

## Guest editorial to the special section on model transformation

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### 1 Introduction

Models have become essential for dealing with the numerous aspects involved in developing and maintaining complex IT systems. Models assist in capturing the relevant aspects of a system from a given perspective and at a precise level of abstraction. Model transformation represents a key activity in model-driven engineering by supporting the definition and implementation of the operations on models, which can provide a chain that enables the automated development of a system from its corresponding models. Furthermore, a model transformation may also be considered a model in its own right, which presents opportunities for higher-order transformations, i.e., transformations that manipulate models representing other model transformations.

There exist several approaches that support model transformation specification, implementation, and execution, which are beginning to be used by model engineers, end-users, and practitioners. However, model transformations need specialized support in several areas in order to realize their full potential. The challenges go beyond the need to have specific languages to represent model transformations; it is also necessary to understand foundational principles, such as the key concepts and operators supporting model transformation languages, their semantics, and their structuring

mechanisms and properties (e.g., modularity, composability, and parameterization). In addition, model transformations can be stored in repositories as reusable assets, where they can be managed, discovered and reused. There is also a need to chain and combine model transformations in order to produce new and more powerful transformations, and to be able to implement new operations on models. Finally, model transformations need methodology support, i.e., they need to be integrated into software development methodologies supported by appropriate tools and environments. These issues and concerns define the focus of this special section.

The objective of this special section is to provide a representative sample of advanced research emerging from the field of model transformation. The selected papers provide an overview of current open issues and identify potential lines for further research.

### 2 Background context: ICMT 2008

The inaugural International Conference on Model Transformation (ICMT 2008) was held in early July 2008 in Zurich, Switzerland. The conference was conducted in collaboration with the TOOLS 2008 conference. ICMT followed the success of two previous tracks on Model Transformation at the ACM Symposium on Applied Computing (SAC): MT 2006 at Dijon, France, and MT 2007 at Seoul, Korea. This first ICMT conference brought together researchers and practitioners to share experiences in using model transformations. Like its SAC predecessors, ICMT 2008 combined a strong practical focus with the theoretical approach required in any discipline that supports engineering practices.

The inaugural conference was very successful. ICMT 2008 received 54 abstract submissions of which 48 were submitted as full papers. The Program Committee suggested

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17 papers for presentation at the conference. The papers presented at ICMT 2008 reflect the fact that the topic of model transformation encompasses many different aspects, such as Process and Engineering of Model Transformations; Model Transformations Supporting Concurrency and Time; Matching and Mapping within Model Transformation Rules; Language Support for Model Transformation Reuse and Modularity; and Correctness and Analysis of Model Transformations. All of these categories of interest were included as technical sessions of the final program and recorded in the ICMT 2008 proceedings [1].

### 3 Selected papers for this special section

From the seventeen papers presented at the ICMT 2008 conference, we selected eight candidate papers for this special section based on the program committee comments and scores, and the quality of the author presentations at the conference. The authors submitted extended version of their papers that underwent a thorough peer review process. There were two rounds of reviews and all papers were refereed by at least three well-known experts in the field. Most of the reviewers were also members of the Program Committee of ICMT 2008, and included Luciano Baresi, Jordi Cabot, Tony Clark, Steve Cook, Antonio Estevez, Jesús García-Molina, Gabor Karsai, Günter Kniesel, Vinay Kulkarni, Michael Lawley, Tom Mens, Richard Paige, Marc Pantel, Vicente Pelechano, Louis Rose, Nicolas Rouquette, Davide Di Ruscio, Jesús Sánchez-Cuadrado, Gabriele Taentzer, Yasemin Topaloglu, Andreas Winter, and Jing Zhang. At the end of the review process, the following five papers were selected for this special section:

- Dennis Wagelaar, Ragnhild Van Der Straeten, and Dirk Deridder, in their paper entitled “Module superimposition: A Composition Technique for Rule-based Model Transformation Languages,” investigate the importance of superimposition, which is a model composition technique that provides extensibility and overriding. The idea supports splitting up a model transformation into units that are more reusable. The paper is focused on ATL and QVT Relations.
- Ivan Kurtev, in his paper “Application of Reflection in a Model Transformation Language,” studies the possibilities and benefits of introducing and using reflection in rule-based model transformation languages. The paper outlines possible implementation strategies for adding reflection to a model transformation language and discusses the advantages and disadvantages of reflection in model transformation. As a primary contribution, the paper identifies several language abstractions that provide structural and

behavioral reflection in an experimental model transformation language called MISTRAL.

- Jordi Cabot, Robert Clarisó, Esther Guerra and Juan de Lara, in the paper “A UML/OCL Framework for the Analysis of Graph Transformation Rules,” present an approach for the analysis of graph transformation rules based on an intermediate OCL representation. The approach is especially useful to analyse the operational semantics of Domain-Specific Visual Languages.
- Greg Freeman, Don Batory, Greg Lavender, and Jacob Neal Sarvela, in the paper entitled “Lifting Transformational Models of Product Lines: A Case Study,” discuss how abstraction can be raised (lifted) through using model transformations in software product lines. The paper considers a product line that is implemented completely through transformations. A contribution of the paper is a demonstration of the ability to use higher level abstractions to describe features that are shared across product lines.
- Zef Hemel, Lennart Kats, Danny Groenewegen, and Eelco Visser, in their paper “Code Generation by Model Transformation. A Case Study in Transformation Modularity,” introduce techniques for improving separation of concerns in the implementation of generators. The core technique is the generation of a structured model representation of the target program instead of plain text.

These papers contribute in different aspects to the theory and practice of model transformations, providing a deeper understanding of some of the issues that practitioners face when applying current model transformation technologies. The papers cover several important topics, such as the introduction of new features for improving re-use and modularization of model transformations (Wagelaar et al., Kurtev), further analysis methods (Cabot et al.), and tools and case studies (Freeman et al.; Hemel et al.).

**Acknowledgments** We are thankful to all of those who submitted papers to the conference, and particularly to the contributing authors of this special section. Our gratitude also goes to the reviewers for the timely manner in which they assisted in choosing and making suggestions to improve the selected papers. We also would like to thank the SoSyM editorial office, and in particular Martin Schindler and Bernhard Rumpe, for the excellent support in preparing this special section. Our appreciation also is extended to the TOOLS 2008 organizers for providing the opportunity to host the first ICMT conference in Zurich, and especially to Richard Paige, Bertrand Meyer and Jean Bézivin for helping to co-locate both events in a seamless and natural manner.

### Reference

1. Antonio, V., Jeff, G., Alfonso, P. (eds.): Theory and practice of model transformations. In: Proceedings of the First International Conference on Model Transformations (ICMT) 2009, July 2008. LNCS 5063, Springer, Heidelberg

## Author Biographies



**Jeff Gray** is an Associate Professor in the Computer and Information Sciences Department at the University of Alabama at Birmingham (UAB) where he co-directs the Software Composition and Modeling (SoftCom) laboratory. His interests include model engineering, aspect-oriented software development, software maintenance, and computer science outreach to young children. Jeff is the recipient of an NSF CAREER Award and was named the Alabama Professor of the Year by the Carnegie Foundation (2008). He received a Ph.D. in Computer Science from Vanderbilt University and a B.S./M.S. from West Virginia University. Jeff is a member of the ACM and a Senior Member of the IEEE (serving as the Chair of the Alabama IEEE Computer Society). Additional information can be found at <http://www.cis.uab.edu/gray>.

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**Alfonso Pierantonio** is Associate Professor in computer science at the University of L'Aquila (Italy). He is currently director of the Master in Web Technology degree program. His current research interests include model-driven engineering and in particular the theory and practice of model versioning/evolution in the current generic modeling platforms. In particular, he investigated the problem of co-evolution in EMOF-based systems trying to build the basis for

a complete automation of the model adaptation procedure. He has been and is currently part of program and organization committees of conferences and has been among the initiators and in the steering committee of the International Conference on Model Transformation (ICMT). He co-edited several special issues on Model Transformation. Additional information can be found on his webpage: <http://www.di.univaq.it/alfonso>.



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