# Lecture Notes in Computer Science

6142

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 of Computer Science, Saarbruecken, Germany

Laurence Tratt Martin Gogolla (Eds.)

# Theory and Practice of Model Transformations

Third International Conference, ICMT 2010 Málaga, Spain, June 28 - July 2, 2010 Proceedings



#### Volume Editors

Laurence Tratt
Middlesex University
Engineering and Information Sciences
The Burroughs, London, NW4 4BT, United Kingdom
E-mail: laurie@tratt.net

Martin Gogolla University of Bremen Computer Science Department Database Systems Group D-28334, Bremen, Germany E-mail: gogolla@informatik.uni-bremen.de

Library of Congress Control Number: 2010928208

CR Subject Classification (1998): D.2, F.3, D.3, C.2, K.6, D.2.4

LNCS Sublibrary: SL 2 – Programming and Software Engineering

ISSN 0302-9743

ISBN-10 3-642-13687-7 Springer Berlin Heidelberg New York ISBN-13 978-3-642-13687-0 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

Model transformations are the glue that tie modelling activities together. If you've used modelling in anger then, whether you know it or not, you've used model transformations. They come in all shapes and sizes from moving models between different tools to generating implementations. Model transformations have humble beginnings—at one point, not long ago, it was said by many 'in the know' that the way forward in model transformations was to use XSLT. That this idea now raises a wry smile shows how far the model transformation community has come in a short time. Where once model transformations were hacked together in a variety of unsuitable languages, we now have a number of powerful, dedicated languages and theories at our disposal.

Since 2008, the ICMT conference series has played a huge part in advancing the subject, and this third edition was no different. The theories and languages presented at ICMT have allowed principled model transformations to play an ever greater part in real systems. Of course there is still much more to do: we need our model transformations, languages, and theories to scale further, allow greater expressivity, be more flexible, and aid reusability; and we lack empirically backed studies of model transformations in use. Doubtless you can think of other gaps. Yet, though some real-world challenges lie just beyond our reach, each year sees once-daunting problems conquered. Much of that progress is now driven by ICMT, and this year's edition showed how model transformations are increasingly being used in previously unfamiliar areas.

ICMT prides itself on transparency: 63 abstracts yielded 58 full submissions, of which 17 were eventually accepted—a 29% acceptance rate. Every paper was reviewed by at least three Programme Committee members. The resulting paper discussion and selection process was lively and detailed, reflecting the strength of the submissions. We were fortunate to have an invited paper and keynote from Stefano Ceri, which provides motivation for modelling and model transformations in a new, exciting, and challenging area.

For each of us, being Chair for this third edition was an honor. Many people helped make this conference what it is. We thank the Programme Committee for their hard work, particularly those who took on extra duties. The Publicity Chair Dennis Wagelaar did a wonderful job at advertising the conference. The ICMT Steering Committee were consistently wise and supportive and some went further than we could reasonably have hoped: Alfonso Pierantonio ran the ICMT 2010 website; Antonio Vallecillo, who doubled as Organizing Chair for the TOOLS Federated Conference as a whole, did wonders in communications; and Richard Paige provided much advice based on his experience as last year's

## VI Preface

PC. Last, but certainly not least, we thank ICMT's lifeblood—those who submitted papers. To all these people we give wholehearted thanks!

April 2010

Laurence Tratt Martin Gogolla

## **Organization**

#### Conference Committee

Programme Chair Laurence Tratt (Middlesex University, UK) Conference Chair

Martin Gogolla (University of Bremen,

Germany)

Publicity Chair Dennis Wagelaar (V.U. Brussel, Belgium) Steering Committee Jean Bézivin (INRIA, Nantes, France)

> Jeff Gray (University of Alabama, USA) Richard Paige (University of York, UK) Alfonso Pierantonio (University of l'Aquila,

Italy)

Antonio Vallecillo (University of Málaga,

Spain)

## Programme Committee

Ivan Kurtev Kelly Androutsopoulos Orlando Avila-Garcia Thomas Kühne Esperanza Marcos Luciano Baresi Jordi Cabot Marc Pantel

Antonio Cicchetti Francesco Parisi-Presicce

Vicente Pelechano Tony Clark

Charles Consel Ivan Porres

Davide Di Ruscio Nicolas Rouguette Gregor Engels Andreas Rummler Piero Fraternali Bernhard Rumpe Jesús García-Molina Andy Schürr Reiko Heckel Bran Selic Howard Ho Jim Steel

Zhenjiang Hu Gabriele Taentzer Frédéric Jouault Yasemin Topaloglu Gerti Kappel Daniel Varro Stuart Kent Eelco Visser Guenter Kniesel Jens Weber Dimitris Kolovos Jon Whittle Andreas Winter Vinay Kulkarni

### **Additional Reviewers**

E. Balland
S. Barat
J. Bézivin
E. Biermann
P. Boström
P. Brauner
P. Brosch
H. Cichos
R. Clarisó
R. Drogemuller
A. Egesoy
Q. Enard
J. Fons

B. Güldali

C. Gerth

A. Haber

B. He

S. Hidaka C. Huemer M. Löwe E. Legros P. Liegl M. Look T. Lundkvist R. Machado J. Manuel Vara Mesa J. Mercadal R. Mohan K. Nakano J. Oliver Ringert R. Paige L. Patzina I. Ráth A. Radwan

I. Rauf
R. Raventós
S. Roychoudhury
J. Sánchez-Cuadrado
M. Schindler
M. Seidl
C. Soltenborn
H. Song
M. Tisi
D. Truscan
A. Vallecillo
G. Varro
G. Wachsmuth
I. Weisemoeller

M. Wimmer

## **Table of Contents**

Invited Paper	
Search Computing: A Model-Driven Perspective	1
Research Papers	
Domain-Specific Composition of Model Deltas	16
Temporal Model-Based Diagnostics Generation for HVAC Control Systems	31
Synthesis of OCL Pre-conditions for Graph Transformation Rules Jordi Cabot, Robert Clarisó, Esther Guerra, and Juan de Lara	45
From State- to Delta-Based Bidirectional Model Transformations Zinovy Diskin, Yingfei Xiong, and Krzysztof Czarnecki	61
A Constructive Approach to Testing Model Transformations	77
From Sequence Diagrams to State Machines by Graph Transformation	93
Safe Composition of Transformations	108
	123
Constructing and Navigating Non-invasive Model Decorations Dimitrios S. Kolovos, Louis M. Rose, Nikolaos Drivalos Matragkas, Richard F. Paige, Fiona A.C. Polack, and Kiran J. Fernandes	138
Model-to-Model Transformations By Demonstration	153
Implementing Business Process Recovery Patterns through QVT Transformations	168

## X Table of Contents

Model Migration with Epsilon Flock	184
Exceptional Transformations	199
Improving Higher-Order Transformations Support in ATL	215
Towards a Rewriting Logic Semantics for ATL	230
Metamodel Matching Based on Planar Graph Edit Distance	245
Surviving the Heterogeneity Jungle with Composite Mapping Operators	260
Author Index	277