

Lecture Notes in Artificial Intelligence 2250

Subseries of Lecture Notes in Computer Science

Edited by J. G. Carbonell and J. Siekmann

Lecture Notes in Computer Science

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

Springer

Berlin

Heidelberg

New York

Barcelona

Hong Kong

London

Milan

Paris

Tokyo

Robert Nieuwenhuis Andrei Voronkov (Eds.)

Logic for Programming, Artificial Intelligence, and Reasoning

8th International Conference, LPAR 2001
Havana, Cuba, December 3-7, 2001
Proceedings



Springer

Series Editors

Jaime G. Carbonell, Carnegie Mellon University, Pittsburgh, PA, USA
Jörg Siekmann, University of Saarland, Saarbrücken, Germany

Volume Editors

Robert Nieuwenhuis
Technical University of Catalonia, Department of Software
Jordi Girona 1, 08034 Barcelona, Spain
E-mail: roberto@lsi.upc.es

Andrei Voronkov
University of Manchester, Department of Computer Science
Kilburn Building, Oxford Road, Manchester M13 9PL, UK
E-mail: voronkov@cs.man.ac.uk

Cataloging-in-Publication Data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Logic for programming, artificial intelligence, and reasoning : 8th
international conference ; proceedings / LPAR 2001, Havana, Cuba, December
3 - 7, 2001. Robert Nieuwenhuis ; Andrei Voronkov (ed.). - Berlin ; Heidelberg ;
New York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Tokyo :
Springer, 2001
(Lecture notes in computer science ; Vol. 2250 : Lecture notes in
artificial intelligence)
ISBN 3-540-42957-3

CR Subject Classification (1998): I.2.3, F.3, F.4.1, D.2.4

ISBN 3-540-42957-3 Springer-Verlag 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-Verlag. Violations are liable for prosecution under the German Copyright Law.

Springer-Verlag Berlin Heidelberg New York
a member of BertelsmannSpringer Science+Business Media GmbH

<http://www.springer.de>

© Springer-Verlag Berlin Heidelberg 2001
Printed in Germany

Typesetting: Camera-ready by author, data conversion by PTP-Berlin, Stefan Sossna
Printed on acid-free paper SPIN: 10845965 06/3142 5 4 3 2 1 0

Preface

This volume contains the papers presented at the Eighth International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR 2001), held on December 3-7, 2001, at the University of Havana (Cuba), together with the Second International Workshop on Implementation of Logics.

There were 112 submissions, of which 19 belonged to the special submission category of experimental papers, intended to describe implementations or comparisons of systems, or experiments with systems. Each submission was reviewed by at least three program committee members and an electronic program committee meeting was held via the Internet. The high number of submissions caused a large amount of work, and we are very grateful to the other 31 PC members for their efficiency and for the quality of their reviews and discussions.

Finally, the committee decided to accept 40 papers in the theoretical category, and 9 experimental papers. In addition to the refereed papers, this volume contains an extended abstract of the invited talk by Frank Wolter. Two other invited lectures were given by Matthias Baaz and Manuel Hermenegildo.

Apart from the program committee, we would also like to thank the other people who made LPAR 2001 possible: the additional referees; the Local Arrangements Chair Luciano García; Andrés Navarro and Òscar Güell, who ran the internet-based submission software and the program committee discussion software at the LSI Department lab in Barcelona; and Bill McCune, whose program committee management software was used.

October 2001

Robert Nieuwenhuis
Andrei Voronkov

Conference Organization

Program Chairs

Robert Nieuwenhuis (Technical University of Catalonia)
Andrei Voronkov (University of Manchester)

Program Committee

Franz Baader (Technische Universität Dresden)
Maurice Bruynooghe (Katholieke Universiteit Leuven)
Jan Van den Bussche (Limburgs Universitair Centrum)
Thierry Coquand (Göteborgs Universitet)
Patrick Cousot (ENS Paris)
Nachum Dershowitz (Tel-Aviv University)
Jürgen Dix (University of Manchester)
Thomas Eiter (Technische Universität Wien)
Javier Esparza (University of Edinburgh)
Alan Frish (University of York)
Harald Ganzinger (Max-Planck Institut, Saarbrücken)
Georg Gottlob (Technische Universität Wien)
Jean Goubault-Larrecq (ENS de Cachan)
John Harrison (Intel Research)
Neil Immerman (University of Massachusetts)
Neil Jones (Københavns Universitet)
Jean-Pierre Jouannaud (CNRS)
Deepak Kapur (University of New Mexico)
Hans Kleine Büning (Universität Paderborn)
Maurizio Lenzerini (Università di Roma “La Sapienza”)
Giorgio Levi (Università di Pisa)
Fabio Massacci (Università di Siena)
Tobias Nipkow (Technische Universität München)
Mitsuhiro Okada (Keio University)
Leszek Pacholski (Wroclawski Uniwersytet)
Michel Parigot (Université Paris 7)
Frank Pfenning (Carnegie Mellon University)
Maarten de Rijke (Universiteit van Amsterdam)
Natarajan Shankar (SRI International)
Wolfgang Thomas (RWTH Aachen)
Moshe Vardi (Rice University)

Local Organization

Luciano Garcia (Universidad de la Habana)

List of Referees

Maria Alpuente	Gianluca Amato	Ofer Arieli
Roberto Bagnara	Richard Banach	Chitta Baral
Gertrud Bauer	Peter Baumgartner	Robert Baumgartner
Chantal Berline	Gerd Beuster	Piero Bonatti
Julian Bradfield	Stefan Brass	Antonio Brogi
Chad Brown	Marco Cadoli	Diego Calvanese
Iliano Cervesato	Kaustuv Chaudhuri	Henry Chinaski
Carl Christian	Roy Crole	Steven Dawson
Frederiksen	Emmanuel De Mot	Giuseppe De Giacomo
Alvaro del Val	Giorgio Delzanno	Bart Demoen
Agostino Dovier	Lyndon Drake	Uwe Egly
Amy Felty	Chris Fermueller	Maurizio Gabbrielli
Didier Galmiche	Paul Gastin	Juergen Giesl
Enrico Giunchiglia	Roberta Gori	Martin Grohe
Michael Hanus	James Harland	Juan Heguiabehere
Tamir Heyman	Thomas Hillenbrand	Martin Hofmann
Tetsuo Ida	Tomi Janhunen	David Janin
Gerda Janssens	A. John Power	Hirofumi Katsuno
Andrzej Kisielewicz	Felix Klaedtke	Gerwin Klein
Christoph Koch	Michael Kohlhase	Ralf Kuester
Orna Kupferman	Gerhard Lakemeyer	Javier Larrosa
Paolo Liberatore	Christof Loeding	Christoph Lueth
Thomas Lukasiewicz	Monika Maidl	Henning Makhholm
Pascal Manoury	Victor Marek	Ian Miguel
Torben Mogensen	Peter Møller Neergaard	Sara Negri
Hans de Nivelle	Damian Niwinski	Kazuhiro Ogata
Nikolay Pelov	Jens Peter Secher	Axel Polleres
David Pym	Riccardo Rosati	Paul Roziere
Harald Ruess	Salvatore Ruggieri	Tatiana Rybina
David Rydeheard	Ken Satoh	Ulrike Sattler
Francesco Scarcello	Andrea Schalk	Torsten Schaub
Francesca Scozzari	Dietmar Seipel	Dan Sheridan
Viorica Sofronie-	Chin Soon Lee	Colin Sterling
Stokkermans	Frieder Stolzenburg	Terry Swift
Kazushige Terui	Sven Thiel	Michael Thielscher
Ashish Tiwari	Hans Tompits	Iddo Tzameret
Christian Urban	Bert Van Nuffelen	Wim Vanhoof
Helmut Veith	Sofie Verbaeten	Luca Vigano
Uwe Waldmann	Toby Walsh	Igor Walukiewicz
Markus Wenzel	Emil Weydert	Stefan Woehrle
Frank Wolter		

Conferences Preceding LPAR 2001

RCLP'90, Irkutsk, Soviet Union

RCLP'91, Leningrad, Soviet Union, aboard the ship "Michail Lomonosov"

LPAR'92, St. Petersburg, Russia, aboard the ship "Michail Lomonosov"

LPAR'93, St. Petersburg, Russia

LPAR'94, Kiev, Ukraine, aboard the ship "Marshal Koshevoi"

LPAR'99, Tbilisi, Republic of Georgia

LPAR 2000, Reunion Island, France

Table of Contents

Session 1. Invited Talk

Monodic Fragments of First-Order Temporal Logics: 2000–2001 A.D.	1
<i>Ian Hodkinson, Frank Wolter, and Michael Zakharyashev</i>	

Session 2. Verification

On Bounded Specifications	24
<i>Orna Kupferman and Moshe Y. Vardi</i>	
Improving Automata Generation for Linear Temporal Logic by Considering the Automaton Hierarchy	39
<i>Klaus Schneider</i>	
Local Temporal Logic Is Expressively Complete for Cograph Dependence Alphabets	55
<i>Volker Diekert and Paul Gastin</i>	

Session 3. Guarded Logics

Games and Model Checking for Guarded Logics	70
<i>Dietmar Berwanger and Erich Grädel</i>	
Computational Space Efficiency and Minimal Model Generation for Guarded Formulae	85
<i>Lilia Georgieva, Ullrich Hustadt, and Renate A. Schmidt</i>	

Session 4. Agents

Logical Omniscience and the Cost of Deliberation	100
<i>Natasha Alechina and Brian Logan</i>	
Local Conditional High-Level Robot Programs	110
<i>Sebastian Sardiña</i>	
A Refinement Theory That Supports Reasoning about Knowledge and Time for Synchronous Agents	125
<i>Kai Engelhardt, Ron van der Meyden, and Yoram Moses</i>	

Session 5. Automated Theorem Proving

Proof and Model Generation with Disconnection Tableaux	142
<i>Reinhold Letz and Gernot Stenz</i>	
Counting the Number of Equivalent Binary Resolution Proofs	157
<i>Joseph D. Horton</i>	

Session 6. Automated Theorem Proving

Splitting through New Proposition Symbols	172
<i>Hans de Nivelle</i>	

Complexity of Linear Standard Theories	186
<i>Christopher Lynch and Barbara Morawska</i>	

Herbrand's Theorem for Prenex Gödel Logic and Its Consequences for Theorem Proving	201
<i>Matthias Baaz, Agata Ciabattoni, and Christian G. Fermüller</i>	

Session 7. Non-classical Logics

Unification in a Description Logic with Transitive Closure of Roles	217
<i>Franz Baader and Ralf Küsters</i>	

Intuitionistic Multiplicative Proof Nets as Models of Directed Acyclic Graph Descriptions	233
<i>Guy Perrier</i>	

Session 8. Types

Coherence and Transitivity in Coercive Subtyping	249
<i>Yong Luo and Zhaohui Luo</i>	

A Type-Theoretic Approach to Induction with Higher-Order Encodings	266
<i>Carsten Schürmann</i>	

Analysis of Polymorphically Typed Logic Programs Using ACI-Unification	282
<i>Jan-Georg Smaus</i>	

Session 9. Experimental Papers

Model Generation with Boolean Constraints	299
<i>Miyuki Koshimura, Hiroshi Fujita, and Ryuzo Hasegawa</i>	

First-Order Atom Definitions Extended	309
<i>Bijan Afshordel, Thomas Hillenbrand, and Christoph Weidenbach</i>	

Automated Proof Support for Interval Logics	320
<i>Thomas Marthedal Rasmussen</i>	

Session 10. Foundations of Logic

The Functions Provable by First Order Abstraction	330
<i>Daniel Leivant</i>	

A Local System for Classical Logic	347
<i>Kai Brännler and Alwen Fernanto Tiu</i>	

Session 11. CSP and SAT

Partial Implicit Unfolding in the Davis-Putnam Procedure for Quantified Boolean Formulae	362
<i>Jussi Rintanen</i>	

Permutation Problems and Channelling Constraints	377
<i>Toby Walsh</i>	

Simplifying Binary Propositional Theories into Connected Components Twice as Fast	392
<i>Alvaro del Val</i>	

Session 12. Non-monotonic Reasoning

Reasoning about Evolving Nonmonotonic Knowledge Bases	407
<i>Thomas Eiter, Michael Fink, Giuliana Sabbatini, and Hans Tompits</i>	

Efficient Computation of the Well-Founded Model Using Update Propagation	422
<i>Andreas Behrend</i>	

Session 13. Semantics

Indexed Categories and Bottom-Up Semantics of Logic Programs	438
<i>Gianluca Amato and James Lipton</i>	

Functional Logic Programming with Failure: A Set-Oriented View	455
<i>F.J. López-Fraguas and J. Sánchez-Hernández</i>	

Operational Semantics for Fixed-Point Logics on Constraint Databases ...	470
<i>Stephan Kreutzer</i>	

Session 14. Experimental Papers

Efficient Negation Using Abstract Interpretation	485
<i>Susana Muñoz, Juan José Moreno, and Manuel Hermenegildo</i>	
Certifying Synchrony for Free	495
<i>Sylvain Boulmé and Grégoire Hamon</i>	
A Computer Environment for Writing Ordinary Mathematical Proofs	507
<i>David McMath, Marianna Rozenfeld, and Richard Sommer</i>	

Session 15. Termination

On Termination of Meta-programs	517
<i>Alexander Serebrenik and Danny De Schreye</i>	
A Monotonic Higher-Order Semantic Path Ordering	531
<i>Cristina Borralleras and Albert Rubio</i>	

Session 16. Knowledge-Based Systems

The Elog Web Extraction Language	548
<i>Robert Baumgartner, Sergio Flesca, and Georg Gottlob</i>	
Census Data Repair: A Challenging Application of Disjunctive Logic Programming	561
<i>Enrico Franconi, Antonio Laureti Palma, Nicola Leone, Simona Perri, and Francesco Scarcello</i>	

Session 17. Analysis of Logic Programs

Boolean Functions for Finite-Tree Dependencies	579
<i>Roberto Bagnara, Enea Zaffanella, Roberta Gori, and Patricia M. Hill</i>	
How to Transform an Analyzer into a Verifier	595
<i>Marco Comini, Roberta Gori, and Giorgio Levi</i>	
Andorra Model Revised: Introducing Nested Domain Variables and a Targeted Search	610
<i>Rong Yang and Steve Gregory</i>	

Session 18. Databases and Knowledge Bases

Coherent Composition of Distributed Knowledge-Bases through Abduction	624
<i>Ofer Arieli, Bert Van Nuffelen, Marc Denecker, and Maurice Bruynooghe</i>	
Tableaux for Reasoning about Atomic Updates	639
<i>Christian G. Fermüller, Georg Moser, and Richard Zach</i>	

Session 19. Termination

Inference of Termination Conditions for Numerical Loops in Prolog	654
<i>Alexander Serebrenik and Danny De Schreye</i>	
Termination of Rewriting with Strategy Annotations	669
<i>Salvador Lucas</i>	
Inferring Termination Conditions for Logic Programs Using Backwards Analysis	685
<i>Samir Genaim and Michael Codish</i>	

Session 20. Program Analysis and Proof Planning

Reachability Analysis of Term Rewriting Systems with Timbuk	695
<i>Thomas Genet and Valérie Viet Triem Tong</i>	
Binding-Time Annotations without Binding-Time Analysis	707
<i>Wim Vanhoof and Maurice Bruynooghe</i>	
Concept Formation via Proof Planning Failure	723
<i>Raúl Monroy</i>	

Author Index	737
-------------------------------	------------