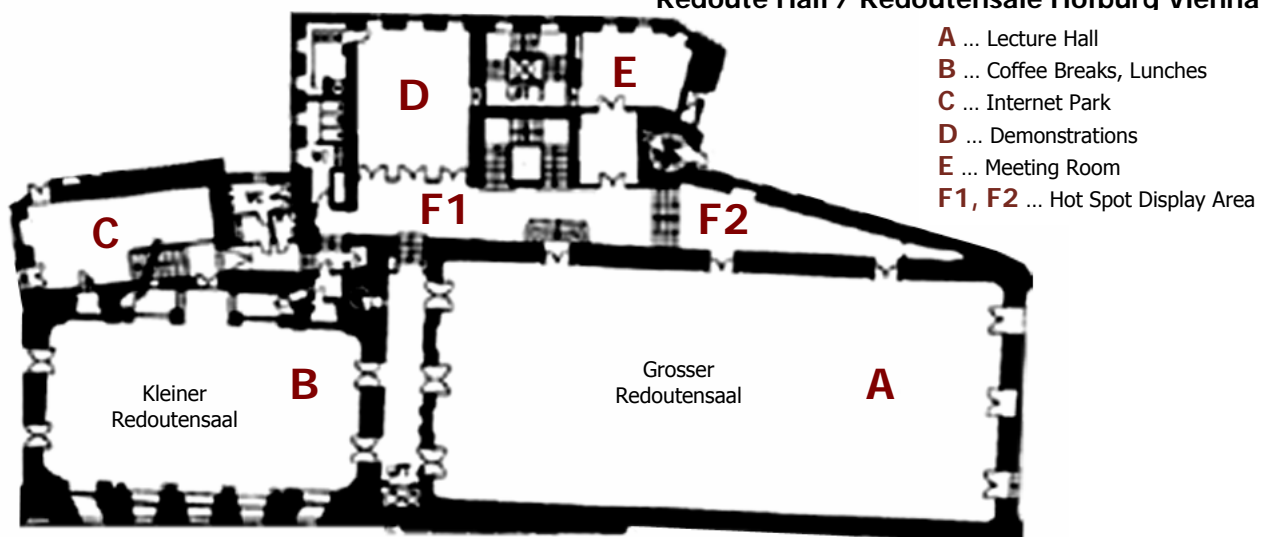
You are kindly invited to visit www.pervasive2004.org/gallery to view the official pervasive 2004 photos or to upload your own snapshots (windows XP and IE required).

Forum

To support electronic communication among conference participants, we have provided a forum at www.pervasive2004.org/forum. You will find your login and password in your personal information sheet in your conference package.

Main Conference Site

Redoute Hall / Redoutensäle Hofburg Vienna





GENERAL INFORMATION

Conference location

Location

Doctoral Colloquium

The doctoral colloquium will be held at the University of Linz, Uni Center / Mensengebäude, Altenberger Strasse 69, A-4040 Linz.

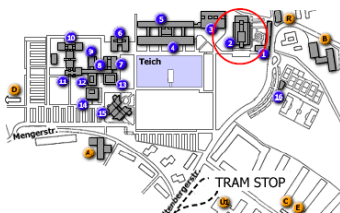
Workshops and Tutorials

Workshops 1, 2, and 3 will be held at Vienna Marriott Hotel, Parking 12a. Workshops 4, 5, 6, and 7 and tutorials will be held at Radisson SAS Palais Hotel, Parking 16. All workshop and tutorial participants have to register and pick up their conference package at Vienna Marriott Hotel.

Main Conference

The main conference will be held in the Redoutensäle (Redoute Halls) within the Hofburg complex. The Hofburg is situated in Vienna's city center. The most important museums are just down the street as are the Spanish Riding School, the Treasury, concert halls or the Kärntnerstraße, Vienna's most elegant shopping street.

University Campus Linz (Doctoral Colloquium)



Transport

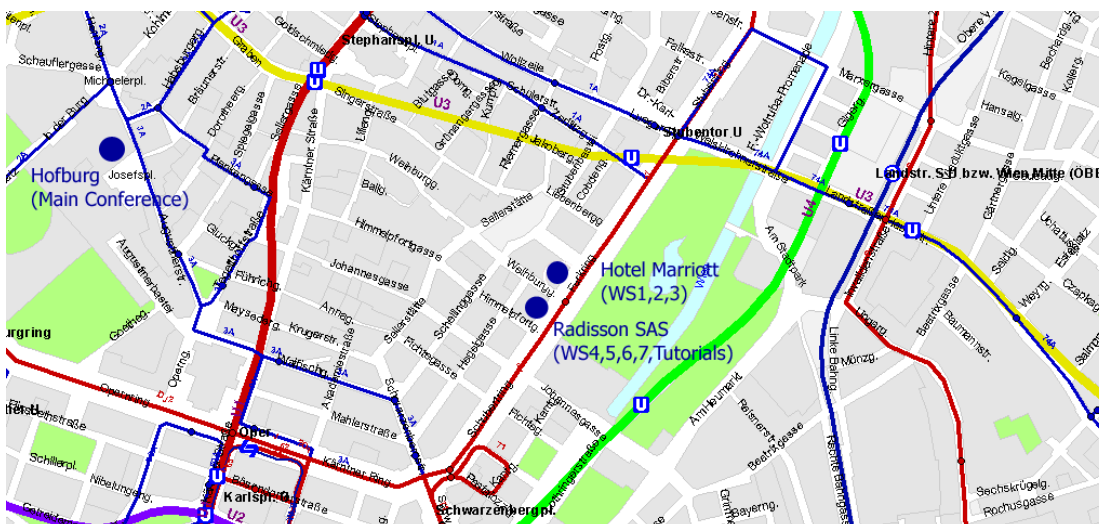
Hofburg (Redoute Hall Building in Yellow)



The best way to reach Vienna and the Hofburg Congress Center & Redoutensäle via:

- **Plane**, Vienna International Airport – Schwechat, distance to city center approx. 15 km or 30 minutes by train, bus and taxi.
- **Train**, South and West Railway Station, 3 km / 15 Min.
- **Bus/Car**, Highway A1, A2 towards: City Center, note that the area around Hofburg has very limited parking space.
- **Underground**, line U3 stop Herrengasse, line U1/U3 stop Stephansplatz, both stops are in walking distance (see map below)
- **City Bus**, line 3A Michaelerplatz Station, walking distance (see map below)

Map of Vienna (Workshop/Tutorial Sites and Main Conference Site)



GENERAL INFORMATION

Conference location

Information about the Hofburg Palace

Hofburg palace, in Vienna's 1st district, located between Josefsplatz, Michaelerplatz and Burgring, was the seat of government (first documented mention in 1279) of the Austrian sovereigns from the 13th century, the German kings and Roman emperors from the 15th century until 1806 (except for the period of 1740-1745) and of the emperor of Austria until 1918. It was the "new" residence of the Babenbergs (Leopold VI, around 1215-1220), also used by King Otakar II and Rudolf of Habsburg and extended and continuously altered over the following centuries. In the 15th century the palace chapel was partly rebuilt (first documented mention 1296; rebuilt 1447-1449), seat of the Hofmusikkapelle. The "Schweizertrakt" tract received its current form in the Renaissance period (Schweizertor gate, 1552/53) by P. Ferrabosco, believed to have also built the Stallburg stables for Maximilian II (1558-1568) and, opposite the Schweizerhof, a late-Renaissance building for Rudolf II, the "Amalienburg" (which derived its name from Amalie Wilhelmine, wife of Joseph I), finished in 1605. The Innerer Burghof court was used as a tournament and theatre square and today is dominated by the late-Classical monument (1824-1846 by P. Marchesi) to Emperor Franz I.

The most important part of the Hofburg, from an artistic point of view, is the court library completed by J. E. Fischer von Erlach in 1735 after plans made by his father for Emperor Karl VI 1735. The superb façade, behind which is the magnificent library hall, is enclosed by 2 side wings built by N. Pacassi 1763-1769. The right wing houses the Redoutensäle halls (1992 destroyed by fire, some parts reconstructed, for example new ceilings and murals by J. Mikl in the Großer Redoutensaal, re-opened in 1997), the left wing, housing the collections of the National Library, also incorporates the façade of the Augustine church. All these buildings enclose the Josefsplatz square (with the equestrian statue of Emperor Joseph II, by F. A. Zauner), considered one of the most beautiful squares in Vienna.

In the course of the expansion of the city of Vienna (initiated by Emperor Franz Joseph in 1857) and the building of the Ringstraße boulevard, construction of the magnificent "Emperor's Forum" began in 1869 (based on plans by G. Semper); it was to extend from the Hofburg to the court stables. The only projects realised were the two court museums (the Kunsthistorisches Museum and the Naturhistorisches Museum) and the "New Hofburg" on Heldenplatz square according to plans by Semper, completed by C. v. Hasenauer 1913. Today the New Hofburg houses the Hofburg Congress Centre, the former court collections of the Kunsthistorisches Museum (Ephesos museum, Hofjagdkammer weapons collection, armoury, collection of old musical instruments), the National Library (portrait collection and picture archives) and the Ethnological Museum.

(Information from AEIOU www.aeiou.at)

General Information





DOCTORAL COLLOQUIUM

Sunday, April 18th, Linz

10:45 – 11:00 Plenary Session

Mensa Building, Room G

Opening and Welcome

Alois Ferscha, Gabriele Kotsis (Johannes Kepler University Linz)

11:00 – 12:30

Session A1 – Mensa Building, Room D

Towards an Architecture and New Modelling Approach for Dynamic Security in Emerging Applications

Ghita Kouadri Mostefaoui (University of Fribourg, Switzerland)

Automatically Generating User Interfaces for Appliances

Jeffrey Nichols (Carnegie Mellon University, USA)

Session B1 – Mensa Building, Room H

An Architecture for Context Prediction

Rene Mayrhofer (Johannes Kepler University Linz, Austria)

Context Management for Heterogeneous Administrative Domains

Filipe Meneses (University of Minho, Portugal)

12:30 – 14:00 Lunch Break

14:00 – 15:30

Session A2 – Mensa Building, Room D

Generating Adaptive User Interfaces Using Meta Description Languages for Device Independent Access

Franz Gruber (RISC GmbH, Austria)

Reconfigurable Software Architecture for Communication Layers in Pervasive Computing Systems

Mahdi Niamanesh (Sharif University of Technology, Iran)

DOCTORAL COLLOQUIUM

Sunday, April 18th, Johannes Kepler University Linz

14:00 – 15:30

Session B2 – Mensa Building, Room H

Self-Organizing and Scalable Service Discovery in Mobile Ad-Hoc Networks

Michael Kreutzer (Universität Freiburg, Germany)

Event Dissemination Service for Pervasive Computing

Sasu Tarkoma (Helsinki Institute for Information Technology, Finland)

Doctoral
Colloquium

15:30 – 16:00 Coffee Break

16:00 – 17:30

Session A3 – Mensa Building, Room D

Pervasive Information Retrieval

Zia Syed (Robert Gordon University, UK)

Personalization Attribute Management

Kari Heikkinen (Lappeenranta University of Technology, Finland)

Session B3 – Mensa Building, Room H

Dichotomy in the Plasticity Process: Architectural Framework Proposal

Montserrat Sendín (Escola Universitària Politècnica, Spain)

Understanding Sharing in Peer-To-Peer Networks

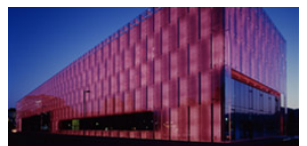
Ronald Mannak (TU Delft, The Netherlands)

18:30 – 19:30

Guided Tour at AEC Center, Museum of the Future

19:30 – 22:30

Dinner at Lentos, Museum of Modern Art, Linz



SUNDAY
April 18



DOCTORAL COLLOQUIUM

Monday, April 19th, Johannes Kepler University Linz

09:00 – 10:30

Session A4 – Mensa Building, Room D

Designing Context-Aware Mobile Applications - User Perceptions for Usable UI's

Jonna Häkkinen (University of Oulu, Finland)

Mobile Usability

Thomas Grill (Johannes Kepler University Linz, Austria)

Session B4 – Mensa Building, Room H

Virtual Distances Used for Optimization of Applications in the Pervasive Computing Domain

Kari S. F. Schougaard (University of Aarhus, Denmark)

A Logic-Based Framework for Qualitative Spatial Reasoning in Mobile GIS Environment with Applications to Navigation

Mohammad Reza Malek (Technical University Vienna, Austria)

10:30 – 11:00 Coffee Break

11:00 – 12:30

Session A5 – Mensa Building, Room D

Supporting Localized Activities in Ubiquitous Computing Environments

Helder Pinto (University of Minho, Portugal)

Reachability Approach for Mobile Service Provision

Reinhard Kronsteiner (Johannes Kepler University Linz, Austria)

Session B5 – Mensa Building, Room H

Bringing Context Awareness Together

Manasawee (Jay) Kaenampornpan (University of Bath, UK)

An Architecture for Building Customizable Context-Aware Applications by End-Users

Tao Zhang (TU Munich, Germany)

DOCTORAL COLLOQUIUM

Monday, April 19th, Johannes Kepler University Linz

12:30 – 14:00 Lunch Break

14:00 – 15:30

Doctoral
Colloquium

Session A6 – Mensa Building, Room D

Sitmod: A Tool For Modeling And Communicating Situations

Martijn Vastenburger (TU Delft, The Netherlands)

Interoperative Systems for Replenishment

Sébastien Truchat (University of Erlangen-Nuremberg, Germany)

Session B6 – Room H

System Support for Ubiquitous Computing

Erwin Aitenbichler (TU Darmstadt, Germany)

Enabling Contextual Services in Wireless Context Area Networks

Mario Pichler (SCCH, Austria)

15:30 – 16:00 Coffee Break

16:00 – 17:30

Session A7 – Mensa Building, Room D

Mobile Agents with Intrusion Detection During Transfer for Pervasive Computing

Degan Zhang (Tsinghua University, Beijing, P.R. China)

Adaptive User Support in Agent Based Dynamic Environments

Jan Misker (TU Delft, The Netherlands)

Session B7 – Mensa Building, Room H

Determination of Time and Location in Large-Scale Dynamic Networks of Tiny Sensors

Kai Römer (ETH Zürich, Switzerland)

Position-Based Composition of Video Scenes from Distributed Sensors

Phuong-Hoang Nguyen (France Telecom R&D, France)

MONDAY

April 19



WORKSHOPS

Tuesday April 20th, Radisson SAS+Vienna Marriott Hotel

09:00 – 17:30

Ballroom B, Vienna Marriott Hotel

Gaming Applications in Pervasive Computing Environments

Carsten Magerkurth (Fraunhofer IPSI Darmstadt, Germany), *Regan Mandryk* (Simon Fraser University, Canada), *Steve Benford* (University of Nottingham, UK), *Johan Sanneblad* (Viktoria Institute, Sweden)

Gaming has been a hot topic and innovating force in most cultures for thousands of years. In contrast to traditional gaming, computer entertainment still lacks rich human-to-human interaction and is not grounded in our physical world. With the emergence of ubiquitous and pervasive computing technology, we are now facing a radical paradigm shift in which the computer as a medium steps back and weaves itself into the fabric of our physical and social environments. Combining pervasive computing technologies with gaming applications many people enjoy and are used to, will have a positive effect on the dissemination of the pervasive computing paradigm and may help creating new and revolutionary forms of experiences. With this workshop we bring together researchers who are interested in interactive entertainment and the opportunities and risks that pervasive computing might introduce to it. We want to discuss initial results from this emerging field and share our experiences and visions to identify relevant research questions and future research directions.

09:00 – 17:30

Ballroom C, Vienna Marriott Hotel

Toolkit Support for Interaction in the Physical World

Rafael Ballagas (RWTH Aachen University, Germany), *Scott Klemmer* (UC Berkeley, USA), *Jennifer Sheridan* (University of Lancaster, UK)

Pervasive computing continues to push computer technology off the desktop and into the physical world. However, building physical interfaces is non-trivial, requiring knowledge of low-level hardware and software details. These difficulties echo the experiences of the GUI community twenty years ago. Tangible user interface (TUI) toolkits have the potential to simplify physical prototyping just as GUI toolkits have improved graphical prototyping.

This workshop will be a collaboration between tangible user interface designers and toolkit developers. TUI designers should give perspectives on the domain they are designing for, prototyping techniques they use, and difficulties they encounter. Toolkit developers should present their toolkit solution or project, and its particular strengths and weaknesses for rapidly prototyping TUIs.

We will address several fundamental issues in toolkit support for interaction in the physical world:

- Creating a taxonomy of existing prototyping techniques for TUIs
- Deriving required features and characteristics of potential TUI toolkits from this taxonomy
- Mapping out the design space of TUI toolkits, and placing existing toolkits into it
- Defining ways to evaluate TUI toolkits
- Identifying opportunities for future collaboration

WORKSHOPS

Tuesday April 20th, Radisson SAS+Vienna Marriott Hotel

09:00 – 17:30

Ballroom D, Vienna Marriott Hotel

Memory and Sharing of Experiences

Kenji Mase (Nagoya University / ATR, Japan), *Yasuyuki Sumi* (Kyoto University / ATR, Japan), *Sidney Fels*, (University of British Columbia, Canada)

Pervasive computing environment will become a strong infrastructure to record experiences of people in the real world because it will network a lot of wide spread sensors that can capture the activities of people continuously in various aspects. The experiences here include activities such as writing, drawing, speaking, meeting, sports, traveling etc., in personal or group context, and interactions with other people and/or artifacts. Recorded experiences by means of digital video, tactile sensors, location tracking device, etc. can be used as a source for various tasks in daily life, business, education and security. They include, for example, multi-media memory aids, reference for context recognition, creation of a model of person's activities and story-telling of life. The useful and computational log can be obtained by ubiquitous sensor networks and effective tagging systems.

There are many research projects on ubiquitous sensor network for recording events, wearable device for personal event recording, real-world oriented CSCW, interaction analysis by ethnological approach, and privacy issues. The researchers who are engaged in this theme are welcome.

Workshops
Tutorials

09:00 – 17:30

Parkingsalon I + II, Radisson SAS Palais Hotel Vienna

Computer Support for Human Tasks and Activities

Jakob E. Bardram, *Henrik Bærbak Christensen* (University of Aarhus, Denmark), *David Garlan*, *João Sousa* (Carnegie Mellon University, USA)

The term task-based or activity-based computing has been proposed as a new paradigm for computing more suited for ubiquitous and pervasive computing than the traditional application- and file-centered computing paradigm, which are oblivious to a notion of a user task spanning multiple applications, services, and information sources. This situation is worse in work environments where users, rather than sitting at a desk all the time, would like to use whatever devices are available at each location for carrying out their work and for impromptu collaboration. This workshop aims at exploring issues related to improving the computational support for human tasks and activities, with a special focus on infrastructures, software architectures, models of user tasks, and on the challenges associated with designing and implementing those. The goal is to build a network of researchers and practitioners working on aspects of task-/activity-based computing. The workshop will focus on exploring this potential by discussing the constraints and possibilities of existing and emerging technologies for supporting human activities, and focusing on identifying current and future research directions. These goals will be accomplished through presentation of the participants' visions and research, brainstorming sessions, and small-group breakout sessions.

TUESDAY

April 20



WORKSHOPS

Tuesday April 20th, Radisson SAS+Vienna Marriott Hotel

09:00 – 17:30

Rauchsalon, Radisson SAS Palais Hotel Vienna

Benchmarks and a database for context recognition

Paul Lukowicz, (UMIT, Innsbruck, Austria) *Jani Mäntyjärvi*, (VTT Electronics, Finland)
Holger Junker (ETH Zurich, Switzerland)

The aim of the workshop is to foster the generation of standard, publicly available data sets for context recognition. Such data sets and benchmarks have proven to their value in many other fields such as speech recognition, image recognition and computer architectures. They allow initial tests of new methods and algorithms without the need for time consuming data collection. Even more important, they provide an objective basis for the evaluation and comparison of algorithms.

As the field of context recognition grows and becomes more mature, the need for such publicly available, standard data sets and benchmarks is becoming more and more obvious. The organizers see the workshop as a first step towards generating such data sets and benchmarks. To this end, we invite all interested researchers to present their views on relevant

scenarios, sensors sets, data formats, mechanism for repository management and other related issues. We would also like to encourage presentations of existing data sets, that could be contributed to an initial database version.

The output of the one-day workshop will be a consensus on the above issues. Ideally, this shall contain concrete steps and a time schedule for the establishment of the envisioned database and benchmark sets.

09:00 – 17:30

Rosa Festsaal, Radisson SAS Palais Hotel Vienna

SPPC: Security and Privacy in Pervasive Computing

Philip Robinson (University of Karlsruhe, Germany), *Harald Vogt* (ETH Zurich, Switzerland), *Waleed Wagealla* (University of Strathclyde, UK)

When someone asks you to use your office, what goes through your mind? Is it the probability that they may make an overseas call? Is it the fear that they may browse your high profile or confidential documents lying on the table? Or in the case of a total stranger, how did they know that your office was available in the first place? In this workshop we build on a notion that decisions influenced by trust, privacy, security and context are not treated in isolation, rather there exists a system of balanced reasoning that interrelates these concerns. The aim of this workshop is to explore the properties of this system, by defining the interfaces between trust, privacy, security and context, the data that is interchanged between their identifiable mechanisms, and how this knowledge can be best applied in pervasive computing applications.

WORKSHOPS

Tuesday April 20th, Radisson SAS+Vienna Marriott Hotel

09:00 – 17:30

Hofsalon I, Radisson SAS Palais Hotel Vienna

Sustainable Pervasive Computing

Siegfried Behrendt (Inst. f. Futures Research & Technology Assessment, Germany),
Danielle Bütschi, (TA-Swiss, Switzerland), *Michèle Courant* (University of Fribourg,
Switzerland), *Lorenz Hilty* (Swiss Fed. Lab. for Materials Testing and Research,
Switzerland)

The term task-based or activity-based computing has been proposed as a new paradigm for computing more suited for ubiquitous and pervasive computing than the traditional application- and file-centered computing paradigm, which are oblivious to a notion of a user task spanning multiple applications, services, and information sources. This situation is worse in work environments where users, rather than sitting at a desk all the time, would like to use whatever devices are available at each location for carrying out their work and for impromptu collaboration. This workshop aims at exploring issues related to improving the computational support for human tasks and activities, with a special focus on infrastructures, software architectures, models of user tasks, and on the challenges associated with designing and implementing those. The goal is to build a network of researchers and practitioners working on aspects of task-/activity-based computing. The workshop will focus on exploring this potential by discussing the constraints and possibilities of existing and emerging technologies for supporting human activities, and focusing on identifying current and future research directions. These goals will be accomplished through presentation of the participants' visions and research, brainstorming sessions, and small-group breakout sessions.

Workshops
Tutorials

TUESDAY
April 20



TUTORIALS

Tuesday April 20th, Fiaker Salon, Radisson SAS Palais Hotel

09:00 – 12:30

Radio Frequency Identification

Christian Floerkemeier (ETH Zurich Switzerland)

Theme

Radio Frequency Identification (RFID) technology is rapidly evolving as a result of increased awareness of its potential in the business community, adoption by developers to bridge the gap between the physical and virtual world and the development of new manufacturing techniques that might allow for low-cost RFID tags.

RFID systems have been successfully used in specialized application domains such as cattle herding, library checkout, car immobilizers and ski ticketing. More recently, the technology has received increased attention as a technology that can provide better transparency and visibility in the supply chain.

Objectives and Outline

The purpose of this tutorial is to provide an overview of RFID systems and their various principles of operation, so that the participants get a better understanding of the challenges and opportunities involved.

We pursue the objective to explain the operating principles of various available, passive RFID systems across the frequency range from low frequency (LF) to ultrahigh frequencies (UHF). In particular, we will show how the operating principles of RFID systems affect performance indicators such as read range and the number of tags that can be detected per unit time. This discussion includes RFID system components, reader-transponder coupling and communication and anti-collision algorithms. We will also outline current standardization efforts in the RFID domain. In particular, we will focus on ISO standards and the Auto-ID Center/EPCglobal standards.

Recent proposals by the research community address the privacy concerns that arise from a large scale deployment of RFID systems. It is our goal to show how, for example, blocker tags or hash-based access control works and to discuss their merits. Finally, future trends in RFID technology and novel application domains are outlined. This includes recent developments at the Auto-ID Center/EPCglobal and the potential availability of low-cost RFID transponders.

Summary

The goal of this tutorial is to provide an overview of the rapidly evolving field of RFID technology. Along with the operating principles of various available systems, we will discuss the opportunities and challenges that arise from their use. Recently proposed approaches to address the privacy concerns associated with large scale deployment of RFID systems are also presented.

About the author

Christian Floerkemeier holds a Ba and MEng degree from Cambridge University in the UK and is currently a research assistant in the group of Prof. Friedemann Mattern at the Institute for Pervasive Computing at ETH Zurich. As part of the industry sponsored research program M-Lab, he was involved in the design and implementation of various RFID based applications. He is also member of the research staff at the Auto-ID Lab in Switzerland. As author of the Auto-ID Center mark-up language PML Core, he has been involved in the standardization effort at the Auto-ID Center for the past two years.



TUTORIALS

Tuesday April 20th, Fiaker Salon, Radisson SAS Palais Hotel

14:00 – 17:30

User Interface Design for Home Systems

Martin Maguire (Loughborough University, UK)

Theme

In the future home, it will be possible for devices to be networked and centrally controlled and for services to be provided that can be aggregated together. This raises many issues that affect the end user such as the usability and acceptance of these services. The design of the user interface to support effective control of devices and access to services is therefore critical to the successful acceptance of the connected home concept.

What delegates will learn

- The need to design the user interface in the knowledge of the home context and use of scenarios to establish the required functions and features.
- Steps to perform in designing a user interface for a home product or system. Principles and guidelines when designing user interfaces for home systems such as the importance of establishing a clear structure that can be understood by a wide range of people.
- Practice in creating a paper-based user interface mock-up and testing it with users.

Who should attend?

The session should be of interest to consumer product designers and designers in the area of home systems. It should also be relevant to project managers and marketers in the home systems sector, as well as students taking courses on IT, usability, and HCI (Human-Computer Interaction).

Materials

Each delegate will receive a booklet with a copy of the slides presented during the session, the exercise materials, and a set of relevant published papers.

About the author

Martin has a background in both computer studies and ergonomics. He works at the Ergonomics and Safety Research Institute (ESRI) at Loughborough University. His main interests are in the design of interactive systems, pervasive computing, and consumer products to be usable by the general public, including older and disabled people, along with the development of human factors tools, methods and guidelines in these areas. He is currently working on a project within The Application Home Initiative (TAHI) in the UK to establish the feasibility of bringing aggregated services into the home. Martin is a member of the UK Ergonomics Society, the ACM and is on the Council of the UK Usability Professionals Association.

Workshops Tutorials



TUESDAY
April 20



SESSIONS

Wednesday April 21st, Hofburg Grosser Redoutensaal

09:00 – 09:30 Opening

Welcome from the Program Chair and the General Chair

Alois Ferscha (Johannes Kepler University Linz, Austria)
Friedemann Mattern (ETH Zürich, Switzerland)
Rudolf Ardel (Rektor, Johannes Kepler University Linz, Austria)

09:30 – 10:30 Keynote Address

Chair: Günter Haring (University of Vienna, Austria)

Brain Computer Interfaces

Bernhard Graimann (University of Technology, Graz, Austria)

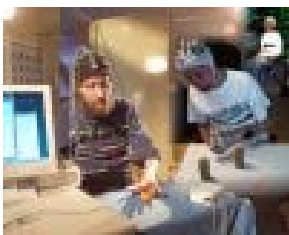
Talk Abstract

Human-computer interfaces (HCI) are an important field of research in pervasive computing. Innovative interfaces based on voice or vision have been devised to improve the usability of human-computer interaction. A new dimension to HCI is added by brain computer interfaces (BCI). Such a BCI establishes a communication channel directly between the brain and a computer. The ultimate goal is to provide effective communication without using the normal neuromuscular output pathways of the brain, but by accepting commands directly encoded in neurophysiological signals. For people who are locked-in after having lost all voluntary muscle control due to severe neurological diseases, a BCI may be their only means of communication with their environment. Existing BCI systems have demonstrated that direct communication between the brain and a computer is indeed possible, but a significant amount of research is still needed to solve many complex problems such as the limited information transfer rate of current BCIs, which is at best 25 bits/min. Although this bit rate is sufficient to provide basic communication for people with severe motor impairments, a further increase in speed will be required before general users of pervasive computing devices will adopt such interfaces. This presentation will include a brief history of brain-computer communication, an overview of the state-of-the-art in BCI research, and will give future perspectives for this fascinating and multidisciplinary research field. A short movie will demonstrate how the motor function of a paralyzed patient can be restored by means of a BCI.

About

Bernhard Graimann is an Assistant Research Scientist in the Institute of Human Computer Interfaces at the University of Technology Graz. He received the M.S. degree in computer science and the Ph.D. degree in biomedical engineering from the University of Technology Graz, Austria, in 1999 and 2002, respectively. Bernhard Graimann's research focuses on the analysis of brain patterns in bioelectrical recordings associated with motor imagery and especially on the design of brain-computer interfaces. In an NIH funded research collaboration with the Department of Biomedical Engineering and the Department of Physical Medicine and Rehabilitation at the University of Michigan, he is currently investigating the potential of subdural (ECoG) recordings as the basis of direct brain-computer communication. He has contributed to the statistical analysis of oscillatory activity in brain signals, and developed optimization methods and advanced signal processing algorithms for increasing the performance of brain-computer interfaces.

10:00 – 11:30 Coffee Break



SESSIONS

Wednesday April 21st, Hofburg Grosser Redoutensaal

11:00 – 12:30 Session 1: Activity Recognition

Chair: Hans Gellersen (Lancaster University UK)

Activity Recognition From User-Annotated Acceleration Data

Ling Bao, Stephen S. Intille (MIT, USA)

Recognizing Workshop Activity Using Body Worn Microphones and Accelerometers

Paul Lukowicz, Jamie A Ward, Holger Junker, Mathias Stäger, Gerhard Tröster (ETH Zürich, Switzerland), Amin Atrash, Thad Starner (Georgia Tech, USA)

"Are You With Me?" – Using Accelerometers to Determine if Two Devices are Carried by the Same Person

Jonathan Lester, Blake Hannaford, Gaetano Borriello (University of Washington, USA)

12:30 – 14:00 Lunch

14:00 – 15:30 Hot Spot & Video Sketches

Chair: Lars Eric Holmquist (Viktoria Institute of Technology, Sweden)

15:30 – 16:00 Coffee Break

16:00 – 17:30 Session 2: Context Computing

Chair: Anind Dey (Intel Research, Berkeley, USA)

Context Cube: Flexible and Effective Manipulation of Sensed Context Data

Lonnie Harvel, Ling Liu, Gregory D. Abowd, Yu-Xi Lim, Chris Scheibe, Chris Chatham (Georgia Institute of Technology, USA)

A Context-Aware Communication Platform for Smart Objects

Frank Siegemund (ETH Zurich, Switzerland)

Siren: Context-aware Computing for Firefighting

Xiaodong Jiang, Nicholas Y. Chen, Jason I. Hong, Kevin Wang (UC Berkeley, USA), Leila Takayama (Stanford University, USA), James A. Landay (Univ. of Washington, USA)

18:30 – 20:30 City Hall Reception

21:00 – 22:00 Video Night

Chair: Horst Hörtner (Ars Electronica Center, Linz, Austria)

Main Festival Hall, University of Vienna

Welcome: Georg Winckler (Rektor, University of Vienna, Austria)

Sessions

WEDNESDAY

April 21



SESSIONS

Thursday April 22nd, Hofburg Grosser Redoutensaal

09:00 – 10:00 Keynote Address

Chair: Alois Ferscha (Johannes Kepler University Linz, Austria)

Tangible Bits

Hiroshi Ishii (Tangible Media Group MIT Media Lab)

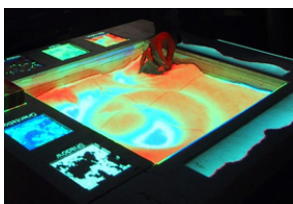
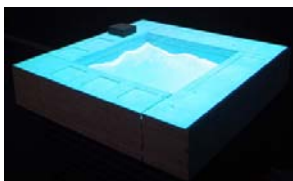
Talk Abstract

Where the sea meets the land, life has blossomed into a myriad of unique forms in the turbulence of water, sand, and wind. At another seashore between the land of atoms and the sea of bits, we are now facing the challenge of reconciling our dual citizenships in the physical and digital worlds. Windows to the digital world are confined to flat square ubiquitous screens filled with pixels, or "painted bits." Unfortunately, one can not feel and confirm the virtual existence of this digital information through one's body.

Tangible Bits, our vision of Human Computer Interaction (HCI), seeks to realize seamless interfaces between humans, digital information, and the physical environment by giving physical form to digital information, making bits directly manipulable and perceptible. The goal is to blur the boundary between our bodies and cyberspace and to turn the objects and architectural space into an interface. In this talk, I will present a variety of tangible user interfaces the Tangible Media Group has designed and presented within the CHI, SIGGRAPH, UIST, CSCW, IDSA, ICSID, ICC, and Ars Electronica communities in the past several years.



Photo: Webb Chappell



About

Hiroshi Ishii is a tenured Associate Professor of Media Arts and Sciences, at the MIT Media Lab. He co-directs Things That Think (TTT) consortium and directs Tangible Media Group. Hiroshi Ishii's research focuses upon the design of seamless interfaces between humans, digital information, and the physical environment. At the MIT Media Lab, he founded and directs the Tangible Media Group pursuing a new vision of Human Computer Interaction (HCI): "Tangible Bits." His team seeks to change the "painted bits" of GUIs to "tangible bits" by giving physical form to digital information. Ishii and his students have presented their vision of "Tangible Bits" at a variety of academic, industrial design, and artistic venues (including ACM SIGCHI, ACM SIGGRAPH, Industrial Design Society of America, Ars Electronica, and Centre Pompidou), emphasizing that the development of tangible interfaces requires the rigor of both scientific and artistic review. A display of many of the group's projects took place at the NTT InterCommunication Center (ICC) in Tokyo in summer 2000. A new, three-year-long exhibition "Get in Touch" that features the Tangible Media group's work opened at Ars Electronica Center (Linz, Austria) in September 2001. Prior to MIT, from 1988-1994, he led a CSCW research group at the NTT Human Interface Laboratories, where his team invented TeamWorkStation and ClearBoard. In 1993 and 1994, he was a visiting assistant professor at the University of Toronto, Canada. He received B. E. degree in electronic engineering, M. E. and Ph. D. degrees in computer engineering from Hokkaido University, Japan, in 1978, 1980 and 1992, respectively

SESSIONS

Thursday April 22nd, Hofburg Grosser Redoutensaal

10:00 – 11:00 Session 3: Near Body Interfaces

Chair: Joe Paradiso (MIT Media Lab, USA)

Spectacle-Based Design of Wearable See-Through Display for Accommodation-Free Viewing

Marc von Waldkirch, Paul Lukowicz, Gerhard Tröster (ETH Zurich, Switzerland)

A Compact Battery-less Information Terminal for Real World Interaction

Takuichi Nishimura, Hideo Itoh, Yoshiyuki Nakamura, Yoshinobu Yamamoto, Hideyuki Nakashima (Cyber Assist Research Center, Japan)

11:00 – 11:30 Coffee Break

11:30 – 12:30 SESSION 4: Software

Chair: Gaetano Borriello (University of Washington, USA)

INCA: A Software Infrastructure to Facilitate the Construction and Evolution of Ubiquitous Capture & Access Applications

Khai N. Truong, Gregory D. Abowd (Georgia Institute of Technology, USA)

12:30 – 14:00 Lunch

14:00 – 15:30 SESSION 5: Sensors

Chair: Friedemann Mattern (ETH Zurich, Switzerland)

Activity Recognition in the Home Using Simple and Ubiquitous Sensors

Emmanuel Munguia Tapia, Stephen S. Intille, Kent Larson (MIT, USA)

Automatic Calibration of Body Worn Acceleration Sensors

Paul Lukowicz, Holger Junker, Gerhard Tröster, (ETH Zurich, Switzerland)
(short presentation, 20 minutes)

Reject-optional LVQ-based Two-level Classifier to Improve Reliability in Footstep Identification

Jaakko Suutala, Susanna Pirttikangas, Jukka Riekk, Juha Röning (Infotech Oulu, Finland)
(short presentation, 20 minutes)

Issues with RFID Usage in Ubiquitous Computing Applications

Christian Floerkemeier, Matthias Lampe (ETH Zurich, Switzerland)
(short presentation, 20 minutes)

Sessions

THURSDAY
April 22



SESSIONS

Thursday / Friday April 22nd and 23rd, Hofburg

15:30 – 16:00 Coffee Break

16:00 – 17:10 **SESSION 6: Security**

Chair: Max Mühlhäuser (TU-Darmstadt, Germany)

A Fault-tolerant Key-Distribution Scheme for Securing Wireless Ad-hoc Networks

Arno Wacker, Timo Heiber, Holger Cermann, Pedro José Marron (Universität Stuttgart, Germany)

ProxNet: Secure Dynamic Wireless Connection by Proximity Sensing

*Jun Rekimoto, Takashi Miyaki, Michimune Kohno (Sony Labs, Japan))
(short presentation, 20 minutes)*

Tackling Security and Privacy Issues in RFID Devices

*Dirk Henrici, Paul Müller (University of Kaiserslautern, Germany))
(short presentation, 20 minutes)*

18:30 – 22:30 Conference Dinner

Orangerie, Schönbrunn Palace

Friday, April 23rd

09:00 – 10:30 **SESSION 7: Architecture & Systems**

Chair: Albrecht Schmidt (Ludwig-Maximilians-Universität Munich, Germany)

Towards Wearable Autonomous Microsystems

Nagendra B. Bharatula, Stijn Ossevoort, Mathias Stäger, Gerhard Tröster (ETH Zurich, Switzerland)

Ubiquitous Chip: a Rule-based I/O Control Device for Ubiquitous Computing

Tsutomu Terada, Masahiko Tsukamoto (Osaka University, Japan), Keisuke Hayakawa, (NEC Corp., Japan), Tomoki Yoshihisa, Yasue Kishino (Osaka University, Japan), Atsushi Kashitani (NEC Corp., Japan), Shojiro Nishio (Osaka University, Japan)

eSeal - A System for Enhanced Electronic Assertion of Authenticity and Integrity

Christian Decker, Michael Beigl, Albert Krohn, Philip Robinson (University of Karlsruhe, Germany), Uwe Kubach, (SAP AG, Corporate Research Germany)

10:30 – 11:00 Coffee Break

SESSIONS

Friday April 22nd, Hofburg Grosser Redoutensaal

11:00 – 12:30 SESSION 8 Algorithms

Chair: Hideyuki Tokuda (Keio University, Japan)

A Distributed Precision Based Localization Algorithm for Ad-Hoc Networks

Leon Evers, Stefan Dulman, Paul Havinga (University of Twente, The Netherlands)

Adaptive On-device Location Recognition

Kari Laasonen, Mika Raento, Hannu Toivonen (University of Helsinki, Finland)

Accommodating Transient Connectivity in Ad Hoc and Mobile Settings

Radu Handorean, Christopher Gill, Gruia-Catalin Roman (Washington University in St. Louis, USA)

12:30 – 14:00 Lunch

14:00 – 15:30 SESSION 9: New Interfaces

Chair: Gabriele Kotsis (Johannes Kepler University, Austria)

Microbiology Tray and Pipette Tracking as a Proactive Tangible User Interface

Harlan Hile, Jiwon Kim, Gaetano Borriello (University of Washington, USA)

Augmenting Collections of Everyday Objects: A Case Study of Clothes Hangers as an Information Display

Tara Matthews (UC Berkeley, USA), *Hans-W. Gellersen, Kristof Van Laerhoven* (Lancaster University, UK),
Anind K. Dey (Intel Research Berkeley, USA)
(short presentation, 20 minutes)

MirrorSpace: using proximity as an interface to video-mediated communication

Nicolas Roussel, Helen Evans, Heiko Hansen (Universit Paris-Sud XI, France)
(short presentation, 20 minutes)

SearchLight - A Lightweight Search Function for Pervasive Environments

Andreas Butz, Michael Schneider, Mira Spassova (Saarland University, Germany)
(short presentation, 20 minutes)

15:30 – 16:00 Closing

Sessions

FRIDAY
April 23



HOT SPOT Presentations

Wednesday April 21st, Hofburg Grosser Redoutensaal

Hot Spot Papers will be presented in the Hot Spot and Video Sketches Session on April 21st, 14:00-15:30.

In addition, Hot Spot papers will be on display during the conference in areas F1 and F2 (see floor plan on page 9).

H01 Microservices: A Lightweight Web Service Infrastructure for Mobile Devices

Nicholas Nicoloudis, I Made (Dennis) Pratistha

H02 A Ubiquitous System for Medication Monitoring

Kenneth Fishkin, Min Wang, Gaetano Borriello

H03 Context Aware Application of Semantic Web in Personified Home

Xuhui Chen, Yimin Wang, Yibin Hou

H04 A Bayesian Approach for Dealing with Uncertain Contexts

Tao Gu, Hung Keng Pung, Da Qing Zhang

H05 Targeted Sound Distribution with Embedded IP Based Loudspeaker Devices

Philipp Hünnerberg, Peter Gober

H06 Spoken Interaction in Intelligent Environments: a Working System

Germán Montoro, Xavier Alamán, Pablo A. Haya

H07 Performance Evaluation Simulation System for MANET Routing Protocols for E-Commerce Hot Spots

Khaled E. A. Negm, Wael Adi

H08 A New Approach to Distributed Context-Aware Computing

Paul Swoboda, John Plaiice

H09 Towards Situation-Aware Affordances: An Experimental Study

Stavros Antifakos, Florian Michahelles, Bernt Schiele

H10 Is TV a Suitable Device for Smart Home Applications?

Martin Maguire

H11 Adaptive, Planning Based, Web Service Composition for Context Awareness

Maja Vukovic, Peter Robinson

HOT SPOT Presentations

Wednesday April 21st, Hofburg Grosser Redoutensaal

H12 Collaborative capturing and interpretation of experiences

Yasuyuki Sumi, Sadanori Ito, Tetsuya Matsuguchi, Sidney Fels, Kenji Mase

H13 An IP-based Bluetooth Multi-Hop Network for Inhouse Communication

Markus Augel, Wolfgang Arne Heidrich, Rudi Knorr

H14 Using Camera-Equipped Mobile Phones for Interacting with Real-World Objects

Michael Rohs, Beat Gfeller

H15 A Visual Marker Using Computer Displays for Real Space Applications

Yasue Kishino, Masahiko Tsukamoto, Yutaka Sakane, Shojiro Nishio

H16 Talking Assistant: A Smart Digital Identity for Ubiquitous Computing

Erwin Aitenbichler, Jussi Kangasharju, Max Mühlhäuser

H17 Fundamentals of Ubiquitous Tracking

Martin Wagner, Asa MacWilliams, Martin Bauer, Gudrun Klinker, Joseph Newman, Thomas Pintaric, Dieter Schmalstieg

H18 The Concepts of an End-user-enabling Architecture for Ubiquitous Computing

Irene Mavrommati, Achilles Kameas

H19 A Mountaineering Supporting System

Yukimune Kuroki, Sachiyo Yoshitaki, Yutaka Sakane, Yoichi Takebayashi

H20 Making Use of Serendipity: A New Direction for Pervasive Computing from a Sociological View

Chao-Ming Teng, Hao-Hua Chu, Jane Yung-Jen Hsu

H21 Pervasive Computing and Proactive Agriculture

Richard Beckwith, Dan Teibel, Pat Bowen

Hot Spots

WEDNESDAY

April 21



HOT SPOT Presentations

Wednesday April 21st, Hofburg Grosser Redoutensaal

H22 Laser Pointers as Interaction Devices for Collaborative Pervasive Computing

Andriy Pavlovych, Wolfgang Stuerzlinger

H23 Context-Aware Queries Using Query by Browsing and Chiromancer

Stavros Polyviou, Paraskevas Evripidou, George Samaras

H24 A Mixed Reality-based Training Application for an Oil Refinery

Werner Hartmann, Jürgen Zauner, Michael Haller

H25 Occlusion Detection for Front-Projected Interactive Displays

Maria Nadia Hilario, Jeremy R. Cooperstock

H26 Context-aware Computing Using a Shared Contextual Information Service

Nancy Miller, Glenn Judd, Urs Hengartner, Fabien Gandon, Peter Steenkiste, I-Heng Meng, Ming-Whei Feng, Norman Sadeh

H27 A Design of the Ubiquitous Karate School for Learning Mind and Body Interaction

Yutaka Sakane, Masami Takahata, Naofumi Ohtani, Yukimune Kuroki, Yoichi Takebayashi

H28 The Smart Box Application Model

Matthias Lampe, Christian Flörkemeier

H29 A Computationally Enhanced Play Board for Group Interaction

Orit Shaer, Babak Ziraknejad, Ken Camarata, Ellen Yi-Luen Do, Mark D. Gross

H30 The Uber-Badge - a Versatile Platform at the Juncture Between Wearable and Social Computing

Matthew Laibowitz, Joseph A. Paradiso

H31 Improving the Reality Perception of Visually Impaired through Pervasive Computing

Vlad Coroamă, Tarik Kapić, Felix Röthenbacher

VIDEO Presentations

Wednesday April 21st, Hofburg (afternoon) / Univ. of Vienna (night)

V01 Creating Ad-hoc Pervasive Computing Environments

Michael Beigl, Tobias Zimmer, Albert Krohn, Christian Decker, Philip Robinson
(University of Karlsruhe, Germany)

Pervasive Computing technology can convert everyday environments, such as office spaces, into digitally enriched places. Users can profit from pervasive computing environments in many ways: context aware applications may proactively react [4], leading to, for example, information being displayed based on the user's current location. In bringing more and more of these technologies together, the potential will rise yet the effort to keep these systems running will increase. Today many approaches require a pre-installation of technology and maintenance of the setting. In our vision such environments will not be planned and installed by experts, but will emerge or even be assembled ad-hoc. This will enable users, unfamiliar with computing technology in general and pervasive computing technology in particular, to profit from such environments without the need for administration and maintenance by others. This paper introduces Impromptu, a concept that enables us to build pervasive computing environments from scratch without the need for infrastructure and without expert knowledge and configuration. Impromptu defines concepts and provides a framework with enabling technology for creating systems that can later be used in Impromptu environments. The Impromptu specifies a computing device that can be part of such an environment, while the Impromptu framework provides technology that supports building technology for Impromptu environments.

Video Papers will be presented in the Hot Spot and Video Sketches Session on April 21st, 14:00-15:30.

In addition, the videos will be shown in the Video Night on April 21st, 21:00-22:00 at the University of Vienna.



Videos

V02 Concept Video for a Context Aware Cell Phone

Urpo Tuomela, Mika P. Mustonen (Nokia Corporation, Finland)

Context aware computing provides new possibilities for user interaction in personal mobile communication. Future mobile terminals benefit from a wide range of communication and interaction methods enabling seamless ubiquitous communication with interactive environment and other terminals. This paper presents the video of context aware cell phone and its user interface/interaction (UI) concept. The development of UI concept is based on the results of user-centric studies meaning that industrial design, user interfaces, user interaction and applications of the device are dominated by end user needs.



V03 Service Mobility Proxy for Seamless Handover between Various Devices

Mikio Hasegawa, Udana Bandara, Masugi Inoue, Khaled Mahmud, Hiroyuki Morikawa
(University of Tokyo, Japan)

This video shows demonstrations of Cross-Device Handover using the Service Mobility Proxy (SMP), which supports seamless handover between various types of terminals of any service application. The SMP has functions for switching the destination terminal and transcoding. As the destination terminals, we use PCs, PDAs, the Polycom TV conferencing system, etc. Moreover, we have designed and implemented a very simple device, which we call the Net Speaker as a destination terminal. It mainly consists of a DA converter, amplifier and Ethernet adaptor. It is a very simple network oriented device, which can receive WAV formatted data and play it. In this video, we show handover of videophone and streaming video applications among those devices.





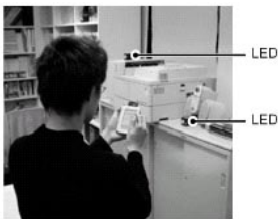
VIDEO Presentations

Wednesday April 21st, Hofburg / Univ. of Vienna

V04 u-Photo: A Snapshot-based Interaction Technique for Ubiquitous Embedded Information

Naohiko Kohtake, Takeshi Iwamoto, Genta Suzuki, Shun Aoki, Daisuke Maruyama, Takuya Kouda, Kazunori Takashio, Hideyuki Tokuda (Keio University, Japan)

We present a snapshot-based direct interaction technique that enables to focus on particular embedded information corresponded to each target object from a limitless number of ubiquitous embedded information through actions of taking photos. With the proposed u-Photo which is augmented image data, available icons of embedded information will be overlaid on a focused target image when the u-Photo was taken and a user can operate networked appliances and monitor sensor data within the focused area. Based on this concept, several applications for intuitive interactions, remote operations and service reproductions have been implemented. We have demonstrated that the u-Photo is quite useful media for exchanging and realizing an easy direct interaction with various kinds of appliances.



V05 Urban Tapestries: Public Authoring in the Wireless City

Alice Angus, Giles Lane (Proboscis, United Kingdom)

Urban Tapestries is a framework for understanding the social, cultural, economic and political implications of pervasive location-based mobile and wireless systems. To investigate these issues, we are building an experimental location-based wireless platform to allow people to access and author location-specific content (text, audio and pictures). It is a forum for exploring and sharing experience and knowledge, for leaving and annotating ephemeral traces of peoples' presence in the geography of the city. Urban Tapestries allows people to author their own virtual annotations of the city, enabling a communities' collective memory to grow organically, allowing ordinary citizens to embed social knowledge in the new wireless landscape of the city. People will be able to add new locations, location content and the threads which link individual locations to local contexts, which are accessed via handheld devices such as PDAs and mobile phones. Urban Tapestries was conceived, initiated and is being developed by Proboscis. It is a partnership with Hewlett-Packard Research Labs, Orange and the London School of Economics in collaboration with France Telecom R&D, Locustworld and the Ordnance Survey. The project has been funded by the Department of Trade and Industry, Arts Council England and the Daniel Langlois Foundation for the Arts, Science and Technology with additional sponsorship from Garbe UK, Apple Computer UK & Sony Europe.



V06 Smart Roads in the Pervasive Computing Landscape

Volker Christian, Alois Ferscha, Wolfgang Narzt, Gustav Pomberger (University of Linz, Austria), Dieter Kolb, Reiner Müller, Jan Wieghardt (Siemens AG, Munich, Germany), Reinhold Bidner, Horst Hörtnner, Christopher Lindinger (Ars Electronica Futurelab, Linz, Austria)

Physical objects capable of supplying computing services to users by utilizing hidden pervasive computing technologies are considered to be smart. Allowing not only a physical correspondence of object and enabling technology but also a logical one substantially increases the set of real objects to be considered as smart. This paper presents an innovative thought model of virtually smart things, i.e., objects in the real world not physically equipped with sensory gadgets or interaction facilities, but also being aware of their surrounding environment by their virtual representation. The main focus of the following sections concentrates on a Smart Road, a fully implemented use-case, telling its users where to go.



VIDEO Presentations

Wednesday April 21st, Hofburg (afternoon) / Univ. of Vienna (night)

V07 Spotlight Navigation: Interaction with a Handheld Projection Device

Stefan Rapp, Georg Michelitsch, Martin Osen, Jason Williams, Martin Barbisch, Ronan Bohan, Zica Valsan, Martin Emele (Sony Europe GmbH, Germany)

This paper introduces a novel interaction paradigm for handheld devices using projection technology that leverages real world experience by users. They can navigate naturally in unlimited virtual information spaces with simple hand gestures, similar to using a flashlight. We describe interaction techniques specifically designed for such devices that are intuitive, efficient and - as informal experimentation with users has shown - fun to use.



V08 Investigating Prototypes Through Play

Kristina Andersen (STEIM, The Netherlands)

The video presents ensemble a set of wireless sensor prototypes designed to be investigated by children through play. It consists of a short technical overview and video from one of the workshops where the children played with the prototypes. All output is sound. The children are between 3 and 5 years old. They play independently and are developing ways of using the interfaces themselves. The video is divided into areas of discovery each with their own header. The children also spend time drawing the prototypes and the video shows examples of this.



Videos

V09 Digital Aura

Alois Ferscha, Manfred Hechinger, Rene Mayrhofer (Johannes Kepler Universität Linz, Austria), Marcos dos Santos Rocha, Marquart Franz, Roy Oberhauser, (SIEMENS Corporate Technology, CT SE 2, Munich, Germany)

Smart space and smart appliances, i.e. wirelessly ad-hoc networked, mobile, autonomous special purpose computing devices, providing largely invisible support and context-aware services have started to populate the real world and our daily lives. In such a world, where literally everything is connected to everything with invisible, wireless data links, we need new styles on how humans and things can interact. We have proposed a "spontaneous interaction" thought model, in which things start to interact once they reach physical proximity to each other: Explained using the metaphor of an "aura", which like a subtle invisible emanation or exhalation radiates from the center of an object into its surrounding, a "digital aura" is built on technologies like Bluetooth radio, RFID or IrDA together with an XML based profile description, such that if an object detects the proximity (e.g. radio signal strength) of another object, it starts exchanging and comparing profile data, and, upon sufficient "similarity" of the two profiles, starts to interact with that object. A "digital aura" depending on the implementation technology, is dense in the center of the object, and thins out towards its surrounding until it is no longer sensible by others. Profiles described as semi-structured data and attached to the object, can be matched by a structural and semantic analysis. Peer-to-peer concepts can then be used to implement applications on top of the digital aura model for spontaneous interaction.





DEMONSTRATIONS

April 21st – April 23rd, Hofburg, "Untere Lounge"

D01 A Real Space Application by Visual Marker using Computer Displays

Yasue Kishino, Masahiko Tsukamoto, Shojiro Nishio (Osaka University), Yutaka Sakane (Shizuoka University)



To construct augmented reality applications with a camera, it is necessary to determine the concise location and the direction of the camera, i.e., a user's \$B!G!\$ (Bs view, in which virtual objects are composed). Recently, there have been extensive researches based on video analysis to achieve this. In these approaches, paper-printed markers or LED markers are typically placed in the real world, and users capture the image of these markers to obtain their information. However, recent trends in ubiquitous computing have required more dynamic and interactive markers. In this research, we propose a new location marking method, called VCC (Visual Computer Communication), which uses computer displays to show markers and send information. In our method, a marker in a matrix shape keeps blinking to provide both coordinate information and attached information such as an address or a URL. We will demonstrate how a laptop PC with a CCD camera detect the VCC marker, recognize the information, and overlay recognized information or open a Web page pointed by the recognized URL. Since we assume in the future environment there should be many ubiquitous displays anywhere in the real world, our system can be used by users walking around with their mobile computers equipped with cameras to obtain various information and services.

D02 The Uber-Badge

Joe Paradiso (MIT Media Lab, USA)



We present the design of a new badge platform for facilitating interaction in large groups of people. We have built this device to be very flexible in order to host a wide variety of interactions in the areas where wearable and social computing converge, from game environments to meetings and conventions. This badge has both RF and IR communication, a 5x9 LED display capable of presenting graphics and scrolling text that users in the vicinity can read, an onboard microphone for 12-bit audio sampling, a 12-bit audio output, a pager motor vibrator for vibratory feedback, 3 onboard processors, capacity for up to 256 MB of flash memory, provisions for connecting LCD displays, and connectors that mate into the Responsive Environments Group's Stack Sensor platform, allowing a variety of different sensors to be integrated. We describe several applications now being developed for this badge at the MIT Media Laboratory, and touch on how it was used in a multiplayer, augmented reality urban adventure hunt game in Manhattan in the summer of 2003.

D03 Ensemble: Clothes, Sensors and Sound

Kristina Andersen (STEIM, The Netherlands)



"ensemble" is a suitcase full of music making clothes designed for children. Each piece of clothing uses sensors to modify a sound or voice. The position of a hat, the swoosh of a dress, the darkness of a ladies bag... The project is developed as an exploration of using embedded wireless sensors as tangible sonic objects and making them available to pre-school children. By observing how they spontaneously explore and interpret them, we aim at capturing their emerging understanding of the causalities of electronic sensing. Seven garments are fitted with wireless sensors that control sound samples and their modifiers in real time. Each garment acts as carriers both for the sensors and the wireless system. The sensors are separated by type and placed in the garments in such a way that the function of the sensor is conceptually supported by the form-factors of the garment. The dress holds an accelerometer, the hat tilt switches etc. The garments are using hacked and modified game-pads as wireless signal carriers. A number of ensemble garments will be demoed along with two pieces of STEIM software: junXion and LiSa.

DEMONSTRATIONS

April 21st – April 23rd, Hofburg, "Untere Lounge"

D04 Microservices: A Lightweight Web Service Infrastructure for Mobile Devices

Nicholas Nicoloudis (Monash University Australia)

Our Microservices framework was developed to enable communication amongst various web enabled mobile devices. The Microservices framework facilitates peer-to-peer communication based upon the architecture independent web services standard. Interoperability is essential to enable communication between mobile and assorted web enabled devices. Our framework referred to as Microservices consists of two key areas; the first includes a lightweight version of the web service architecture. The second includes the development of a compact and lightweight component-based web server capable of supporting Microservices and a range of other internet standards. In developing the web server we have taken into consideration that the functionality supported and resource requirements should not be as lightweight and minimalist as existing embedded web servers. The reason being is that mobile devices are at the centre of the scale when it comes to hardware resource availability. Several limitations are imposed in implementing the web service framework for the mobile device. These limitations are due to the constraints of available resources in comparison to desktop systems. However, the framework remains compatible with the original architecture, since it merely imposes certain restrictions as opposed to a complete overhaul of the underlying architecture.

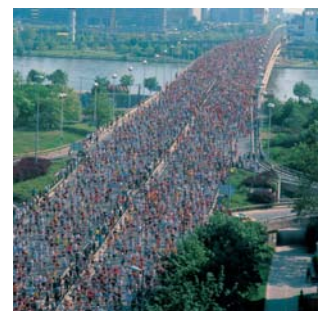


D05 Event-Triggered SMS-Based Notification Services

Alois Ferscha (Johannes Kepler University Linz, Austria)

Short message services, initially designed for text communication between two mobile phones, are nowadays used in many other applications, including ordering of services and goods, mobile payment, or delivery of news. We have designed, implemented, and successfully deployed in real life an SMS based notification system supporting push and pull services for real time querying in sport events using RFID for time keeping. Participants in the sport event, e.g. runners or bikers, are equipped with RFID chips which omit a unique ID to be captured by an RFID reader. Typically such readers are positioned at the start and end of the race, as well as on predefined control points for time keeping. Most sport events offer internet based tools to query race results. However, spectators of the event would also be interested in querying and receiving intermediate and final results in real time while watching the event, where typically internet access cannot easily be provided. This was our motivation for offering mobile SMS based push and pull services. In the push service, users register themselves for the race number of their choice giving the mobile phone number where the results should be delivered. If the race participant crosses the reader, the RFID signal is captured and triggers not only the time keeping functions but also queries a database for any registered delivery requests. If requests are found, the time keeping data are transferred into SMS format and delivered to the registered number(s) via an SMS gateway provided by our partner ONE. Compared to "traditional" internet based queries, users benefit from the advantage of (nearly) world wide coverage and from instant delivery of results triggered by the event of interest itself. In the pull service, the user would send an SMS with the contestants' race number and would immediately receive the most current results (e.g. half distance timings or at least the name of the participant) available. The Vienna City Marathon was the first sports event offering this notification service. More than 10.000 messages have been delivered via the push and the pull service to world wide destinations at the day of the race.

Demonstrations





DEMONSTRATIONS

April 21st – April 23rd, Hofburg, "Untere Lounge"

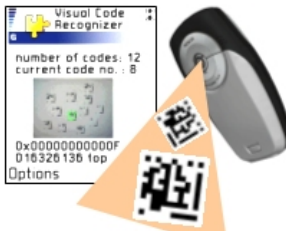
D06 Visual Code Recognition for Camera-Equipped Mobile Phone

Michael Rohs, Beat Gfeller (ETH Zurich, Switzerland)

This demo illustrates how interaction with mobile phones can be enhanced by using 2-dimensional visual codes. We present a visual code system for camera-equipped mobile phones and a show number of example applications. Even though the computing power of current mobile phones is limited and the image quality of the cameras is comparatively poor, such devices can act as mobile sensors for 2-dimensional visual codes. The codes we have developed can be displayed on electronic screens, projected with a beamer, printed on paper documents, or attached to physical objects. They act as a key to access object-related information and functionality.

The ability to detect objects in the user's vicinity offers a natural way of interaction and strengthens the role of mobile phones in a large number of application scenarios. Mobile phones are in constant reach of their users, are thus available in everyday situations, and provide continuous wireless connectivity. They are therefore suitable to act as the user's "bridge" between physical entities in the real world and associated entities in the virtual world.

The visual code system is designed for low-quality images and uses a lightweight recognition algorithm. It allows the simultaneous detection of multiple codes, introduces a position-independent code coordinate system, and provides the phone's orientation as a parameter.



D07 Improving the Reality Perception of Visually Impaired

Vlad Coroama, Felix Röthenbacher, Christoph Plüss (ETH Zürich, Switzerland)

The visually impaired experience serious difficulties in leading an independent life. Particularly in unknown environments (foreign cities, large airport terminals) they rely on external assistance. But even ordinary tasks such as the daily shopping in the supermarket are hard to be performed independently. It is virtually impossible to distinguish between the thousands supermarket-products with other senses than the sight. The common cause for these problems is the lack of information the visually impaired have about their immediate surroundings.

In this demo, we show the prototype of the Chatty Environment, a ubiquitous computing system designed to help the visually impaired to better understand their neighborhoods. The tagged objects in the chatty environment reveal their existence to the user through an audio interface, when he comes in their vicinity. The user can then interact with these entities, getting more information about their attributes or even perform small actions on them.

By supporting two complementary tagging methods, the system tries to map the way sighted people perceive the world. Large and important objects can be detected from a distance, as they advertise themselves to the user. For small supermarket-like items a different paradigm is used: the user has to explicitly pick up an object to begin interaction.



PRESENTER INFORMATION

Visual Support

A data video projector and a projection screen are available. Overhead projection is not possible. A live video of the presenter will be recorded and displayed in the lecture room.

Audio Support

A podium and a clip-on microphone are available for presenters. In addition, a connection from computer audio to room audio is provided.

Computer Support

You may either bring and connect your own computer which must be equipped with an VGA interface. At the presentation desk, there will also be a notebook with a CD-ROM / DVD drive, USB and firewire interfaces. The notebook is connected to the Internet, installed software includes Windows XP as operating system, Microsoft Office Suite, an Acrobat reader and a Microsoft Media player. A Mac powerbook can also be provided for presenters.

Speakers Preparation Room

To prepare for your talk, you may use the office room E (see the floor plan on page 9). Please, check in advance at the information desk to ensure availability. (Make room reservation with Rene Mayrhofer, rene@soft.uni-linz.ac.at)

Session Chair

Session chairs have to introduce the speakers, lead the discussion and ensure that the time schedule is followed. If you are a session chair, please contact the information desk where you will receive further information about your session. All speakers are kindly asked to contact their session chair who will provide the presenters with necessary details.

Hot Spot and Video Sketches

Presenters of Hot Spot and Video Papers will be given precisely two minutes to sketch their work on Wednesday afternoon in the "Grosse Redoutensaal". Presentations will be given in the order as shown in the program. Authors of Hot Spot papers may also use the pin boards located in areas F1 and F2 (see floor plan on page 9), pin boards are marked with the paper code and title.

Demonstrations

Demonstrations will be given in the "Untere Lounge" (see floor plan code D). For each demonstration, a board with the demonstration presentation number (Dnn) indicates the right spot. Presenters of demonstrations may use this board to present posters about their work. For installation of demos, the presenters are kindly asked to contact the organization team.

**Information
for Presenters**



SOCIAL PROGRAM

Wednesday, April 21st 2004

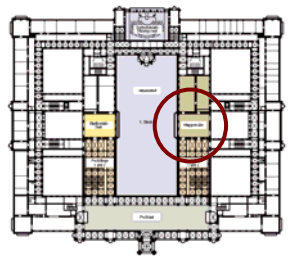
18:30 – 20:30 Reception

Wappensaal, Vienna City Hall

Vienna welcomes the participants of PERVASIVE 2004 at a reception under the auspices of the Major of Vienna given in the Wappensaal of the Vienna City Hall. The old town hall was originally gothic, but received a baroque facade around 1700. The complex houses the governor of the state of Vienna, the Assembly and the City Council. On the top of the tower sits the 'Iron Knight of City Hall' (Eiserner Rathausmann), which is one of the symbols of Vienna. In the interior courtyard one can admire the Andromeda Fountain from 1741, a creation by the baroque master Georg Raphael Donner. The Salvator Chapel, with its magnificent Renaissance portal from 1360 (Salvatorgasse) was integrated into the complex.

Attendance to the reception is included in the conference registration. You will receive your ticket at the registration desk where also additional tickets for accompanying persons can be bought.

The Vienna City Hall is located in walking distance from Hofburg palace. Guides and signs will direct you to the City Hall, entrance to the City Hall is only possible from Lichtenfelsgasse.



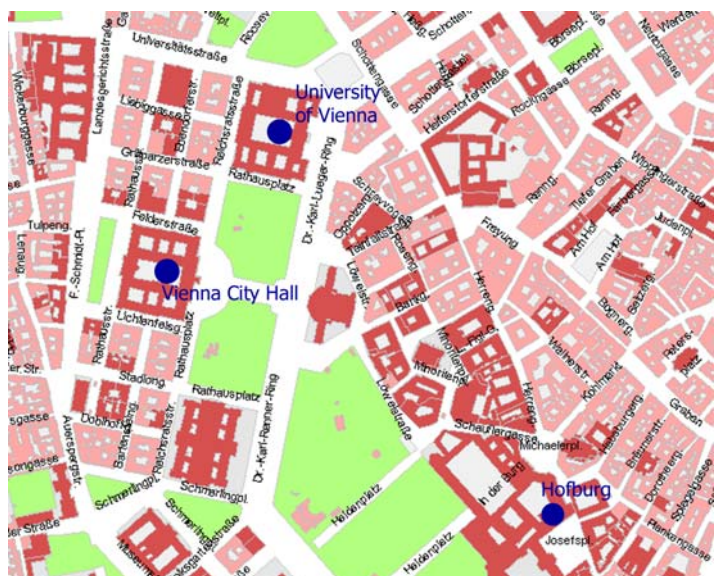
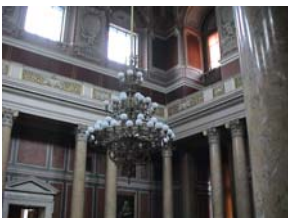
21:00 – 22:00 Video Night

Main Festival Hall, University of Vienna

The video papers of PERVASIVE 2004 will be shown at the video night, held in the Main Festival Hall at the University of Vienna.

Attendance to the video night is included in the conference registration. You will receive your ticket at the registration desk where also additional tickets for accompanying persons can be bought.

The University of Vienna is located at the Ringstrasse next to the Vienna City Hall. Guides and signs will direct you to the University.



SOCIAL PROGRAM

Thursday, April 22nd 2004

18:30 – 23:00 Conference Dinner

Orangerie, Schönbrunn Palace

The PERVASIVE 2004 conference dinner will be held in the Orangerie, which is part of Schönbrunn palace. The magnificent Baroque Schönbrunn Palace with grandly formal gardens was built for the Habsburgs between 1696 and 1713. The complex has been a summer residence for such personages as Maria Theresa and Napoleon. Kaiser Franz Josef I was born and died here. His 'office' (kept as he left it in 1916) is a touching reminder of his spartan life. In contrast, other rooms are filled with truly spectacular imperial elegance. Six-year-old Mozart played here in the Hall of Mirrors for Maria Theresa and the court. The ornate reception areas are still used for state occasions. A guided tour leading through more than 40 of the palace's 1,441 rooms is the best way to see inside the palace.

The French-style gardens, bigger than the principality of Monaco, are a riot of colour in the summer. Hidden away in them you'll find some fake Roman ruins, the exuberant Neptune Fountain (a riotous ensemble from Greek mythology) and the triumphant Gloriette Monument. Also on the grounds is the baroque Schlosstheater (Palace Theater), which stages summer performances. Marie Antoinette appeared on its stage in pastorals during her happy youth. On the west side of the gardens are the Palmenhaus (Palm House), filled with exotic plants, and the Tiergarten (zoo), the world's oldest, dating from 1752. Schmetterlingshaus (Butterfly House) can also be found in the park.

Attendance to the conference dinner is included in the conference registration, you will find your ticket in your registration package. Additional tickets can be bought at the registration desk.

To reach the Orangerie, you have to take the metro line U4, exit at stop Schönbrunn. Conference Participants will receive two complimentary underground tickets and detailed instructions for going to / returning from the conference dinner on Thursday after the last conference session at the registration desk. Please, note that the tickets must be stamped before entering the metro, machines are located at the entrance of the stations. If you arrive between 18:15 and 18:30, you will have the opportunity to participate in an approx. 20 minutes walk through the palace garden.



Social
Program





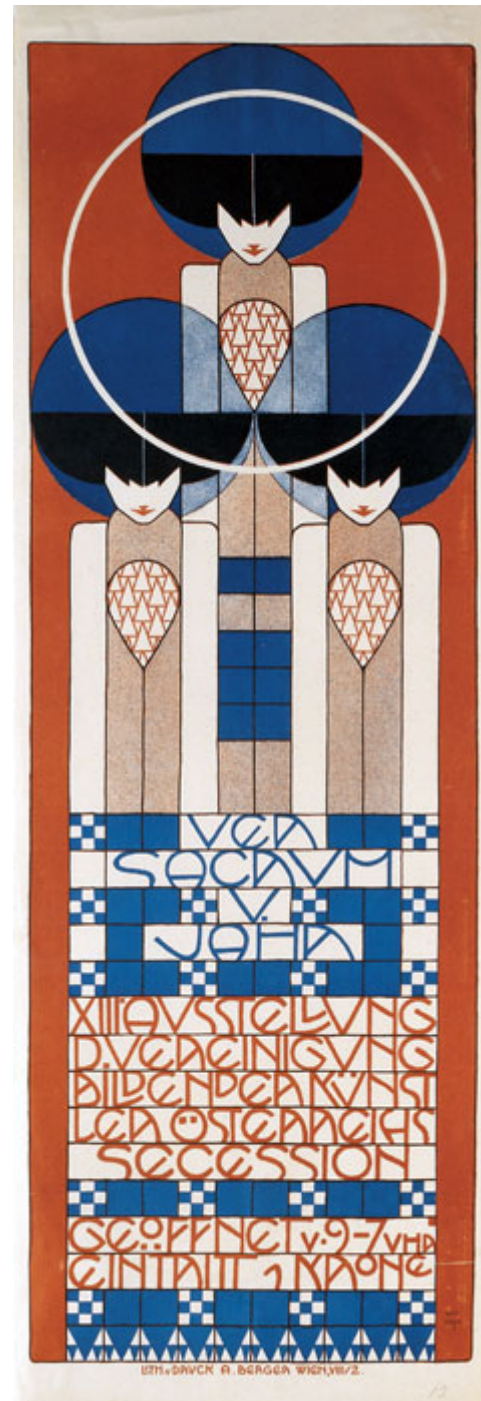
ARTWORK

Artwork by Koloman Moser

The artwork for PERVASIVE 2004 was inspired by the poster for the thirteenth art exhibition of the "Vienna Secession" by Kolo Moser in 1902 (177 x 60 cm).

" ... Moser, Kolo (real name: Koloman M.), b. Vienna, March 30, 1868, d. Vienna, Oct. 18, 1918, painter, graphic artist and designer. Studied at the Vienna Academy and at the Vienna School of Arts and Crafts, founder member of the Vienna Secession, from 1899 teacher at the Vienna School of Arts and Crafts. In 1903 together with J. Hoffmann, founded the Wiener Werkstätte, of which both became joint art directors. Contributed to the magazines "Ver Sacrum", "Hohe Warte" and "Der liebe Augustin". 1904 designed the apse mosaic and the glass windows of the church "Am Steinhof" designed by O. Wagner. Left the Vienna Secession in 1905 together with the Klimt group; co-founder of the Österreichischer Werkbund. His paintings were first influenced by the Impressionists, in his later years he was profoundly influenced by F. Hodler. ... "

Text: Encyclopaedia www.aeiou.at
Image: Museen der Stadt Wien



NOTES



NOTES

NOTES

	Wednesday, April 21, Vienna Hofburg, Redoute Hall	Thursday, April 22, Vienna Hofburg, Redoute Hall	Friday, April 23, Vienna Hofburg, Redoute Hall
09:00-10:30	Opening	Keynote Chair: Alois Ferscha (Johannes Kepler University, Austria) Tangible Bits Hiroshi Ishii (Tangible Media Group, MIT Media Laboratori)	Session 7: Architectures and Systems Chair: Albrecht Schmidt (Ludwig-Maximilians-University Munich, Germany) <ul style="list-style-type: none">Towards Wearable Autonomous Microsystems <i>Nagendra B. Bharatula, Stijn Ossevoort, Mathias Stäger, Gerhard Tröster (ETH Zurich, Switzerland)</i>Ubiquitous Chip: a Rule-based I/O Control Device for Ubiquitous Computing <i>Tsutomu Terada, Masahiko Tsukamoto (Osaka University, Japan), Keisuke Hayakawa, (NEC Corp., Japan), Tomoki Yoshihisa, Yasue Kishino (Osaka University, Japan), Atsushi Kashitani (NEC Corp., Japan), Shojiro Nishio (Osaka University, Japan)</i>eSeal - A System for Enhanced Electronic Assertion of Authenticity and Integrity of Sealed Items <i>Christian Decker, Michael Beigl, Albert Krohn, Philip Robinson (University of Karlsruhe, Germany), Uwe Kubach, (SAP AG, Corporate Research Germany)</i>
	Keynote Chair: Günter Haring (University of Vienna, Austria) Brain Computer Interfaces Bernhard Greinmann (University of Technology Graz)	Session 3: Near Body Interfaces Chair: Joe Paradiso (MIT Media Lab, USA) <ul style="list-style-type: none">Spectacle-Based Design of Wearable See-Through Display for Accommodation-Free Viewing <i>Marc von Waldkirch, Paul Lukowicz, Gerhard Tröster (ETH Zurich, Switzerland)</i>A Compact battery-less information terminal for Real World Interaction <i>Takuichi Nishimura, Hideo Itoh, Yoshiyuki Nakamura, Yoshinobu Yamamoto, Hideyuki Nakashima (Cyber Assist Research Center, Japan)</i>	
10:30-11:00	Coffee Break		Coffee Break
11:00-12:30	Session 1: Activity Recognition Chair: Hans Gellersen (Lancaster University, UK) <ul style="list-style-type: none">Activity Recognition From User-Annotated Acceleration Data <i>Ling Bao, Stephen S. Intille (MIT, USA)</i>Recognizing Workshop Activity Using Body Worn Microphones and Accelerometers <i>Paul Lukowicz, Jamie A Ward, Holger Junker, Mathias Stäger, Gerhard Tröster (ETH Zürich, Switzerland), Amin Atrash, Thad Stanner (Georgia Tech, USA)</i>"Are You With Me" - Using Accelerometers to Determine if Two Devices are Carried by the Same Person <i>Jonathan Lester, Blake Hannaford, Gaetano Borriello (University of Washington, USA)</i>	Coffee Break	Session 8: Algorithms Chair: Hideyuki Tokuda (Keio University, Japan) <ul style="list-style-type: none">A Distributed Precision Based Localization Algorithm for Ad-Hoc Networks <i>Leon Evers, Stefan Dulman, Paul Havinga (University of Twente, The Netherlands)</i>Adaptive On-device Location Recognition <i>Kari Laasonen, Mika Raento, Hannu Toivonen (University of Helsinki, Finland)</i>Accommodating Transient Connectivity in Ad Hoc and Mobile Settings <i>Radu Handorean, Christopher Gill, Gruia-Catalin Roman (Washington University in St. Louis, USA)</i>
		Session 4: Software Chair: Gaetano Borriello (University of Washington, USA) <ul style="list-style-type: none">INCA: A Software Infrastructure to Facilitate the Construction & Evolution of Capture & Access Apps <i>Khai N. Truong, Gregory D. Abowd (Georgia Institute of Technology, USA)</i>	
12:30-14:00	Lunch	Lunch	Lunch
14:00-15:30	Hot Spot & Video sketches Chair: Lars Eric Holmquist (Viktorja Institute of Technology, Sweden)	Session 5: Sensors Chair: Friedemann Mattern (ETH Zurich, Switzerland) <ul style="list-style-type: none">Activity Recognition in the Home Using Simple and Ubiquitous Sensors <i>Emmanuel Munguia Tapia, Stephen S. Intille, Kent Larson (MIT, USA)</i>Automatic Calibration of Body Worn Acceleration Sensors <i>Paul Lukowicz, Holger Junker, Gerhard Tröster, (ETH Zurich, Switzerland)</i> (presentation time 20 minutes)Reject Optional LVQ Based Two-level Classifier to Improve Reliability in Footstep Identification <i>Jaakko Suutala, Susanna Pirttikangas, Jukka Riekk, Juha Röining (Infotech Oulu, Finland)</i> (presentation time 20 minutes)Issues with RFID usage in ubiquitous computing applications <i>Christian Floerkemeier, Matthias Lampe (ETH Zurich, Switzerland)</i> (presentation time 20 minutes)	Session 9: New Interfaces Chair: Gabriele Kotsis (Johannes Kepler University, Austria) <ul style="list-style-type: none">Microbiology Tray and Pipette Tracking as a Proactive Tangible User Interface <i>Harlan Hile, Jiwon Kim, Gaetano Borriello (University of Washington, USA)</i>Augmenting Collections of Everyday Objects: Clothes Hangers as an Information Display <i>Tara Matthews (UC Berkeley, USA), Hans-W. Gellersen, Kristof Van Laerhoven (Lancaster University, UK), Anind K. Dey (Intel Research Berkeley, USA)</i> (presentation time 20 minutes)MirrorSpace: using proximity as an interface to video-mediated communication <i>Nicolas Roussel, Helen Evans, Heiko Hansen (Universit Paris-Sud XI, France)</i> (presentation time 20 minutes)SearchLight - A Lightweight Search Function for Pervasive Environments <i>Andreas Butz, Michael Schneider, Mira Spassova (Saarland University, Germany)</i> (presentation time 20 minutes)
15:30-16:30	Coffee Break	Coffee Break	Closing
16:00-17:30	Session 2: Context Computing Chair: Anind Dey (Intel Research, Berkeley, USA) <ul style="list-style-type: none">Context Cube: Flexible and Effective Manipulation of Sensed Context Data <i>Lonnie Harvel, Ling Liu, Gregory D. Abowd, Yu-Xi Lim, Chris Scheibe, Chris Chatham (Georgia Institute of Technology, USA)</i>A Context-Aware Communication Platform for Smart Objects <i>Frank Siegemund (ETH Zurich, Switzerland)</i>Siren: Context-aware Computing for Firefighting <i>Xiaodong Jiang, Nicholas Y. Chen, Jason I. Hong, Kevin Wang (UC Berkeley, USA), Leila Takayama (Stanford University, USA), James A. Landay (University of Washington, USA)</i>	Session 6: Security Chair: Max Mühlhäuser (TU-Darmstadt, Germany) <ul style="list-style-type: none">A Fault-tolerant Key-Distribution Scheme for Securing Wireless Ad-hoc Networks <i>Arno Wacker, Timo Heiber, Holger Germann, Pedro José Marron (Universität Stuttgart, Germany)</i>ProxNet: Secure Dynamic Wireless Connection by Proximity Sensing <i>Jun Rekimoto, Takashi Miyaki, Michimune Kohno (Sony Labs, Japan)</i> (presentation time 20 minutes)Tackling Security and Privacy Issues in Radio Frequency Identification Devices <i>Dirk Henrici, Paul Müller (University of Kaiserslautern, Germany)</i> (presentation time 20 minutes)	
18:30-22:00	Mayor ´s Reception, Vienna City Hall Video Night Main Festival Hall, Univ. of Vienna	Conference Dinner Orangerie Schönbrunn Palace	