Lecture Notes in Computer Science 1764

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Springer
Berlin
Heidelberg
New York
Barcelona
Hong Kong
London
Milan
Paris
Singapore
Tokyo

Hartmut Ehrig Gregor Engels
Hans-Jörg Kreowski Grzegorz Rozenberg (Eds.)

Theory and Application of Graph Tranformations

6th International Workshop, TAGT'98
Paderborn, Germany, November 16-20, 1998
Selected Papers

Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany
Juris Hartmanis, Cornell University, NY, USA
Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Hartmut Ehrig
Technical University of Berlin, Sekr. FR 6 - 1, Computer Science Department (FB13)
Franklinstr. 28/29, 10587 Berlin, Germany
E-mail: ehrig@cs.tu-berlin.de

Gregor Engels
University of Paderborn, Department of Computer Science
Warburger Str. 100, 33098 Paderborn, Germany
E-mail: engels@upb.de

Hans-Jörg Kreowski
University of Bremen, Department of Computer Science, P. O. 330440
28334 Bremen, Germany
E-mail: kreo@informatik.unibremen.de

Grzegorz Rozenberg
Leiden University
Leiden Institute of Advanced Computer Science (LIACS)
Niels-Bohr-Weg 1, 2333 CA Leiden, The Netherlands
E-mail: rozenberg@wi.leidenuniv.nl

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme
Theory and application of graph transformations. - 6. 1998 (2000)-. -
Berlin ; Heidelberg ; New York ; Barcelona; Hong Kong ; London ; Milan
; Paris ; Singapore ; Tokyo : Springer, 2000
(Lecture notes in computer science ; ...)
Früher u.d.T.: Graph-grammars and their application to computer science
6. Paderborn, Germany, November 1998
Selected papers. - 2000
(Lecture notes in computer science ; Vol. 1764)
ISBN 3-540-67203-6

CR Subject Classification (1991): F.4.2-3, I.1.1, I.2.4, D.2, F. 3, I. 5.1, J.3., J.5.1

ISSN 0302-9743
ISBN 3-540-67203-6 Springer-Verlag Berlin Heidelberg New York

Typesetting: Camera-ready by author, data conversion by DA-TeX Gerd Blumenstein
Printed on acid-free paper SPIN 10719685 06/3142 5 4 3 2 1 0

Preface

The area of graph transformation originated in the late 1960s under the name "graph grammars" – the main motivation came from practical considerations concerning pattern recognition and compiler construction. Since then, the list of areas which have interacted with the development of graph transformation has grown impressively. The areas include: software specification and development, VLSI layout schemes, database design, modeling of concurrent systems, massively parallel computer architectures, logic programming, computer animation, developmental biology, music composition, distributed systems, specification languages, software and web engineering, and visual languages.

As a matter of fact, graph transformation is now accepted as a fundamental computation paradigm where computation includes specification, programming, and implementation. Over the last three decades the area of graph transformation has developed at a steady pace into a theoretically attractive research field, important for applications.

This volume consists of papers selected from contributions to the Sixth International Workshop on Theory and Applications of Graph Transformation that took place in Paderborn, Germany, November 16-20, 1998. The papers underwent an additional refereeing process which yielded 33 papers presented here (out of 55 papers presented at the workshop). This collection of papers provides a very broad snapshot of the state of the art of the whole field today. They are grouped into nine sections representing most active research areas.

The workshop was the sixth in a series of international workshops which take place every four years. Previous workshops were called "Graph Grammars and Their Application to Computer Science". The new name of the Sixth Workshop reflects more accurately the current situation, where both theory and application play an equally central role.

The workshop has received financial support from the European Community as a TMR Euroconference, as well as through the TMR network GETGRATS and the ESPRIT Working Group APPLIGRAPH.

November 1999

H. Ehrig, G. Engels,
H.-J. Kreowski, G. Rozenberg

Organization

TAGT'98 was organized by the Department of Mathematics and Computer Science of the University of Paderborn, Germany, at the Heinz Nixdorf Museums-Forum, Paderborn.

Organizing Committee

G. Engels	University of Paderborn, D	(chair)
H. Ehrig	Technical University of Berlin, D	
H.-J. Kreowski	University of Bremen, D	
G. Rozenberg	University of Leiden, NL	

Program Committee

G. Engels	University of Paderborn, D	(co-chair)
G. Rozenberg	University of Leiden, NL	(co-chair)
B. Courcelle	LaBRI, Bordeaux, F	
H. Ehrig	Technical University of Berlin, D	
D. Janssens	University of Antwerp, B	
H.-J. Kreowski	University of Bremen, D	
U. Montanari	University of Pisa, I	
M. Nagl	RWTH Aachen, D	
F. Parisi–Presicce	University of Rome, I	
R. Plasmeijer	University of Nijmegen, NL	
A. Rosenfeld	University of Maryland, USA	
H.J. Schneider	University of Erlangen, D	

Referees

P. Baldan
R. Bardohl
A. Corradini
G. Costagliola
F. Drewes
J. Engelfriet
G. Ferrari
I. Fischer
M. Gajewsky
M. Große–Rhode
St. Gruner
J. Hage
A. Habel
R. Heckel
D. Janssens
B. Hoffmann
M. Koch
M. Llabrés–Segura
M. Minas
U. Nickel
J. Padberg
D. Plump
F. Rossi
A. Schürr
M. Simeoni
G. Taentzer
N. Verlinden
J. Wadsack
E. Wanke
B. Westfechtel
A. Zündorf

Table of Contents

Modularity and Refinement

Software Engineering