Lecture Notes in Computer Science

6412

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

Alfred Kobsa

University of California, Irvine, CA, 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

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbruecken, Germany

Jeffrey Parsons Motoshi Saeki Peretz Shoval Carson Woo Yair Wand (Eds.)

Conceptual Modeling – ER 2010

29th International Conference on Conceptual Modeling Vancouver, BC, Canada, November 1-4, 2010 Proceedings



Volume Editors

Jeffrey Parsons Memorial University of Newfoundland St. John's, NL, Canada E-mail: jeffreyp@mun.ca

Motoshi Saeki Tokyo Institute of Technology Tokyo, Japan E-mail: saeki@se.cs.titech.ac.jp

Peretz Shoval Ben-Gurion University of the Negev Beer-Sheva, Israel E-mail: shoval@bgu.ac.il

Carson Woo University of British Columbia Vancouver, BC, Canada E-mail: carson.woo@sauder.ubc.ca

Yair Wand University of British Columbia Vancouver, BC, Canada E-mail: yair.wand@sauder.ubc.ca

Library of Congress Control Number: 2010936075

CR Subject Classification (1998): D.2, F.3, D.3, I.2, F.4.1, D.2.4

LNCS Sublibrary: SL 3 – Information Systems and Application, incl. Internet/Web and HCI

ISSN 0302-9743

ISBN-10 3-642-16372-6 Springer Berlin Heidelberg New York ISBN-13 978-3-642-16372-2 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.com

© Springer-Verlag Berlin Heidelberg 2010 Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India Printed on acid-free paper 06/3180

Preface

This publication comprises the proceedings of the 29th International Conference on Conceptual Modeling (ER 2010), which was held this year in Vancouver, British Columbia, Canada.

Conceptual modeling can be considered as lying at the confluence of the three main aspects of information technology applications — the world of the stakeholders and users, the world of the developers, and the technologies available to them. Conceptual models provide abstractions of various aspects related to the development of systems, such as the application domain, user needs, database design, and software specifications. These models are used to analyze and define user needs and system requirements, to support communications between stakeholders and developers, to provide the basis for systems design, and to document the requirements for and the design rationale of developed systems.

Because of their role at the junction of usage, development, and technology, conceptual models can be very important to the successful development and deployment of IT applications. Therefore, the research and development of methods, techniques, tools and languages that can be used in the process of creating, maintaining, and using conceptual models is of great practical and theoretical importance. Such work is conducted in academia, research institutions, and industry. Conceptual modeling is now applied in virtually all areas of IT applications, and spans varied domains such as organizational information systems, systems that include specialized data for spatial, temporal, and multimedia applications, and biomedical applications.

The annual International Conference on Conceptual Modeling is the premiere forum for presenting and discussing developments in the research and practice of conceptual modeling. The diversity of the conference is manifested in the call for papers. The call this year included information modeling; semantics, metadata, and ontology; Web information systems and the Semantic Web; business process modeling and enterprise architecture; semi-structured data and XML; integration of models and data; information retrieval, filtering, classification, and visualization; methods, tools, evaluation approaches, quality and metrics; requirements engineering, reuse, and reverse engineering; maintenance, change and evolution of models; integrity constraints and active concepts; knowledge management and business intelligence; logical foundations; and empirical methods.

We are delighted to provide you with an exciting technical program this year. The Program Committee received 147 submissions from authors in 32 countries, reflecting the international nature of the conference. Thirty submissions were accepted as full papers for presentation and publication in the proceedings (an acceptance rate of 20%). The authors of a further seven papers were invited to present in poster sessions. Their papers are included as short papers (six pages) in the proceedings.

The technical program consisted of 10 sessions covering all aspects of conceptual modeling and related topics. The technical program included one panel, dedicated to empirical methods in conceptual modeling research. In addition, the poster session

included two demonstrations. In parallel to the technical sessions were two additional streams, combining specialized workshops and tutorials. One of the workshops was dedicated to the Doctoral Consortium. Most workshops represented continuing activities from previous ER conferences. As well, we were fortunate to obtain the participation of three keynote speakers, each providing a different perspective on IT: industry and consulting (John Thorp of Thorp Network Inc.), research and development (Mamdouh Ibrahim of IBM), and IT management (Ted Dodds of University of British Columbia).

We would like to thank all those who helped put this program together. The Program Chairs extend special thanks to the 70 members of the Program Committee who worked many long hours reviewing and discussing the submissions. They tolerated frequent reminders with good humor. The high standard of their reviews not only provided authors with outstanding feedback but also substantially contributed to the quality of the technical program. It was a great pleasure to work with such a dedicated group of researchers. Thanks go also to the 72 external reviewers who helped with their assessments. They are individually acknowledged in the proceedings.

We would also like to especially thank the chairs of the various activities that make any conference diverse and interesting. This included Workshop Chairs Gillian Dobbie and Juan-Carlos Trujillo; Doctoral Consortium Chairs Andrew Burton-Jones, Paul Johannesson, and Peter Green; Tutorial Chairs Brian Henderson-Sellers and Vijay Khatri; Panel Chairs Bernhard Thalheim and Michael Rosemann; and Demonstrations program and posters Chairs Gove Allen and Hock Chan.

We are very grateful to Sase Singh, the Proceedings Chair, for working with the authors and conference submission system to organize the conference proceedings. Palash Bera helped us in publicizing the conference. William Tan was always available as our Webmaster. Heinrich Mayr and Oscar Pastor from the ER steering committee were generous with their time in answering our questions and providing guidance. We thank Andrew Gemino, as Local Arrangement Co-chair, for making sure that the conference ran smoothly. Finally, special thanks are due to Jessie Lam, who, in her role as a Local Arrangements Co-chair, made a major contribution to making everything happen.

All aspects of the paper submission and reviewing processes were handled using the EasyChair Conference Management System. We thank the EasyChair development team for making this outstanding system freely available to the scientific community.

Finally, we would like to thank the authors of all submitted papers, workshops, tutorials, panels, and software demonstrations, whether accepted or not, for their outstanding contributions. These contributions are critical to the high quality of an ER conference, and without them this conference could have not taken place.

November 2010

Jeffrey Parsons Motoshi Saeki Peretz Shoval Yair Wand Carson Woo

ER 2010 Conference Organization

Conference Co-chairs

Yair Wand University of British Columbia, Canada Carson Woo University of British Columbia, Canada

Program Co-chairs

Jeffrey Parsons Memorial University of Newfoundland, Canada

Motoshi Saeki Tokyo Institute of Technology, Japan Peretz Shoval Ben-Gurion University of Negev, Israel

Workshop Chairs

Gillian Dobbie University of Auckland, New Zealand

Jaun-Carlos Trujillo Universidad de Alicante, Spain

Doctoral Consortium Chairs

Andrew

Burton-Jones University of British Columbia, Canada

Paul Johannesson Stockholm University and the Royal Institute of

Technology, Sweden

Peter Green University of Queensland, Australia

Tutorial Chairs

Brian

Henderson-Sellers University of Technology Sydney, Australia

Vijay Khatri Indiana University, USA

Panel Chairs

Bernhard Thalheim Christian-Albrechts-Universitat zu Kiel, Germany Michael Rosemann Queensland University of Technology, Australia

Demonstrations Program and Posters Chairs

Gove Allen Brigham Young University, USA

Hock Chan National University of Singapore, Singapore

Proceedings Chair

Sase Singh University of British Columbia, Canada

Local Arrangement Chairs and Treasurers

Andrew Gemino Simon Fraser University, Canada
Jessie Lam University of British Columbia, Canada

Publicity Chair

Palash Bera Texas A&M International University, USA

Webmaster

William Tan University of British Columbia, Canada

Steering Committee Liaison

Heinrich Mayr University of Klagenfurt, Austria

Program Committee

Akhilesh Bajaj University of Tulsa, USA Carlo Batini University of Milano, Italy

Zohra Bellahsene University of Montpellier II, France Boualem Benatallah University of New South Wales, Australia

Mokrane Bouzeghoub Université de Versailles, France

Andrew Burton-Jones University of British Columbia, Canada Silvana Castano Università degli Studi di Milano, Italy University of Cincinnati, USA

Philippe Cudre-Mauroux MIT, USA

Alfredo Cuzzocrea University of Calabria, Italy Joseph Davis University of Sydney, Australia

Umesh Daval HP Labs, USA

Johann Eder Universität Vienna, Austria

Ramez Elmasri University of Texas-Arlington, USA David W. Embley Brigham Young University, USA Opher Etzion IBM Research Labs, Haifa, Israel

Joerg Evermann Memorial University of Newfoundland, Canada

Alfio Ferrara University of Milano, Italy

Xavier Franch Universitat Politècnica de Catalunya, Spain

Piero Fraternali Politecnico di Milano, Italy

Avigdor Gal Technion Institute of Technology, Israel

Andrew Gemino Simon Fraser University, Canada

Paolo Girogini University of Trento, Italy Paulo Goes University of Arizona, USA

Jaap Gordijn Vrije Universiteit Amsterdam, The Netherlands

Peter Green University of Queensland, Australia

Giancarlo Guizzardi Universidade Federal do Espírito Santo, Brazil

Peter Haase Universität Karlsruhe, Germany Jean-Luc Hainaut University of Namur, Belgium

Sven Hartmann Clausthal University of Technology, Germany
Brian Henderson-Sellers University of Technology Sydney, Australia
Howard Ho IBM Almaden Research Center, USA
Manfred Jeusfeld Tilburg University, The Netherlands

Paul Johannesson Stockholm University & the Royal Institute of

Technology, Sweden Indiana University, USA

Vijay Khatri Indiana University, USA Tsvika Kuflik Haifa University, Israel

Alberto Laender Universidade Federal de Minas Gerais, Brazil

Qing Li University of Hong Kong, China Stephen Liddle Brigham Young University, USA

Tok-Wang Ling National University of Singapore, Singapore

Peri Loucopoulos Loughborough University, UK

Mirella M. Moro Universidade Federal de Minas Gerais, Brazil

Takao Miura Hosei University, Japan John Mylopoulos University of Trento, Italy Moira Norrie ETH Zurich, Switzerland

Antoni Olivè Universitat Politècnica de Catalunya, Spain Sylvia Osborn University of Western Ontario, Canada Oscar Pastor Technical University of Valencia, Spain

Zhiyong Peng Wuhan University, China
Barbara Pernici Politecnico di Milano, Italy
University of Crete, Greece
Sudha Ram University of Arizona, USA
Iris Reinhertz-Berger
Lior Rokach Ben-Gurion University, Israel

Colette Rolland University Paris 1 Panthéon-Sorbonne, France

Gustavo Rossi Universidad de La Plata, Argentina

Klaus-Dieter Schewe Information Science Research Centre, New Zealand

Graeme Shanks University of Melbourne, Australia Richard Snodgrass University of Arizona, USA Pnina Soffer Haifa University, Israel

Pnina Soffer Haifa University, Israel
Il-Yeol Song Drexel University, USA
Ananth Srinivasan University of Auckland, New Zealand

Veda Storey Georgia State University, USA Arnon Sturm Ben-Gurion University, Israel

Ernest Teniente Universitat Politècnica de Catalunya, Spain

Bernhard Thalheim University of Kiel, Germany Riccardo Torlone Università Roma Tre, Italy

Juan TrujilloUniversity of Alicante, SpainAparna VardeMontclair State University, USAVânia VidalUniversidade Federal do Cear, Brazil

Kevin Wilkinson HP Labs, USA

Eric Yu University of Toronto, Canada

External Referees

Sofiane Abbar, Raian Ali, Toshiyuki Amagasa, Birger Andersson, Sven Arnhold, Claudia P. Ayala, Zhifeng Bao, Moshe Barukh, Seyed Mehdi Reza Beheshti, Maria Bergholtz, Alexander Bergmayr, Windson Carvalho, Van Munin Chhieng, Paolo Ciaccia, Anthony Cleve, Fabiano Dalpiaz, Fabien Duchateau, Golnaz Elahi, Bernhard Freundenthaler, Irini Fundulaki, Matteo Golfarelli, Adnene Guabtni, Lifan Guo, Jon Heales, Patrick Heymans, Ela Hunt, Marta Indulska, Ritu Khare, Markus Kirchberg, Kerstin Klemisch, Haridimos Kondylakis, Fernando Lemos, Maya Lincoln, An Liu, Lidia López, Hui Ma, José Macedo, Amel Mammar, Sabine Matook, Stefano Montanelli, Christine Natschläger, Matteo Palmonari, Paolo Papotti, Horst Pichler, Anna Queralt, Al Robb, Fiona Rohde, Oscar Romero, Seung Ryu, Tomer Sagi, Ana-Carolina Salgado, Michael Schmidt, Pierre-Yves Schobbens, Isamu Shioya, Nobutaka Suzuki, XuNing Tang, Ornsiri Thonggoom, Thu Trinh, Domenico Ursino, Gaia Varese, Gaia Varese, Hung Vu, Kei Wakabayashi, Jing Wang, Qing Wang, Chiemi Watanabe, Ingo Weber, Robert Woitsch, Huayu Wu, Haoran Xie, Liang Xu, Lijuan Yu, Rui Zhang.

Organized by

Sauder School of Business, University of British Columbia

Sponsored by

The ER Institute Sauder School of Business Xerox Canada Limited

In Cooperation with

ACM SIGMIS

Table of Contents

Business Process Modeling	
Meronymy-Based Aggregation of Activities in Business Process Models	1
Leveraging Business Process Models for ETL Design	15
Adaptation in Open Systems: Giving Interaction Its Rightful Place Fabiano Dalpiaz, Amit K. Chopra, Paolo Giorgini, and John Mylopoulos	31
Requirements Engineering and Modeling 1	
Information Use in Solving a Well-Structured IS Problem: The Roles of IS and Application Domain Knowledge	46
Finding Solutions in Goal Models: An Interactive Backward Reasoning Approach	59
The Model Role Level – A Vision	76
Requirements Engineering and Modeling 2	
Establishing Regulatory Compliance for Information System Requirements: An Experience Report from the Health Care Domain Alberto Siena, Giampaolo Armellin, Gianluca Mameli, John Mylopoulos, Anna Perini, and Angelo Susi	90
Decision-Making Ontology for Information System Engineering Elena Kornyshova and Rébecca Deneckère	104
Reasoning with Optional and Preferred Requirements	118

Data Evolution and Adaptation

A Conceptual Approach to Database Applications Evolution	132
Automated Co-evolution of Conceptual Models, Physical Databases, and Mappings	146
A SchemaGuide for Accelerating the View Adaptation Process Jun Liu, Mark Roantree, and Zohra Bellahsene	160
Operations on Spatio-temporal Data	
Complexity of Reasoning over Temporal Data Models	174
Using Preaggregation to Speed Up Scaling Operations on Massive Spatio-temporal Data	188
Situation Prediction Nets: Playing the Token Game for Ontology-Driven Situation Awareness	202
Model Abstraction, Feature Modeling, and Filtering	
Granularity in Conceptual Modelling: Application to Metamodels Brian Henderson-Sellers and Cesar Gonzalez-Perez	219
Feature Assembly: A New Feature Modeling Technique	233
A Method for Filtering Large Conceptual Schemas	247
Integration and Composition	
Measuring the Quality of an Integrated Schema	261
Contextual Factors in Database Integration—A Delphi Study	274

Demos and Posters

The CARD System	433
AuRUS: Automated Reasoning on UML/OCL Schemas	438
How the Structuring of Domain Knowledge Helps Casual Process Modelers	445
Jakob Pinggera, Stefan Zugal, Barbara Weber, Dirk Fahland, Matthias Weidlich, Jan Mendling, and Hajo A. Reijers	440
SPEED: A Semantics-Based Pipeline for Economic Event Detection Frederik Hogenboom, Alexander Hogenboom, Flavius Frasincar, Uzay Kaymak, Otto van der Meer, Kim Schouten, and Damir Vandic	452
Prediction of Business Process Model Quality Based on Structural	458
Metrics	
Modelling Functional Requirements in Spatial Design	464
Business Processes Contextualisation via Context Analysis	471
A Generic Perspective Model for the Generation of Business Process	
Views	477
Extending Organizational Modeling with Business Services Concepts: An Overview of the Proposed Architecture	483
Author Index	489