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Conceptual Modeling - ER 2007

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Preface

Conceptual modeling is fundamental to the development of complex systems, because it provides the key communication means between systems developers, end-users and customers. Conceptual modeling provides languages, methods and tools to understand and represent the application domain; to elicitate, conceptualize and formalize system requirements and user needs; to communicate systems designs to all stakeholders; to formally verify and validate system designs on high levels of abstractions; and to minimize ambiguities in system development. Initially, conceptual modeling mainly addressed data-intensive information systems and contributed to data modeling and database application engineering. The area of conceptual modeling has now matured to encompass all kinds of application areas such as e-applications (including e-business and e-learning), web-based systems (including the semantic web and ubiquitous systems), life science and geographic applications.

The annual International Conference on Conceptual Modeling serves as the premiere forum for presenting and discussing research and applications in all areas associated with conceptual modeling. This year, the Call for Papers solicited contributions dealing with logical and philosophical foundations of conceptual modeling, information modeling concepts including ontologies, correctness in modeling, web-based and mobile information systems, semi-structured data and XML, information and database integration, information retrieval, organization and evaluation, design methodologies and tools, reuse, re-engineering and reverse engineering, quality assurance in conceptual modeling, conceptual change and evolution, data warehousing and data mining, spatial and temporal modeling, business process and workflow modeling, knowledge management, requirements elicitation, and advanced applications.

This Call for Papers attracted 167 submissions from authors from 28 countries. Each paper was carefully reviewed by at least three members of the program committee. Finally, the program committee accepted 37 research papers, giving an acceptance rate of 22.2%. This volume contains these papers, presented at the 26th International Conference on Conceptual Modeling (ER 2007), which was held in Auckland, New Zealand, on November 5–8, 2007.

In addition, following a separate Call for Workshops, six workshops were selected as co-located ER-workshops. A total of 43 research papers, including three invited papers, were presented at the workshops. The average acceptance rate for the co-located workshops was 33.3%. The workshop papers have been published in a separate LNCS volume: LNCS 4802. Furthermore, the conference program included 4 systems demonstrations, 1 panel, 6 tutorials, 32 poster presentations, and 3 keynotes.

We are very happy that Profs. Egon Börger from the University of Pisa, Enrico Franconi from the Free University of Bolzano-Bozen, and Peter Hunter

from the University of Auckland accepted our invitations to present keynotes to this year's conference.

Prof. Börger gave a presentation on *The Abstract State Machine System Design and Analysis Method: An Illustration by Modeling Workflow Patterns from First Principles*, in which he first surveyed the basic ingredients of the Abstract State Machine method and its applications for the design and the validation of complex computer-based systems, and then illustrated the method by the definition of a small set of parameterized abstract models for workflow patterns.

Prof. Franconi gave a presentation on *Conceptual Schemas and Ontologies for Database Access: Myths and Challenges*, in which he argued that well-founded conceptual modeling and ontology design is required to support intelligent information access, and then demonstrated which are the technical consequences of such choices, and the foundational and computational problems to be faced.

Prof. Hunter gave a presentation on *Heart Modeling, Computational Physiology and the IUPS Physiome Project*, in which he outlined the major goal of the Physiome project to use computational modeling to analyze integrative biological function in terms of underlying structure and molecular mechanisms. He argued for the need to develop supporting XML markup languages (CellML & FieldML) for encoding models, and software tools for creating, visualizing and executing these models, focusing in particular on the development of the Auckland heart model.

Many people contributed to the success of ER 2007. We are most grateful to all keynote speakers, authors of submitted papers, posters, tutorials and panels, and members of the program committees of the main ER conference and its associated workshops. Thanks are due to the chairs of the workshops, tutorials, panels, and posters and demonstrations, and the industry chair: Jean-Luc Hainaut, Elke Rundensteiner, Sven Hartmann, Alberto Laender, John Roddick, Leszek Maciaszek, and John Grundy, whose efforts contributed to the creation of an attractive program at a very high quality level. We would like to express our thanks to the local organizers Gill Dobbie and Patricia Rood and their collaborators, without whom this conference would not have come to life. Thanks are also due to Tok Wang Ling and Steve Liddle, who supported the conference from the steering committee. Finally, we offer our special thanks to our publicity chair and webmaster Markus Kirchberg, who maintained the conference website and the conference reviewing system, took care of all communication with the public, the program committee members and authors, and finally composed this proceedings volume as well as all other documentation associated with the conference.

November 2007

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Table of Contents

Keynotes

Modeling Workflow Patterns from First Principles	1
<i>Egon Börger</i>	
Heart Modeling, Computational Physiology and the IUPS Physiome Project	21
<i>Peter J. Hunter</i>	

Conceptual Schemas and Ontologies for Database Access: Myths and Challenges	22
<i>Enrico Franconi</i>	

Data Warehousing and Data Mining

Multidimensional Data Modeling for Business Process Analysis	23
<i>Svetlana Mansmann, Thomas Neumuth, and Marc H. Scholl</i>	
Mining Hesitation Information by Vague Association Rules	39
<i>An Lu and Wilfred Ng</i>	

A Model Driven Modernization Approach for Automatically Deriving Multidimensional Models in Data Warehouses	56
<i>Jose-Norberto Mazón and Juan Trujillo</i>	

Design Methodologies and Tools

Cost-Based Fragmentation for Distributed Complex Value Databases	72
<i>Hui Ma and Markus Kirchberg</i>	

From Business Models to Service-Oriented Design: A Reference Catalog Approach	87
<i>Amy Lo and Eric Yu</i>	

Teaching a Schema Translator to Produce O/R Views	102
<i>Peter Mork, Philip A. Bernstein, and Sergey Melnik</i>	

Building a Tool for Cost-Based Design of Object-Oriented Database Schemas	120
<i>Joachim Biskup and Ralf Menzel</i>	

Information and Database Integration

Generic Schema Mappings	132
<i>David Kensche, Christoph Quix, Yong Li, and Matthias Jarke</i>	
Relational Data Tailoring Through View Composition	149
<i>Cristiana Bolchini, Elisa Quintarelli, and Rosalba Rossato</i>	
On the Discovery of Preferred Work Practice Through Business Process Variants	165
<i>Ruopeng Lu and Shazia Sadiq</i>	

Information Modelling Concepts and Ontologies

Towards Automated Reasoning on ORM Schemes: Mapping ORM into the \mathcal{DLR}_{id} Description Logic	181
<i>Mustafa Jarrar</i>	
From Declarative to Imperative UML/OCL Operation Specifications ...	198
<i>Jordi Cabot</i>	
An Ontological Metamodel of Classifiers and Its Application to Conceptual Modelling and Database Design	214
<i>Jeffrey Parsons and Xueming Li</i>	

Integrity Constraints

Handling Inconsistency of Vague Relations with Functional Dependencies	229
<i>An Lu and Wilfred Ng</i>	
Querying Incomplete Data with Logic Programs: ER Strikes Back.....	245
<i>Andrea Calì</i>	
Prioritized Preferences and Choice Constraints	261
<i>Wilfred Ng</i>	

Logical Foundations of Conceptual Modelling

Reasoning over Extended ER Models	277
<i>A. Artale, D. Calvanese, R. Kontchakov, V. Ryzhikov, and M. Zakharyashev</i>	
On Order Dependencies for the Semantic Web	293
<i>David Toman and Grant Weddell</i>	
Collection Type Constructors in Entity-Relationship Modeling	307
<i>Sven Hartmann and Sebastian Link</i>	

Patterns and Conceptual Meta-modelling

Schema Exchange: A Template-Based Approach to Data and Metadata Translation.....	323
<i>Paolo Papotti and Riccardo Torlone</i>	
A Conceptual Modeling Methodology Based on Niches and Granularity	338
<i>Sonia Berman and Thembinkosi Daniel Semwayo</i>	
As We May Link: A General Metamodel for Hypermedia Systems	359
<i>Beat Signer and Moira C. Norrie</i>	

Requirements Elicitation

A Goal Oriented Approach for Modeling and Analyzing Security Trade-Offs	375
<i>Golnaz Elahi and Eric Yu</i>	
Rapid Business Process Discovery (<i>R-BPD</i>)	391
<i>Aditya Ghose, George Koliadis, and Arthur Chueng</i>	
Ontology-Driven Business Modelling: Improving the Conceptual Representation of the REA Ontology	407
<i>Frederik Gailly and Geert Poels</i>	
A Comparison of Two Approaches to Safety Analysis Based on Use Cases	423
<i>Tor Stålhane and Guttorm Sindre</i>	
Using Unified Modeling Language for Conceptual Modelling of Knowledge-Based Systems	438
<i>Mohd Syazwan Abdullah, Ian Benest, Richard Paige, and Chris Kimble</i>	
Tracing the Rationale Behind UML Model Change Through Argumentation	454
<i>Ivan J. Jureta and Stéphane Faulkner</i>	

Reuse and Reengineering

Exploring Alternatives for Representing and Accessing Design Knowledge About Enterprise Integration	470
<i>Karthikeyan Umaphathy and Sandeep Purao</i>	
Mining and Re-engineering Transactional Workflows for Reliable Executions	485
<i>Walid Gaaloul, Sami Bhiri, and Armin Haller</i>	

XVI Table of Contents

Cross: An OWL Wrapper for Reasoning on Relational Databases.....	502
<i>Pierre-Antoine Champin, Geert-Jan Houben, and Philippe Thiran</i>	

Semi-structured Data and XML

Augmenting Traditional Conceptual Models to Accommodate XML Structural Constructs	518
<i>Reema Al-Kamha, David W. Embley, and Stephen W. Liddle</i>	

VERT: A Semantic Approach for Content Search and Content Extraction in XML Query Processing.....	534
<i>Huayu Wu, Tok Wang Ling, and Bo Chen</i>	

A Conceptual Model for Multidimensional Analysis of Documents.....	550
<i>Franck Ravat, Olivier Teste, Ronan Tournier, and Gilles Zurlfuh</i>	

Web Information Systems and XML

Automatic Hidden-Web Table Interpretation by Sibling Page Comparison	566
<i>Cui Tao and David W. Embley</i>	

A Fine-Grained XML Structural Comparison Approach.....	582
<i>Joe Tekli, Richard Chbeir, and Kokou Yetongnon</i>	

Fine-Grained Compatibility and Replaceability Analysis of Timed Web Service Protocols	599
<i>Julien Ponge, Boualem Benatallah, Fabio Casati, and Farouk Toumani</i>	

Author Index	615
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Modeling Workflow Patterns from First Principles

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Abstract. We propose a small set of parameterized abstract models for workflow patterns, starting from first principles for sequential and distributed control. Appropriate instantiations yield the 43 workflow patterns that have been listed recently by the Business Process Modeling Center. The resulting structural classification of those patterns into eight basic categories, four for sequential and four for parallel workflows, provides a semantical foundation for a rational evaluation of workflow patterns.

1 Introduction

In [3] we have provided Abstract State Machine (ASM) models for the 43 workflow pattern descriptions that have been presented recently in [8] by the Business Process Modeling Center. Our goal there was to make the underlying relevant questions and implicit parameters explicit and to turn the patterns into a precise and truly abstract form. To ease the validation of these ASM ground models, in the sense defined in [1], we essentially followed the order of presentation adopted in [8] and only hinted at the most obvious streamlining the ASM models offer for the classification presented in [8].

In this paper we revisit those workflow pattern ASMs and define eight basic workflow patterns, four for sequential and four for distributed control, from which all the other patterns can be derived by parameter instantiation.¹ This provides a conceptual basis for a rational workflow pattern classification that can replace the partly repetitive listing presented in [8].

We use again the ASM method to provide a high-level, both state-based and process-oriented view of workflow patterns. This provides a solid semantic foundation for reasoning about workflow functionality. In the ASM models the behavioral interface is defined through actions performed with the help of submachines that remain largely abstract. The parameterization exploits the possibility the ASM method offers the specifier to build ‘models with holes’, that is to leave

¹ We omit here the four so-called State-Based Patterns in [10], which concern “business scenarios where an explicit notion of state is required” and are only loosely connected to workFLOW. Exploiting the most general character of the ASM notion of state, these four state-based patterns can be expressed by rather simple ASMs.