Electronic Communications of the EASST
Volume 30 (2010)

International Colloquium on Graph and Model Transformation - On the occasion of the 65th birthday of Hartmut Ehrig (GraMoT 2010)

Preface

Claudia Ermel, Hartmut Ehrig, Fernando Orejas and Gabriele Taentzer

5 pages

Guest Editors: Claudia Ermel, Hartmut Ehrig, Fernando Orejas, Gabriele Taentzer
Managing Editors: Tiziana Margaria, Julia Padberg, Gabriele Taentzer
ECEASST Home Page: http://www.easst.org/eceasst/ ISSN 1863-2122

Preface

Claudia Ermel[1], Hartmut Ehrig[1], Fernando Orejas[2] and Gabriele Taentzer[3]

[1] Technische Universität Berlin, Germany
claudia.ermel@tu-berlin.de, ehrig@cs.tu-berlin.de

[2] Universitat Politècnica de Catalunya, Barcelona, Spain
orejas@lsi.upc.edu

[3] Philipps-Universität Marburg, Germany
taentzer@informatik.uni-marburg.de

Abstract: This volume is a collection of invited papers and position statements presented at the *International Colloquium on Graph and Model Transformation*, February 11-12, 2010, at Technische Universität Berlin on the occasion of the 65th birthday of Hartmut Ehrig. After the colloquium all contributions have been peer-reviewed, and the final versions of the accepted contributions are now published in this special issue of ECEASST.

Keywords: graph transformation, model transformation

Scope and Objectives of the Colloquium

Graphs are a general kind of models which have been used in various fields of computer science. On the one hand, they are well-suited to formally describe complex structures. On the other hand, the underlying structure of models, especially visual models, can be described best by graphs, due to their multidimensional extension. Graphs can be manipulated by graph transformation in a rule-based manner. Considering current trends in software development such as model driven engineering and model-integrated computing, there is an emerging need to describe model manipulations, model evolution, model semantics, etc. in a precise way. Recent research has shown that graph transformation is a promising formalism to specify model transformations.

The goal of the colloquium was to foster interaction between the graph transformation and the model transformation community in order to facilitate exchange of results and challenging problems. The graph transformation research community has built up a significant body of knowledge over the past 30 years and in addition to the theoretical base several practical implementations have been created. The research area of model transformations has recently been identified as a key subject in model-driven development. Graph transformations could offer an elegant theory and powerful concepts for the model-driven engineering of software systems, while the software engineering community can generate interesting challenges for the graph transformation community. Therefore, there is a need for strong interaction and inter-operation between these communities: the interchange of ideas, problems, and solutions will lead to major advances in both fields.

Invited Papers and Position Statements for the Colloquium

The program was organized in six technical sessions, in two days:

Thursday, February 11, 2010	**Friday, February 12, 2010**
1. Graph Transformation Techniques, 2. Modeling with Graph and Net Transformations, 3. Verification and Constraints, 4. Modeling of Chemical and Biochemical Reactions	5. Model Transformations, 6. Software System Modelling (incl. Panel Discussion)

In **Session 1 (Graph Transformation Techniques)**, hierarchical graphs are used to model a service and session calculus in the first contribution by A. Corradini, U. Montanari and R. Bruni. In the second one by L. Lambers and F. Orejas, the new concept of *symbolic attributed graphs* is introduced to deal with attributed graphs in contrast and comparison with the standard approaches to attributed graph transformation.

The paper by K. Ehrig and C. Ermel in **Session 2 (Modelling with Graph and Net Transformations)** focuses on the role of graphs and graph transformations in practical application areas like molecular analysis, model transformations, and medical information systems. The second contribution by F. Parisi-Presicce and P. Bottoni proposes a new termination criterion for graph transformation systems with negative application conditions. Finally, an integration of Petri nets and high-level replacement systems, known as *reconfigurable Petri nets*, is used in the third paper by T. Modica and K. Hoffmann for formal modeling and analysis of flexible processes in communication based systems, like mobile ad-hoc networks and Skype.

In **Session 3 (Verification and Constraints)**, the first paper by T. Margaria and B. Steffen presents a second order value numbering as new optimization method to be used in the $M2L(Str)$ verification tool set for monadic second-order logic on strings. This new method allows applications to transformations on directed acyclic graphs. In the second paper by L. Ribeiro et al., the Event-B formal method and its theorem proving tools are proposed to analyze graph grammars, especially reachable states. Finally, in the third contribution by A. Habel and H. Radke, graph conditions – in the sense of nested application conditions – are extended to graph conditions with variables in order to improve the expressive power, especially concerning non-local properties like ”there exists a path”.

In **Session 4 (Modelling of Chemical and Biochemical Reactions)**, the contribution by R. Heckel and M. Bapodra presents a methodology for extracting ordinary differential equations from stochastic graph transformation systems, especially based on a model for chemical reactions. In the second contribution G. Rozenberg et al. introduce the new concept of reaction systems as a formal framework for biochemical reactions.

The first paper by S. Glesner et al. in **Session 5 (Model Transformations)** presents an approach of the VATES project using process algebraic techniques in order to integrate modeling,

implementation, transformation, and verification stages of embedded system development. The second contribution by F.Hermann, B. König and M. Hülsbusch presents specification and verification techniques for model transformations based on triple graph grammars and the *Double-Pushout-Approach with Borrowed Context* (DPO-BC). Finally, H.-J. Kreowski, S. Kuske and C. von Totth show how to use graph transformation units in order to handle composition and correctness of model transformations.

In **Session 6 (Software System Modelling)**, the first contribution by G. Engels and C. Soltenborn is a paper on test-driven language derivation using the specification technique *Dynamic Meta Modelling* which is based on graph transformations. The remaining contributions are position statements for the Panel Discussion *Software System Modelling : Past, Present and Future*. The position statement of H. Ehrig discusses the state of the art and role of formal specification techniques in these three periods, starting from single techniques in the past and leading to certified, integrated, and visual techniques and environments in the future. The statement of M. Löwe discusses the role of graph transformations for agile software development, including concepts like software refactoring, test-first, extreme programming, or dynamic systems development. B. Mahr points out in his statement that the modeling of software systems is a task in which a complex interaction of models is being created. Finally, G. Taentzer shows that the theory of algebraic graph transformation can be used to show important properties of model transformations, like type consistency, functional behavior, as well as conflicts and dependencies between transformation steps.

We would like to thank all invited speakers and panelists for their contributions presented at the colloquium and their revised papers accepted for the special issue of ECEASST. Moreover, we thank the local GraMoT organization team at TU Berlin (F. Hermann, O. Runge, M. Russ and K. Schlicht) for their permanent support during the event.

Last but not least, we thank all reviewers who were involved in the review process and had their share in improving the papers for this special issue of ECEASST.

Berlin, October 2010

Claudia Ermel,
Hartmut Ehrig,
Fernando Orejas,
Gabriele Taentzer

(Guest Editors of GraMoT 2010)

Reviewers

Enrico Biermann (TU Berlin, Germany)
Paolo Bottoni (Università di Roma "La Sapienza", Italy)
Andrea Corradini (Università di Pisa, Italy)
Hartmut Ehrig (TU Berlin, Germany) (PC chair)
Karsten Ehrig (BAM Berlin, Germany)
Claudia Ermel (TU Berlin, Germany) (PC chair)
Thomas Göthel (TU Berlin, Germany)
Ulrike Golas (TU Berlin, Germany)
Annegret Habel (Universität Oldenburg, Germany)
Reiko Heckel (University of Leicester, UK)
Steffen Helke (TU Berlin, Germany)
Berthold Hoffmann (Universität Bremen, Germany)
Dirk Janssens (Universiteit Antwerpen, Belgium)
Gabor Karsai (Vanderbilt University, Nashville, TN, USA)
Jens Knoop (TU Wien, Austria)
Barbara König (Universität Duisburg-Essen)
Hans-Jörg Kreowski (Universität Bremen, Germany)
Leen Lambers (HPI, Universität Potsdam, Germany)
Juan de Lara (Universidad Autónoma de Madrid, Spain)
Michael Löwe (Fachhochschule für die Wirtschaft, Hannover, Germany)
Tony Modica (TU Berlin, Germany)
Ugo Montanari (Università di Pisa, Italy)
Manfred Nagl (RWTH Aachen, Germany)
Fernando Orejas (Universitat Politècnica de Catalunya, Barcelona, Spain)
Hendrik Radke (Universität Oldenburg, Germany)
Leila Ribeiro (Universidade Federal do Rio Grande Do Sul, Port Alegre, Brazil)
Andy Schürr (Universität Darmstadt, Germany)
Gabriele Taentzer (Universität Marburg, Germany) (Panel Chair)
Daniel Varró (Budapest University of Technology and Economics, Hungary)

Congratulatory Address on Behalf of the ICGT Steering Committee

This spring it is 10 years since the first meeting of the steering committee of the International Conference on Graph Transformation. By now we have had four successful conferences, in Barcelona, Rome, Natal, and Leicester, with the fifth coming up in Enschede this Autumn. Graph transformation is firmly established as a discipline and recognised both for its foundational contributions and applications.

None of this would have happened without Hartmut's scientific contribution and services to the community. Recognising its potential, Hartmut was among those who first formalised the general mechanism of rewriting on graphs in the early 70ies, based on the algebraic or double-pushout approach which is still amongst the most popular today. He went on to make seminal contributions to its conceptual foundation and mathematical theory and it is not an overstatement to say that the majority of papers published in the area today in some way rely on foundations Hartmut helped to establish. For example, two thirds of the papers presented at the last ICGT in 2008 are directly based on the algebraic approach or variants of it.

Besides founding this Berlin school of graph transformation, Hartmut has also been the driving force behind the formation and organisation of the community of people behind what is now the ICGT conference, but evolved via a series of international workshops and with support from a number of European projects such as COMPUGRAPH, APPLIGRAPH, GETGRATS and SEGRAVIS. After having led two instalments of the European Working Group COMPUGRAPH in the late 80ies and early 90ies, Hartmut kept his role as coordinator of the community, motivating and guiding others like myself, until he became chair of the ICGT steering committee in 2000.

Apart from his scientific achievements and organisational contributions, Hartmut's main legacy are the people he educated in his culture of theoretical research inspired by practical phenomena, formalised in terms of graphs, algebra and category theory. Equipped with this background, we are now able to address today's problems in computer science and beyond, build tools, design languages and algorithms for analysis, etc. while relying on solid foundations.

Dear Hartmut, on behalf of your students, the ICGT steering committee, and the graph transformation community at large I would like to thank you for your invaluable contributions and the support and guidance you are giving us. We hope that you keep driving us forward both scientifically and as a community for many years to come and wish you many happy returns of your anniversary.

Leicester, February 2010

Reiko Heckel, University of Leicester (UK)
Chair of the ICGT Steering Committee