Lecture Notes in Computer Science

3855

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

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

University of Dortmund, Germany

Madhu Sudan

Massachusetts Institute of Technology, MA, USA

Demetri Terzopoulos

New York University, NY, USA

Doug Tygar

University of California, Berkeley, CA, USA

Moshe Y. Vardi

Rice University, Houston, TX, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Verification, Model Checking, and Abstract Interpretation

7th International Conference, VMCAI 2006 Charleston, SC, USA, January 8-10, 2006 Proceedings



Volume Editors

E. Allen Emerson University of Texas at Austin, Department of Computer Science Austin, TX 78712, USA

E-mail: emerson@cs.utexas.edu

Kedar S. Namjoshi Bell Labs, Lucent Technologies 600 Mountain Avenue, Murray Hill, NJ 07974, USA E-mail: kedar@research.bell-labs.com

Library of Congress Control Number: 2005937944

CR Subject Classification (1998): F.3.1-2, D.3.1, D.2.4

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

ISSN 0302-9743

ISBN-10 3-540-31139-4 Springer Berlin Heidelberg New York ISBN-13 978-3-540-31139-3 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 is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2006 Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India Printed on acid-free paper SPIN: 11609773 06/3142 5 4 3 2 1 0

Preface

This volume contains the papers accepted for presentation at the 7th International Conference on Verification, Model Checking, and Abstract Interpretation, held January 8-10, 2006, at Charleston, South Carolina, USA.

VMCAI provides a forum for researchers from the communities of verification, model checking, and abstract interpretation, facilitating interaction, crossfertilization, and advancement of hybrid methods.

The program was selected from 58 submitted papers. In addition, the program included invited talks by Edmund M. Clarke (Carnegie Mellon University), James R. Larus (Microsoft Research), and Greg Morrisett (Harvard University), and invited tutorials by Nicolas Halbwachs (VERIMAG) and David Schmidt (Kansas State University).

VMCAI was sponsored by the University of Texas at Austin, with additional support from Microsoft Research and NEC Research Labs. We are grateful for the support. We would like to thank the Program Committee and the reviewers for their hard work and dedication in putting together this program. We especially wish to thank Jacob Abraham, director of the Computer Engineering Research Center at the University of Texas at Austin and Debi Prather for their invaluable support and assistance, and Rich Gerber for his help with the START conference management system.

January 2006

E. Allen Emerson Kedar S. Namjoshi

Organization

Program Committee

Alex Aiken Stanford University, USA
Thomas Ball Microsoft Research, USA
Hana Chockler IBM Research, Israel

Patrick Cousot École Normale Supérieure, France
E. Allen Emerson (Co-chair)
Javier Esparza University of Stuttgart, Germany
Roberto Giacobazzi University of Verona, Italy
Patrice Godefroid Bell Laboratories, USA

Warren Hunt University of Texas at Austin, USA

Neil Jones DIKU, University of Copenhagen, Denmark

Tiziana Margaria University of Göttingen, Germany Markus Müller-Olm University of Münster, Germany

Kedar S. Namjoshi (Co-chair) Bell Laboratories, USA

George Necula University of California at Berkeley, USA

Jens Palsberg UCLA, USA

Andreas Podelski Max-Planck-Institut für Informatik, Germany

Thomas W. Reps University of Wisconsin, USA

A. Prasad Sistla University of Illinois at Chicago, USA

Colin Stirling University of Edinburgh, UK Scott D. Stoller SUNY at Stony Brook, USA

Lenore Zuck University of Illinois at Chicago, USA

Steering Committee

Agostino Cortesi University of Venice, Italy

Patrick Cousot École Normale Supérieure, France E. Allen Emerson University of Texas at Austin, USA

Giorgio Levi University of Pisa, Italy

Andreas Podelski Max-Planck-Institut für Informatik, Germany

Thomas W. Reps University of Wisconsin, USA David Schmidt Kansas State University, USA

Lenore Zuck University of Illinois at Chicago, USA

Sponsoring Institutions

The University of Texas at Austin Microsoft Research NEC Research Labs

Referees

Parosh Abdulla Gilad Arnold Gadiel Auerbach James Avery Bernard Boigelot Ahmed Bouajjani Glenn Bruns Scott Cotton Dennis Dams Jared Davis John Erickson Xiang Fu Maria del Mar Gallardo Peter Habermehl Brian Hackett Tom Henzinger Bertrand Jeannet

Robert Krug

Viktor Kuncak

Damien Masse

Orna Kupferman

Alexander Malkis

Isabella Mastroeni Alessio Merlo David Monniaux Anders Møller Serita Neleson Ziv Nevo Tobias Nipkow Avigail Orni Julien d'Orso German Puebla Mila Dalla Preda David Rager C.R. Ramakrishnan Francesco Ranzato Sandip Ray Erik Reeber Xavier Rival Oliver Rüthing Giovanni Scardoni Stefan Schwoon Roberto Segala

Zhong Shao

Jakob Grue Simonsen Viorica Sofronie-Stokkermans Fausto Spoto Bernhard Steffen Sol Swords Wenkai Tan Francesco Tapparo Tachio Terauchi Helmut Veith Mahesh Viswanathan Hubert Wagner Thomas Wies Daniel Wilkerson Ping Yang Pei Ye Karen Yorav Greta Yorsh Damiano Zanardini Qiang Zhang Min Zhou

Table of Contents

Closure Operators for ROBDDs Peter Schachte, Harald Søndergaard	1
A CLP Method for Compositional and Intermittent Predicate Abstraction Joxan Jaffar, Andrew E. Santosa, Răzvan Voicu	17
Combining Shape Analyses by Intersecting Abstractions Gilad Arnold, Roman Manevich, Mooly Sagiv, Ran Shaham	33
A Complete Abstract Interpretation Framework for Coverability Properties of WSTS Pierre Ganty, Jean-François Raskin, Laurent Van Begin	49
Complexity Results on Branching-Time Pushdown Model Checking Laura Bozzelli	65
A Compositional Logic for Control Flow Gang Tan, Andrew W. Appel	80
Detecting Non-cyclicity by Abstract Compilation into Boolean Functions Stefano Rossignoli, Fausto Spoto	95
Efficient Strongly Relational Polyhedral Analysis Sriram Sankaranarayanan, Michael A. Colón, Henny B. Sipma, Zohar Manna	111
Environment Abstraction for Parameterized Verification Edmund Clarke, Muralidhar Talupur, Helmut Veith	126
Error Control for Probabilistic Model Checking Håkan L.S. Younes	142
Field Constraint Analysis Thomas Wies, Viktor Kuncak, Patrick Lam, Andreas Podelski, Martin Rinard	157
A Framework for Certified Program Analysis and Its Applications to Mobile-Code Safety Bor-Yuh Evan Chang, Adam Chlipala, George C. Necula	174

Improved Algorithm Complexities for Linear Temporal Logic Model Checking of Pushdown Systems Katia Hristova, Yanhong A. Liu	190
A Logic and Decision Procedure for Predicate Abstraction of Heap-Manipulating Programs Jesse Bingham, Zvonimir Rakamarić	207
Monitoring Off-the-Shelf Components A. Prasad Sistla, Min Zhou, Lenore D. Zuck	222
Parallel External Directed Model Checking with Linear I/O Shahid Jabbar, Stefan Edelkamp	237
Piecewise FIFO Channels Are Analyzable Naghmeh Ghafari, Richard Trefler	252
Ranking Abstraction of Recursive Programs Ittai Balaban, Ariel Cohen, Amir Pnueli	267
Relative Safety Joxan Jaffar, Andrew E. Santosa, Răzvan Voicu	282
Resource Usage Analysis for the π-Calculus Naoki Kobayashi, Kohei Suenaga, Lucian Wischik	298
Semantic Hierarchy Refactoring by Abstract Interpretation Francesco Logozzo, Agostino Cortesi	313
Strong Preservation of Temporal Fixpoint-Based Operators by Abstract Interpretation Francesco Ranzato, Francesco Tapparo	332
Symbolic Methods to Enhance the Precision of Numerical Abstract Domains Antoine Miné	348
Synthesis of Reactive(1) Designs Nir Piterman, Amir Pnueli, Yaniv Sa'ar	364
Systematic Construction of Abstractions for Model-Checking Arie Gurfinkel, Ou Wei, Marsha Chechik	381
Totally Clairvoyant Scheduling with Relative Timing Constraints K. Subramani	398

Table of Contents	XI
Verification of Well-Formed Communicating Recursive State Machines Laura Bozzelli, Salvatore La Torre, Adriano Peron	412
What's Decidable About Arrays? Aaron R. Bradley, Zohar Manna, Henny B. Sipma	427
Author Index	443