

Andreas Holzinger (Ed.)

LNCS 4799

HCI and Usability for Medicine and Health Care

Third Symposium of the Workgroup
Human-Computer Interaction and Usability Engineering
of the Austrian Computer Society, USAB 2007
Graz, Austria, November 2007, Proceedings

Andreas Holzinger (Ed.)

HCI and Usability for Medicine and Health Care

Third Symposium of the Workgroup
Human-Computer Interaction and Usability Engineering
of the Austrian Computer Society, USAB 2007
Graz, Austria, November 22, 2007
Proceedings



Springer

Volume Editor

Andreas Holzinger
Medical University Graz (MUG)
Institute of Medical Informatics, Statistics and Documentation (IMI)
Research Unit HCI4MED
Auenbruggerplatz 2/V, 8036 Graz, Austria
E-mail: andreas.holzinger@meduni-graz.at

Library of Congress Control Number: 2007938906

CR Subject Classification (1998): H.5, D.2, J.3, J.4, K.4

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN	0302-9743
ISBN-10	3-540-76804-1 Springer Berlin Heidelberg New York
ISBN-13	978-3-540-76804-3 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2007
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 12191642 06/3180 5 4 3 2 1 0

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Preface

The work group Human–Computer Interaction & Usability Engineering (HCI&UE) of the Austrian Computer Society (OCG) serves as a platform for interdisciplinary exchange, research and development. While human–computer interaction brings together psychologists and computer scientists, usability engineering is a discipline within software engineering.

It is essential that psychology research must be incorporated into software engineering at a systemic level. The aspect of integration of human factors into informatics is especially important, since it is here that innovations take place, systems are built and applications are implemented.

Our 2007 topic was “Human–Computer Interaction for Medicine and Health Care” (HCI4MED), culminating in the third annual Usability Symposium USAB 2007 on November 22, 2007 in Graz, Austria (<http://www.meduni-graz.at/imi/usab-symposium>).

Medical information systems are already extremely sophisticated and technological performance increases exponentially. However, *human cognitive evolution does not advance at the same speed*. Consequently, the focus on interaction and communication between humans and computers is of increasing importance in medicine and health care. The daily actions of medical professionals must be the central concern, surrounding and supporting them with new and emerging technologies.

Information systems are a central component of modern knowledge-based medicine and health services, therefore knowledge management needs to continually be adapted to the needs and demands of medical professionals within this environment of steadily increasing high-tech medicine. Information processing, in particular its potential effectiveness in modern health services and the optimization of processes and operational sequences, is of increasing interest.

It is particularly important for medical information systems (e.g., hospital information systems and decision support systems) to be designed with the end users in mind. Within the context of this symposium our end users are medical professionals and justifiably expect the software technology to provide a clear benefit; they expect to be supported efficiently and effectively in their daily activities.

This is a highly interdisciplinary field, producing specific problems; especially for younger researchers, who, being new to their field and not yet firmly anchored in one single discipline, are in danger of “falling between two seats.” It is much easier to gain depth and acknowledgement within a scientific community in one single field. While innovation and new developments often take place at the junction of two or more disciplines, this requires a broader basis of knowledge and much more effort.

Working in an interdisciplinary area, one needs the ability to communicate with professionals in other disciplines and a willingness to accept and incorporate their points of view. USAB 2007 was organized in order to promote this closer collaboration between software engineers, psychology researchers and medical professionals.

USAB 2007 received a total of 97 submissions. We followed a careful and rigorous two-level, double-blind review, assigning each paper to a minimum of three and

maximum of six reviewers. On the basis of the reviewer's results, 21 full papers (≥ 14 pages), 18 short papers, 1 poster and 1 tutorial were accepted.

USAB 2007 can be seen as a bridge, within the scientific community, between computer science and psychology. The people who gathered together to work for this symposium have displayed great enthusiasm and dedication.

I cordially thank each and every person who contributed toward making USAB 2007 a success, for their participation and commitment: the authors, reviewers, sponsors, organizations, supporters, the team of the Research Unit HCI4MED of the Institute of Medical Informatics, Statistics and Documentation (IMI), and all the volunteers. Without their help, this bridge would never have been built.

Finally, we are grateful to the Springer LNCS Team for their profound work on this volume.

November 2007

Andreas Holzinger

Organization

Programme Committee

Patricia A. Abbot, Johns Hopkins University, USA
Ray Adams, Middlesex University London, UK
Sheikh Iqbal Ahamed, Marquette University, USA
Henning Andersen, Risoe National Laboratory, Denmark
Keith Andrews, TU Graz, Austria
Sue Bogner, LLC Bethesda, USA
Noelle Carbonell, Université Henri Poincaré Nancy, France
Tiziana Catarci, Università di Roma La Sapienza, Italy
Wendy Chapman, University of Pittsburgh, USA
Luca Chittaro, University of Udine, Italy
Matjaz Debevc, University of Maribor, Slovenia
Alan Dix, Lancaster University, UK
Judy Edworthy, University of Plymouth, UK
Peter L. Elkin, Mayo Clinic, Rochester, USA
Pier Luigi Emiliani, National Research Council, Florence, Italy
Daryle Gardner-Bonneau, Western Michigan University, USA
Andrina Granic, University of Split, Croatia
Eduard Groeller, TU Wien, Austria
Sissel Guttormsen, University of Bern, Switzerland
Martin Hitz, University of Klagenfurt, Austria
Andreas Holzinger, Med. University of Graz, Austria (Chair)
Timo Honkela, Helsinki University of Technology, Finland
Ebba P. Hvannberg, University of Iceland, Reykjavik, Iceland
Julie Jacko, Georgia Institute of Technology, USA
Chris Johnson, University of Glasgow, UK
Anirudha N. Joshi, Indian Institute of Technology, Bombay, India
Erik Liljegren, Chalmers Technical University, Sweden
Zhengjie liu, Dalian Maritime University, China
Klaus Miesenberger, University of Linz, Austria
Silvia Miksch, Donau University Krems, Austria
Lisa Neal, Tufts University School of Medicine Boston, USA
Alexander Nischelwitzer, FH Joanneum Graz, Austria
Shogo Nishida, Osaka University, Japan
Hiromu Nishitani, University of Tokushima, Japan
Nuno J Nunes, University of Madeira, Portugal
Anne-Sophie Nyssen, Université de Liège, Belgium
Erika Orrick, GE Healthcare, Carrollton, USA
Philippe Palanque, Université Toulouse, France

Helen Petrie, University of York, UK
Margit Pohl, TU Wien, Austria
Robert W. Proctor, Purdue University, USA
Harald Reiterer, University of Konstanz, Germany
Wendy Rogers, Georgia Institute of Technology, USA
Anxo C. Roibas, University of Brighton, UK
Anthony Savidis, ICS FORTH, Heraklion, Greece
Albrecht Schmidt, Fraunhofer IAIS/B-IT, Uni Bonn, Germany
Andrew Sears, UMB, Baltimore, USA
Ahmed Seffah, Concordia University, Montreal, Canada
Ben Shneiderman, University of Maryland, USA
Katie A. Siek, University of Colorado at Boulder, USA
Daniel Simons, University of Illinois at Urbana Champaign, USA
Christian Stary, University of Linz, Austria
Constantine Stephanidis, ICS FORTH, Heraklion, Greece
Zoran Stjepanovic, University of Maribor, Slovenia
A Min Tjoa, TU Wien, Austria
Manfred Tscheligi, University of Salzburg, Austria
Berndt Urlesberger, Med. University of Graz, Austria
Karl-Heinz Weidmann, FHV Dornbirn, Austria
William Wong, Middlesex University, London, UK
Panayiotis Zaphiris, City University London, UK
Jürgen Ziegler, Universität Duisburg Essen, Germany
Ping Zhang, Syracuse University, USA
Jiajie Zhang, University of Texas Health Science Center, USA

Organizing Committee

Marcus Bloice, Med. University of Graz
Maximilian Errath, Med. University of Graz
Regina Geierhofer, Med. University of Graz
Christine Haas, Austrian Computer Society
Martin Hoeller, Student
Andreas Holzinger, Med. University of Graz (Chair)
Birgit Jauk, Med. University of Graz
Sandra Leitner, Austrian Computer Society
Thomas Moretti, Med. University of Graz
Elisabeth Richter (Student Volunteers Chair)
Gig Searle, Med. University of Graz
Elisabeth Waldbauer, Austrian Computer Society

Members of the WG HCI&UE of the Austrian Computer Society

Ahlstroem, David
Aigner, Wolfgang
Albert, Dietrich
Andrews, Keith
Baillie, Lynne
Baumann, Konrad
Bechinie, Michael
Benedikt, Eckhard
Bernert, Christa
Biffl, Stefan
Binder, Georg
Bloice, Marcus
Breiteneder, Christian
Burgsteiner, Harald
Christian, Johannes
Debevc, Matjaz
Dirnbauer, Kurt
Ebner, Martin
Edelmann, Noelle
Ehrenstrasser, Lisa
Erharter, Dorothea
Errath, Maximilian
Ferro Bernhard
Flieder, Karl
Freund, Rudi
Frühwirth, Christian
Fürcht, Reinhard
Geierhofer, Regina
Gorz, Karl
Grill, Thomas
Gross, Tom
Haas, Christine
Haas, Rainer
Haberfellner, Tom
Hable, Franz
Hailing, Mario
Hauser, Helwig
Heimgärtner, Rüdiger
Hitz, Martin
Hoeller, Martin
Holzinger, Andreas
Hruska, Andreas
Huber, Leonhard
Hyna, Irene
Jaquemar, Stefan

Jarz, Thorsten
Kainz, Regina
Kempter, Guido
Kickmeier-Rust, Michael
Kingsbury, Paul
Kittl, Christian
Kment, Thomas
Koller, Andreas
Költringer, Thomas
Krieger, Horst
Kriegshaber, Ursula
Kriglstein, Simone
Kroop, Sylvana
Krümming, Sabine
Lanyi, Cecilia
Leeb, Christian
Leitner, Daniel
Leitner, Gerhard
Leitner, Hubert
Lenhart, Stephan
Linder, Jörg
Loidl, Susanne
Maier, Edith
Makolm, Josef
Mangler, Jürgen
Manhartsberger, Martina
Meisenberger, Matthias
Messner, Peter
Miesenberger, Klaus
Miksch, Silvia
Motschnig, Renate
Musil, Sabine
Mutz, Uwe
Nemecek, Sascha
Nischelwitzer, Alexander
Nowak, Greta
Oppitz, Marcus
Osterbauer, Christian
Pesendorfer, Florian
Pfaffenlehner, Bernhard
Pohl, Margit
Purgathofer, Peter
Putz, Daniel
Rauhala, Marjo
Reichl, Peter

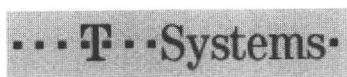
Richter, Helene
 Riener, Andreas
 Sahanek, Christian
 Scheugl, Max
 Schreier, Günther
 Schwaberg, Klaus
 Searle, Gig W.
 Sefelin, Reinhard
 Seibert-Giller, Verena
 Seyff, Norbert
 Sik-Lanyi, Cecilia
 Spangl, Jürgen
 Sproger, Bernd
 Stry, Christian
 Stenitzer, Michael
 Stickel, Christian
 Stiebellehner, Johann
 Stjepanovic, Zoran
 Thümer, Herbert

Thurnher, Bettina
 Tjoa, A Min
 Tscheligi, Manfred
 Urlesberger, Bernd
 Vecsei, Thomas
 Wagner, Christian
 Wahlmüller, Christine
 Wassertheurer, Siegfried
 Weidmann, Karl-Heinz
 Weippl, Edgar
 Werthner, Hannes
 Wimmer, Erhard
 Windlinger, Lukas
 Wöber, Willi
 Wohlkinger, Bernd
 Wolkerstorfer, Peter
 Zechner Jürgen
 Zeimpekos, Paris
 Zellhofer, Norbert

Sponsors

We are grateful to the following companies and institutions for their support in our aims to bridge science and industry. Their logos are displayed below.





Lecture Notes in Computer Science

Sublibrary 2: Programming and Software Engineering

For information about Vols. 1–4192
please contact your bookseller or Springer

- Vol. 4834: R. Cerqueira, R.H. Campbell (Eds.), *Middleware 2007*. XIII, 451 pages. 2007.
- Vol. 4824: A. Paschke, Y. Biletskiy (Eds.), *Advances in Rule Interchange and Applications*. XIII, 243 pages. 2007.
- Vol. 4807: Z. Shao (Ed.), *Programming Languages and Systems*. XI, 431 pages. 2007.
- Vol. 4799: A. Holzinger (Ed.), *HCI and Usability for Medicine and Health Care*. XVI, 458 pages. 2007.
- Vol. 4789: M. Butler, M.G. Hinchey, M.M. Larrondo-Petrie (Eds.), *Formal Methods and Software Engineering*. VIII, 387 pages. 2007.
- Vol. 4767: F. Arbab, M. Sirjani (Eds.), *International Symposium on Fundamentals of Software Engineering*. XIII, 450 pages. 2007.
- Vol. 4764: P. Abrahamsson, N. Baddoo, T. Margaria, R. Messnarz (Eds.), *Software Process Improvement*. XI, 225 pages. 2007.
- Vol. 4762: K.S. Namjoshi, T. Yoneda, T. Higashino, Y. Okamura (Eds.), *Automated Technology for Verification and Analysis*. XIV, 566 pages. 2007.
- Vol. 4758: F. Oquendo (Ed.), *Software Architecture*. XVI, 340 pages. 2007.
- Vol. 4757: F. Cappello, T. Herault, J. Dongarra (Eds.), *Recent Advances in Parallel Virtual Machine and Message Passing Interface*. XVI, 396 pages. 2007.
- Vol. 4753: E. Duval, R. Klamma, M. Wolpers (Eds.), *Creating New Learning Experiences on a Global Scale*. XII, 518 pages. 2007.
- Vol. 4749: B.J. Krämer, K.-J. Lin, P. Narasimhan (Eds.), *Service-Oriented Computing – ICSOC 2007*. XIX, 629 pages. 2007.
- Vol. 4748: K. Wolter (Ed.), *Formal Methods and Stochastic Models for Performance Evaluation*. X, 301 pages. 2007.
- Vol. 4741: C. Bessière (Ed.), *Principles and Practice of Constraint Programming – CP 2007*. XV, 890 pages. 2007.
- Vol. 4735: G. Engels, B. Opdyke, D.C. Schmidt, F. Weil (Eds.), *Model Driven Engineering Languages and Systems*. XV, 698 pages. 2007.
- Vol. 4716: B. Meyer, M. Joseph (Eds.), *Software Engineering Approaches for Offshore and Outsourced Development*. X, 201 pages. 2007.
- Vol. 4680: F. Saglietti, N. Oster (Eds.), *Computer Safety, Reliability, and Security*. XV, 548 pages. 2007.
- Vol. 4670: V. Dahl, I. Niemelä (Eds.), *Logic Programming*. XII, 470 pages. 2007.
- Vol. 4652: D. Georgakopoulos, N. Ritter, B. Benatalah, C. Zircpins, G. Feuerlicht, M. Schoenherr, H.R. Motahari-Nezhad (Eds.), *Service-Oriented Computing ICSOC 2006*. XVI, 201 pages. 2007.
- Vol. 4634: H. Riis Nielson, G. Filé (Eds.), *Static Analysis*. XI, 469 pages. 2007.
- Vol. 4615: R. de Lemos, C. Gacek, A. Romanovsky (Eds.), *Architecting Dependable Systems IV*. XIV, 435 pages. 2007.
- Vol. 4610: B. Xiao, L.T. Yang, J. Ma, C. Muller-Schloer, Y. Hua (Eds.), *Autonomic and Trusted Computing*. XVIII, 571 pages. 2007.
- Vol. 4609: E. Ernst (Ed.), *ECOOP 2007 – Object-Oriented Programming*. XIII, 625 pages. 2007.
- Vol. 4608: H.W. Schmidt, I. Crnković, G.T. Heineman, J.A. Stafford (Eds.), *Component-Based Software Engineering*. XII, 283 pages. 2007.
- Vol. 4591: J. Davies, J. Gibbons (Eds.), *Integrated Formal Methods*. IX, 660 pages. 2007.
- Vol. 4589: J. Münch, P. Abrahamsson (Eds.), *Product-Focused Software Process Improvement*. XII, 414 pages. 2007.
- Vol. 4574: J. Derrick, J. Vain (Eds.), *Formal Techniques for Networked and Distributed Systems – FORTE 2007*. XI, 375 pages. 2007.
- Vol. 4556: C. Stephanidis (Ed.), *Universal Access in Human-Computer Interaction, Part III*. XXII, 1020 pages. 2007.
- Vol. 4555: C. Stephanidis (Ed.), *Universal Access in Human-Computer Interaction, Part II*. XXII, 1066 pages. 2007.
- Vol. 4554: C. Stephanidis (Ed.), *Universal Access in Human-Computer Interaction, Part I*. XXII, 1054 pages. 2007.
- Vol. 4553: J.A. Jacko (Ed.), *Human-Computer Interaction, Part IV*. XXIV, 1225 pages. 2007.
- Vol. 4552: J.A. Jacko (Ed.), *Human-Computer Interaction, Part III*. XXI, 1038 pages. 2007.
- Vol. 4551: J.A. Jacko (Ed.), *Human-Computer Interaction, Part II*. XXIII, 1253 pages. 2007.
- Vol. 4550: J.A. Jacko (Ed.), *Human-Computer Interaction, Part I*. XXIII, 1240 pages. 2007.
- Vol. 4542: P. Sawyer, B. Paech, P. Heymans (Eds.), *Requirements Engineering: Foundation for Software Quality*. IX, 384 pages. 2007.
- Vol. 4536: G. Concas, E. Damiani, M. Scotto, G. Succi (Eds.), *Agile Processes in Software Engineering and Extreme Programming*. XV, 276 pages. 2007.

- Vol. 4530: D.H. Akehurst, R. Vogel, R.F. Paige (Eds.), *Model Driven Architecture - Foundations and Applications*. X, 219 pages. 2007.
- Vol. 4523: Y.-H. Lee, H.-N. Kim, J. Kim, Y.W. Park, L.T. Yang, S.W. Kim (Eds.), *Embedded Software and Systems*. XIX, 829 pages. 2007.
- Vol. 4498: N. Abdennahder, F. Kordon (Eds.), *Reliable Software Technologies - Ada-Europe 2007*. XII, 247 pages. 2007.
- Vol. 4486: M. Bernardo, J. Hillston (Eds.), *Formal Methods for Performance Evaluation*. VII, 469 pages. 2007.
- Vol. 4470: Q. Wang, D. Pfahl, D.M. Raffo (Eds.), *Software Process Dynamics and Agility*. XI, 346 pages. 2007.
- Vol. 4468: M.M. Bonsangue, E.B. Johnsen (Eds.), *Formal Methods for Open Object-Based Distributed Systems*. X, 317 pages. 2007.
- Vol. 4467: A.L. Murphy, J. Vitek (Eds.), *Coordination Models and Languages*. X, 325 pages. 2007.
- Vol. 4454: Y. Gurevich, B. Meyer (Eds.), *Tests and Proofs*. IX, 217 pages. 2007.
- Vol. 4444: T. Reps, M. Sagiv, J. Bauer (Eds.), *Program Analysis and Compilation, Theory and Practice*. X, 361 pages. 2007.
- Vol. 4440: B. Liblit, *Cooperative Bug Isolation*. XV, 101 pages. 2007.
- Vol. 4408: T. Choren, A. Garcia, H. Giese, H.-f. Leung, C. Lucena, A. Romanovsky (Eds.), *Software Engineering for Multi-Agent Systems V*. XII, 233 pages. 2007.
- Vol. 4406: W. De Meuter (Ed.), *Advances in Smalltalk*. VII, 157 pages. 2007.
- Vol. 4405: L. Padgham, F. Zambonelli (Eds.), *Agent-Oriented Software Engineering VII*. XII, 225 pages. 2007.
- Vol. 4401: N. Guelfi, D. Buchs (Eds.), *Rapid Integration of Software Engineering Techniques*. IX, 177 pages. 2007.
- Vol. 4385: K. Coninx, K. Luyten, K.A. Schneider (Eds.), *Task Models and Diagrams for Users Interface Design*. XI, 355 pages. 2007.
- Vol. 4383: E. Bin, A. Ziv, S. Ur (Eds.), *Hardware and Software, Verification and Testing*. XII, 235 pages. 2007.
- Vol. 4379: M. Südholt, C. Consel (Eds.), *Object-Oriented Technology*. VIII, 157 pages. 2007.
- Vol. 4364: T. Kühne (Ed.), *Models in Software Engineering*. XI, 332 pages. 2007.
- Vol. 4355: J. Julliand, O. Kouchnarenko (Eds.), *B 2007: Formal Specification and Development in B*. XIII, 293 pages. 2006.
- Vol. 4354: M. Hanus (Ed.), *Practical Aspects of Declarative Languages*. X, 335 pages. 2006.
- Vol. 4350: M. Clavel, F. Durán, S. Eker, P. Lincoln, N. Martí-Ollet, J. Meseguer, C. Talcott, *All About Maude - A High-Performance Logical Framework*. XXII, 797 pages. 2007.
- Vol. 4348: S. Tucker Taft, R.A. Duff, R.L. Brukardt, E. Plöedereder, P. Leroy, *Ada 2005 Reference Manual*. XXII, 765 pages. 2006.
- Vol. 4346: L. Brim, B.R. Haverkort, M. Leucker, J. van de Pol (Eds.), *Formal Methods: Applications and Technology*. X, 363 pages. 2007.
- Vol. 4344: V. Gruhn, F. Oquendo (Eds.), *Software Architecture*. X, 245 pages. 2006.
- Vol. 4340: R. Prodan, T. Fahringer, *Grid Computing*. XXIII, 317 pages. 2007.
- Vol. 4336: V.R. Basili, H.D. Rombach, K. Schneider, B. Kitchenham, D. Pfahl, R.W. Selby (Eds.), *Empirical Software Engineering Issues*. XVII, 193 pages. 2007.
- Vol. 4326: S. Göbel, R. Malkewitz, I. Iurgel (Eds.), *Technologies for Interactive Digital Storytelling and Entertainment*. X, 384 pages. 2006.
- Vol. 4323: G. Doherty, A. Blandford (Eds.), *Interactive Systems*. XI, 269 pages. 2007.
- Vol. 4322: F. Kordon, J. Sztipanovits (Eds.), *Reliable Systems on Unreliable Networked Platforms*. XIV, 317 pages. 2007.
- Vol. 4309: P. Inverardi, M. Jazayeri (Eds.), *Software Engineering Education in the Modern Age*. VIII, 207 pages. 2006.
- Vol. 4294: A. Dan, W. Lamersdorf (Eds.), *Service-Oriented Computing - ICSSOC 2006*. XIX, 653 pages. 2006.
- Vol. 4290: M. van Steen, M. Henning (Eds.), *Middleware 2006*. XIII, 425 pages. 2006.
- Vol. 4279: N. Kobayashi (Ed.), *Programming Languages and Systems*. XI, 423 pages. 2006.
- Vol. 4262: K. Havelund, M. Núñez, G. Roşu, B. Wolff (Eds.), *Formal Approaches to Software Testing and Runtime Verification*. VIII, 255 pages. 2006.
- Vol. 4260: Z. Liu, J. He (Eds.), *Formal Methods and Software Engineering*. XII, 778 pages. 2006.
- Vol. 4257: I. Richardson, P. Runeson, R. Messnarz (Eds.), *Software Process Improvement*. XI, 219 pages. 2006.
- Vol. 4242: A. Rashid, M. Aksit (Eds.), *Transactions on Aspect-Oriented Software Development II*. IX, 289 pages. 2006.
- Vol. 4229: E. Najm, J.-F. Pradat-Peyre, V.V. Donzeau-Gouge (Eds.), *Formal Techniques for Networked and Distributed Systems - FORTE 2006*. X, 486 pages. 2006.
- Vol. 4227: W. Nejdl, K. Tochtermann (Eds.), *Innovative Approaches for Learning and Knowledge Sharing*. XVII, 721 pages. 2006.
- Vol. 4218: S. Graf, W. Zhang (Eds.), *Automated Technology for Verification and Analysis*. XIV, 540 pages. 2006.
- Vol. 4214: C. Hofmeister, I. Crnković, R. Reussner (Eds.), *Quality of Software Architectures*. X, 215 pages. 2006.
- Vol. 4204: F. Benhamou (Ed.), *Principles and Practice of Constraint Programming - CP 2006*. XVIII, 774 pages. 2006.
- Vol. 4199: O. Nierstrasz, J. Whittle, D. Harel, G. Reggio (Eds.), *Model Driven Engineering Languages and Systems*. XVI, 798 pages. 2006.

Table of Contents

Formal Methods in Usability Engineering

User-Centered Methods Are Insufficient for Safety Critical Systems <i>Harold Thimbleby</i>	1
Improving Interactive Systems Usability Using Formal Description Techniques: Application to HealthCare <i>Philippe Palanque, Sandra Basnyat, and David Navarre</i>	21
Using Formal Specification Techniques for Advanced Counseling Systems in Health Care <i>Dominikus Herzberg, Nicola Marsden, Corinna Leonhardt, Peter Kübler, Hartmut Jung, Sabine Thomanek, and Annette Becker</i>	41

System Analysis and Methodologies for Design and Development

Nurses' Working Practices: What Can We Learn for Designing Computerised Patient Record Systems? <i>Elke Reuss, Rochus Keller, Rahel Naef, Stefan Hunziker, and Lukas Furler</i>	55
Organizational, Contextual and User-Centered Design in e-Health: Application in the Area of Telecardiology <i>Eva Patricia Gil-Rodríguez, Ignacio Martínez Ruiz, Álvaro Alesanco Iglesias, José García Moros, and Francesc Saigí Rubió</i>	69
The Effect of New Standards on the Global Movement Toward Usable Medical Devices <i>Torsten Gruchmann and Anfried Borgert</i>	83
Usability of Radio-Frequency Devices in Surgery <i>Dirk Büchel, Thomas Baumann, and Ulrich Matern</i>	97
BadIdeas for Usability and Design of Medicine and Healthcare Sensors <i>Paula Alexandra Silva and Kristof Van Laerhoven</i>	105
Physicians' and Nurses' Documenting Practices and Implications for Electronic Patient Record Design <i>Elke Reuss, Rahel Naef, Rochus Keller, and Moira Norrie</i>	113

Ambient Assisted Living and Life Long Learning

Design and Development of a Mobile Medical Application for the Management of Chronic Diseases: Methods of improved Data Input for Older People	119
<i>Alexander Nischelwitzer, Klaus Pintoﬀl, Christina Loss, and Andreas Holzinger</i>	
Technology in Old Age from a Psychological Point of View	133
<i>Claudia Oppenauer, Barbara Preschl, Karin Kalteis, and Ilse Kryspin-Exner</i>	
Movement Coordination in Applied Human-Human and Human-Robot Interaction	143
<i>Anna Schubö, Cordula Vesper, Mathey Wiesbeck, and Sonja Stork</i>	
An Orientation Service for Dependent People Based on an Open Service Architecture	155
<i>A. Fernández-Montes, J.A. Álvarez, J.A. Ortega, Natividad Martínez Madrid, and Ralf Seepold</i>	
Competence Assessment for Spinal Anaesthesia	165
<i>Dietrich Albert, Cord Hockemeyer, Zsuzsanna Kulcsar, and George Shorten</i>	

Visualization and Simulation in Medicine and Health Care

Usability and Transferability of a Visualization Methodology for Medical Data	171
<i>Margit Pohl, Markus Rester, and Sylvia Wiltner</i>	
Refining the Usability Engineering Toolbox: Lessons Learned from a User Study on a Visualization Tool	185
<i>Homa Javahery and Ahmed Seffah</i>	
Interactive Analysis and Visualization of Macromolecular Interfaces Between Proteins	199
<i>Marco Wiltgen, Andreas Holzinger, and Gernot P. Tilz</i>	
Modeling Elastic Vessels with the LBGK Method in Three Dimensions	213
<i>Daniel Leitner, Siegfried Wassertheurer, Michael Hessinger, Andreas Holzinger, and Felix Breitenecker</i>	

Usability of Mobile Computing and Augmented Reality

Usability of Mobile Computing Technologies to Assist Cancer Patients	227
<i>Rezwana Islam, Sheikh I. Ahamed, Nilothpal Talukder, and Ian Obermiller</i>	

Usability of Mobile Computing in Emergency Response Systems – Lessons Learned and Future Directions	241
<i>Gerhard Leitner, David Ahlström, and Martin Hitz</i>	
Some Usability Issues of Augmented and Mixed Reality for e-Health Applications in the Medical Domain	255
<i>Reinhold Behringer, Johannes Christian, Andreas Holzinger, and Steve Wilkinson</i>	
Designing Pervasive Brain-Computer Interfaces	267
<i>Nithya Sambasivan and Melody Moore Jackson</i>	

Medical Expert Systems and Decision Support

The Impact of Structuring the Interface as a Decision Tree in a Treatment Decision Support Tool	273
<i>Neil Carrigan, Peter H. Gardner, Mark Conner, and John Maule</i>	
Dynamic Simulation of Medical Diagnosis: Learning in the Medical Decision Making and Learning Environment MEDIC	289
<i>Cleotilde Gonzalez and Colleen Vrbín</i>	
SmartTransplantation - Allogeneic Stem Cell Transplantation as a Model for a Medical Expert System	303
<i>Gerrit Meixner, Nancy Thiels, and Ulrike Klein</i>	
Framing, Patient Characteristics, and Treatment Selection in Medical Decision-Making	315
<i>Todd Eric Roswarski, Michael D. Murray, and Robert W. Proctor</i>	
The How and Why of Incident Investigation: Implications for Health Information Technology	323
<i>Marilyn Sue Bogner</i>	

Research Methodologies, Cognitive Analysis and Clinical Applications

Combining Virtual Reality and Functional Magnetic Resonance Imaging (fMRI): Problems and Solutions	335
<i>Lydia Beck, Marc Wolter, Nan Mungard, Torsten Kuhlen, and Walter Sturm</i>	
Cognitive Task Analysis for Prospective Usability Evaluation in Computer-Assisted Surgery	349
<i>Armin Janß, Wolfgang Lauer, and Klaus Radermacher</i>	
Serious Games Can Support Psychotherapy of Children and Adolescents	357
<i>Veronika Brezinka and Ludger Hovestadt</i>	

Development and Application of Facial Expression Training System 365
Kyoko Ito, Hiroyuki Kurose, Ai Takami, and Shogo Nishida

Usability of an Evidence-Based Practice Website on a Pediatric
Neuroscience Unit 373
Susan McGee, Nancy Daraiseh, and Myra M. Huth

Ontologies, Semantics, Usability and Cognitive Load

Cognitive Load Research and Semantic Apprehension of Graphical
Linguistics 375
Michael Workman

An Ontology Approach for Classification of Abnormal White Matter in
Patients with Multiple Sclerosis 389
*Bruno Alfano, Arturo Brunetti, Giuseppe De Pietro, and
Amalia Esposito*

The Evaluation of Semantic Tools to Support Physicians in the
Extraction of Diagnosis Codes 403
Regina Geierhofer and Andreas Holzinger

Ontology Usability Via a Visualization Tool for the Semantic Indexing
of Medical Reports (DICOM SR) 409
Sonia Mhiri and Sylvie Despres

**Agile Methodologies, Analytical Methods and
Remote Usability Testing**

Fostering Creativity Thinking in Agile Software Development 415
Claudio León de la Barra and Broderick Crawford

An Analytical Approach for Predicting and Identifying Use Error and
Usability Problem 427
Lars-Ola Bligård and Anna-Lisa Osvalder

User’s Expertise Differences When Interacting with Simple Medical
User Interfaces 441
Yuanhua Liu, Anna-Lisa Osvalder, and MariAnne Karlsson

Usability-Testing Healthcare Software with Nursing Informatics
Students in Distance Education: A Case Study 447
Beth Meyer and Diane Skiba

Tutorial: Introduction to Visual Analytics 453
Wolfgang Aigner, Alessio Bertone, and Silvia Miksch

Author Index 457