

Lecture Notes in Computer Science

1702

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

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

Gopalan Nadathur (Ed.)

Principles and Practice of Declarative Programming

International Conference, PPDP'99
Paris, France, September, 29 - October 1, 1999
Proceedings

Series Editors

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

Volume Editor

Gopalan Nadathur
The University of Chicago, Department of Computer Science
1100 East 58th Street, Chicago, IL 60637, USA
E-mail: gopalan@cs.uchicago.edu

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Principles and practice of declarative programming : proceedings /
International Conference PPDP '99, Paris, France, September, 29 -
October 1, 1999. Gopalan Nadathur (ed.). - Berlin ; Heidelberg ; New
York ; Barcelona ; Hong Kong ; London ; Milan ; Paris ; Singapore ;
Tokyo : Springer, 1999
(Lecture notes in computer science ; Vol. 1702)
ISBN 3-540-66540-4

CR Subject Classification (1998): D.3, D.1, F.3

ISSN 0302-9743

ISBN 3-540-66540-4 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 1999
Printed in Germany

Typesetting: Camera-ready by author
SPIN: 10704567 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Preface

This volume contains the papers presented at the 1999 International Conference on Principles and Practice of Declarative Programming (PPDP'99) held in Paris from September 29 through October 1, 1999. PPDP'99 participated, together with the International Conference on Functional Programming (ICFP) and several related workshops, in a federation of colloquia known as Principles, Logics and Implementations of high-level programming languages (PLI'99). The overall event was organized by the Institut National de Recherche en Informatique et en Automatique (INRIA) and the ACM Special Interest Group for Programming Languages (ACM/SIGPLAN).

PPDP represents the union of two conferences that had been in existence for about a decade: Programming Languages, Implementations, Logics and Programs (PLILP) and Algebraic and Logic Programming (ALP). These conferences were held as one for the first time under the name PLILP/ALP in their tenth and seventh respective incarnations last year. The present rendition follows a decision by the combined steering committees to adopt a simpler name for the conference that also reflected the union. Continuing the tradition of PLILP/ALP, PPDP aims to stimulate research in the use of declarative methods in programming and on the design, application, and implementation of programming languages that support such methods. Topics of interest include the use of type theory, logics, and logical methods in understanding, defining, integrating, and extending programming paradigms such as those for functional, logic, object-oriented, constraint, and concurrent programming; support for modularity; the use of logics in the design of program development tools; development of implementation methods; and the application of the relevant paradigms and associated methods in industry and education. Many of these themes are reflected in the papers appearing in the present collection. Of particular note in these proceedings is the broad interpretation of declarative programming and the emphasis on both principles and practice in this area of research.

A few words about the selection of papers. Fifty-one full-length papers were received in response to the call for submissions. Each of these papers was reviewed by at least four individuals. The program committee met electronically in the last two weeks of April 1999 and, based on the reviews, selected 22 papers for presentation at the conference. A decision was also made during this meeting to include invited talks by Georges Gonthier (INRIA-Rocquencourt, France), Simon Peyton Jones (Microsoft Research, UK) and Pascal van Hentenryck (Catholic University of Louvain, Belgium), and tutorials by Chris Okasaki (Columbia University, USA) and Frank Pfenning (Carnegie Mellon University, USA) in the scientific program. These proceedings include all 22 contributed papers that were accepted, revised in accordance with the suggestions of the reviewers. Also included are papers that complement the presentations of Simon Peyton Jones and Pascal van Hentenryck and an abstract of the tutorial by

Frank Pfenning. Papers accompanying the remaining invited talk and tutorial were not received by the time of going to press.

Many people and institutions are to be acknowledged for their contributions to PPDP'99. The organization of this conference and PLI'99 would not have been possible but for the efforts of François Fages and Didier Rémy, the chairs of PPDP'99 and ICFP'99, and Annick Theis-Viemont and the INRIA staff. The quality of the technical program owes much to the diligence of the program committee members and the several referees whose help they enlisted. In addition to providing careful reviews of submitted papers, many of these individuals participated in extended discussions at the PC meeting towards ensuring consistency and accuracy in the selection process. At a financial level, PPDP'99 benefitted from a grant from the European Commission program for Training and Mobility of Researchers; this grant was mediated by the European Association for Programming Languages and Systems (EAPLS). Additional financial support was provided by the Centre National de la Recherche Scientifique (CNRS), Compu-logNet, Microsoft Research, Ministère de l'Education Nationale, de la Recherche et de la Technologie (Gouv. France), Trusted Logic, and France Telecom. Finally, the meeting received an endorsement from the Association for Logic Programming.

July 1999

Gopalan Nadathur

Conference Organization

Conference Chair

François Fages, CNRS, ENS, Paris, France

Program Chair

Gopalan Nadathur, University of Chicago, USA

Program Committee

Martín Abadi	System Research Center, Compaq, Palo Alto, USA
Maria Alpuente	Universidad Politécnica de Valencia, Spain
Mats Carlsson	SICS, Sweden
Iliano Cervesato	Stanford University, USA
Bart Demoen	Katholieke Universiteit Leuven, Belgium
Sandro Etalle	Universiteit Maastricht, The Netherlands
François Fages	CNRS, ENS, Paris, France
Manuel Hermenegildo	Universidad Politécnica de Madrid, Spain
Patricia Hill	University of Leeds, UK
Joxan Jaffar	National University of Singapore, Singapore
Bharat Jayaraman	SUNY Buffalo, USA
Xavier Leroy	INRIA, Rocquencourt, France
Pierre Lescanne	ENS Lyon, France
Eugenio Moggi	University of Genova, Italy
Gopalan Nadathur	University of Chicago, USA
Tobias Nipkow	Technische Universität München, Germany)
Francesca Rossi	University of Padova, Italy
Harald Søndergaard	University of Melbourne, Australia
David S. Warren	SUNY Stony Brook, USA
Nobuko Yoshida	University of Sussex, UK

List of Referees

The following individuals and a few others who wished to remain anonymous have participated in the assessment of the manuscripts submitted to the conference:

Martín Abadi	Martin Henz	Frédéric Prost
Elvira Albert	Manuel Hermenegildo	Germán Puebla
Maria Alpuente	Angel Herranz	María José Ramírez
Roberto Bagnara	Carlos Herrero	Rafael Ramirez
Richard Banach	Patricia Hill	Gianna Reggio
Françoise Bellegarde	Kohei Honda	Pedro Resende
Zine-El-Abidine Benaïssa	Zhenjiang Hu	Christophe Ringeissen
Brandon Bennett	Joxan Jaffar	Francesca Rossi
Nick Benton	Gerda Janssens	Salvatore Ruggieri
Roberto Bruni	Bharat Jayaraman	Claudio Vittorio Russo
Maurice Bruynooghe	Wolfram Kahl	Konstantinos Sagonas
Francisco Bueno	Antonios Kakas	David Sands
Daniel Cabeza	Andy King	Ralf Schweimeier
Mats Carlsson	Shinji Kono	Bernhard Schätz
Manuel Carro	Per Kreuger	Laura Semini
Iliano Cervesato	Frédéric Lang	Manuel Serrano
Michael Codish	Xavier Leroy	Peter Sewell
Vítor Santos Costa	Pierre Lescanne	Konrad Slind
Baoqiu Cui	Francesca Levi	Jan-Georg Smaus
Rowan Davies	Mark D. Lillibridge	Sylvain Soliman
Danny De Schreye	Luigi Liquori	Zoltan Somogyi
Pierpaolo Degano	Pedro López-García	Harald Søndergaard
Giorgio Delzanno	Salvador Lucas	Fausto Spoto
Bart Demoen	Luc Maranget	Leon Sterling
Marc Denecker	Julio Mariño	Christopher A. Stone
Rachid Echahed	Kim Marriott	Peter Stuckey
Jesper Eskilsson	Michel Mauny	Péter Szeredi
Sandro Etalle	Guy McCusker	Walid Taha
François Fages	Aart Middeldorp	Vincent Tam
Moreno Falaschi	Dale Miller	Hélène Touzet
Antonio J. Fernandez	Eugenio Moggi	Henk Vandecasteele
Maribel Fernández	Eric Monfroy	Wim Vanhoof
G. Ferrari	Juan José Moreno-Navarro	Femke van Raamsdonk
Cormac Flanagan	Gines Moreno-Valverde	Sofie Verbaeten
Matthew Flatt	Gopalan Nadathur	German Vidal
Cedric Fournet	Wolfgang Naraschewski	David S. Warren
Fabio Gadducci	Tobias Nipkow	Markus Wenzel
María García de la Banda	Michael J. O'Donnell	Benjamin Werner
Simon Gay	Hitoshi Ohsaki	Roland Yap
Vincente Gisbert	Mehmet Orgun	Nobuko Yoshida
Michael Hanus	Catuscia Palamidessi	Zhang Yuanlin
Andrew Heaton	Benjamin C. Pierce	Hans Zantema
Nevin Heintze	Enrico Pontelli	

Table of Contents

C--: A Portable Assembly Language that Supports Garbage Collection	1
<i>Simon Peyton Jones, Norman Ramsey and Fermin Reig</i>	
On Formalised Proofs of Termination of Recursive Functions	29
<i>Fairouz Kamareddine and François Monin</i>	
Argument Filtering Transformation	47
<i>Keiichirou Kusakari, Masaki Nakamura and Yoshihito Toyama</i>	
A Primitive Calculus for Module Systems	62
<i>Davide Ancona and Elena Zucca</i>	
Non-dependent Types for Standard ML Modules	80
<i>Claudio V. Russo</i>	
Constraint Programming in OPL	98
<i>P. Van Hentenryck, L. Michel, L. Perron and J.-C. Régin</i>	
Compiling Constraint Handling Rules into Prolog with Attributed Variables	117
<i>Christian Holzbaur and Thom Frühwirth</i>	
Parallel Execution Models for Constraint Programming over Finite Domains	134
<i>Alvaro Ruiz-Andino, Lourdes Araujo, Fernando Sáenz and José Ruz</i>	
Functional Plus Logic Programming with Built-In and Symbolic Constraints	152
<i>P. Arenas-Sánchez, F.J. López-Fraguas and M. Rodríguez-Artalejo</i>	
A Calculus for Interaction Nets	170
<i>Maribel Fernández and Ian Mackie</i>	
Distributed Programming in a Multi-Paradigm Declarative Language	188
<i>Michael Hanus</i>	
Logical and Meta-Logical Frameworks (Abstract)	206
<i>Frank Pfenning</i>	
A Simple and General Method for Integrating Abstract Interpretation in SICStus	207
<i>Dante Baldan, Nicola Cívrán, Gilberto Filé and Francesco Pulvirenti</i>	
Run Time Type Information in Mercury	224
<i>Tyson Dowd, Zoltan Somogyi, Fergus Henderson, Thomas Conway and David Jeffery</i>	

A Virtual Machine for a Process Calculus	244
<i>Luís Lopes, Fernando Silva and Vasco T. Vasconcelos</i>	
Optimising Bytecode Emulation for Prolog	261
<i>Vítor Santos Costa</i>	
OPENLOG: A Logic Programming Language Based on Abduction	278
<i>Jacinto A. Dávila</i>	
An Operational Semantics of Starlog	294
<i>Lunjin Lu and John G. Cleary</i>	
On the Verification of Finite Failure	311
<i>Roberta Gori and Giorgio Levi</i>	
Localizing and Explaining Reasons for Non-terminating Logic Programs with Failure-Slices	328
<i>Ulrich Neumerkel and Fred Mesnard</i>	
Modular Termination Proofs for Prolog with Tabling	342
<i>Sofie Verbaeten, Konstantinos Sagonas and Danny De Schreye</i>	
Declarative Program Transformation: A Deforestation Case-Study	360
<i>Loïc Correnson, Etienne Duris, Didier Parigiot and Gilles Roussel</i>	
A Semantic Account of Type-Directed Partial Evaluation	378
<i>Andrzej Filinski</i>	
A Parameterized Unfold/Fold Transformation Framework for Definite Logic Programs	396
<i>Abhik Roychoudhury, K. Narayan Kumar, C.R. Ramakrishnan and I.V. Ramakrishnan</i>	
Widening Sharing	414
<i>Enea Zaffanella, Roberto Bagnara and Patricia M. Hill</i>	
Author Index	433