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Covers the theory, applications, theoretical possibilities and implementation issues that represent the material in Prolog.

The Tenth International Conference on Logic Programming, sponsored by the Association for Logic Programming, is a major forum for presentations of research, applications, and implementations in this important area of computer science. Logic programming is one of the most promising steps toward declarative programming and forms the theoretical basis of the programming language Prolog and its various extensions. Logic programming is also fundamental to work in artificial intelligence, where it has been used for nonmonotonic and commonsense reasoning, expert systems implementation, deductive databases, and applications such as computer-aided manufacturing. David S. Warren is Professor of Computer Science at the State University of New York, Stony Brook. Topics covered: Theory and Foundations. Programming Methodologies and Tools. Meta and Higher-order Programming. Parallelism. Concurrency. Deductive Databases. Implementations and Architectures. Applications. Artificial Intelligence. Constraints. Partial Deduction. Bottom-Up Evaluation. Compilation Techniques.

The refereed proceedings of the 10th International Symposium on Static Analysis, SAS 2003, held in San Diego, CA, USA in June 2003 as part of FCRC 2003. The 25 revised full papers presented together with two invited contributions were carefully reviewed and selected from 82 submissions. The papers are organized in topical sections on static analysis of object-oriented languages, static analysis of concurrent languages, static analysis of functional languages, static analysis of procedural languages, static data analysis, static linear relation analysis, static analysis based program transformation, and static heap analysis. This volume constitutes the proceedings of the 6th International Symposium on Programming Language Implementation and Logic Programming (PLILP '94), held in Madrid, Spain in September 1994. The volume contains 27 full research papers selected from 67 submissions as well as abstracts of full versions of 3 invited talks by renowned researchers and abstracts of 11 system demonstrations and poster presentations. Among the topics covered are parallelism and concurrency; implementation techniques; partial evaluation, synthesis, and language issues; constraint programming; meta-programming and program transformation; functional-logic programming; and program analysis and abstract interpretation.

Logic Programming is a style of programming in which programs take the form of sets of sentences in the language of Symbolic Logic. Over the years, there has been growing interest in Logic Programming due to applications in deductive databases, automated worksheets, Enterprise Management (business rules), Computational Law, and General Game Playing. This book introduces Logic Programming theory, current technology, and popular applications. In this

volume, we take an innovative, model-theoretic approach to logic programming. We begin with the fundamental notion of datasets, i.e., sets of ground atoms. Given this fundamental notion, we introduce views, i.e., virtual relations; and we define classical logic programs as sets of view definitions, written using traditional Prolog-like notation but with semantics given in terms of datasets rather than implementation. We then introduce actions, i.e., additions and deletions of ground atoms; and we define dynamic logic programs as sets of action definitions. In addition to the printed book, there is an online version of the text with an interpreter and a compiler for the language used in the text and an integrated development environment for use in developing and deploying practical logic programs. "This is a book for the 21st century: presenting an elegant and innovative perspective on logic programming. Unlike other texts, it takes datasets as a fundamental notion, thereby bridging the gap between programming languages and knowledge representation languages; and it treats updates on an equal footing with datasets, leading to a sound and practical treatment of action and change." - Bob Kowalski, Professor Emeritus, Imperial College London "In a world where Deep Learning and Python are the talk of the day, this book is a remarkable development. It introduces the reader to the fundamentals of traditional Logic Programming and makes clear the benefits of using the technology to create runnable specifications for complex systems." - Son Cao Tran, Professor in Computer Science, New Mexico State University "Excellent introduction to the fundamentals of Logic Programming. The book is well-written and well-structured. Concepts are explained clearly and the gradually increasing complexity of exercises makes it so that one can understand easy notions quickly before moving on to more difficult ideas." - George Younger, student, Stanford University

This volume contains the proceedings of LPAR '92, the international conference on logic programming and automated reasoning held in St. Petersburg in July 1992. The aim of the conference was to bring together researchers from the Russian and the international logic programming and theorem proving communities. The topics of interest covered by papers in the volume include automated theorem proving, non-monotonic reasoning, applications of mathematical logic to computer science, deductive databases, implementation of declarative concepts, and programming in non-classical logics. LPAR '92 is the successor of the First and Second Russian Conferences on Logic Programming held in 1990 and 1991, respectively, the proceedings of which were published in LNAI Vol. 592.

This two-volume set LNCS 9094 and LNCS 9095 constitutes the thoroughly refereed proceedings of the 13th International Work-Conference on Artificial Neural Networks, IWANN 2015, held in Palma de Mallorca, Spain, in June 2013. The 99 revised full papers presented together with 1 invited talk were carefully reviewed and selected from 195 submissions. The papers are organized in topical sections on brain-computer interfaces: applications and tele-services;

multi-robot systems; applications and theory (MRSAT); video and image processing; transfer learning; structures, algorithms and methods in artificial intelligence; interactive and cognitive environments; mathematical and theoretical methods in fuzzy systems; pattern recognition; embedded intelligent systems; expert systems; advances in computational intelligence; and applications of computational intelligence.

This volume contains extended versions of papers presented at the Third International Workshop on Logic Program Synthesis and Transformation (LOPSTR 93) held in Louvain-la-Neuve in July 1993. Much of the success of the workshop is due to Yves Deville who served as Organizer and Chair. Many people believe that machine support for the development and evolution of software will play a critical role in future software engineering environments. Machine support requires the formalization of the artifacts and processes that arise during the software lifecycle. Logic languages are unique in providing a uniform declarative notation for precisely describing application domains, software requirements, and for prescribing behavior via logic programs. Program synthesis and transformation techniques formalize the process of developing correct and efficient programs from requirement specifications. The natural intersection of these two fields of research has been the focus of the LOPSTR workshops. The papers in this volume address many aspects of software development including: deductive synthesis, inductive synthesis, transformations for optimizing programs and exploiting parallelism, program analysis techniques (particularly via abstract interpretation), meta programming languages and tool support, and various extensions to Prolog-like languages, admitting non-Horn clauses, functions, and constraints. Despite the progress represented in this volume, the transition from laboratory to practice is fraught with difficulties.

Content Description #Includes bibliographical references and index.

P-Prolog is put forward as an alternative proposal to the difficulties faced in the main research areas of parallel logic programmings, which have been studied. P-Prolog provides the advantages of guarded Horn clauses while retaining don't know non-determinism where required. This monograph presents also an or-tree model and an implementation scheme for it, to combine and- and or- parallelism with reasonable efficiency. The model and implementation scheme discussed can be applied to P-Prolog and other parallel logic languages.

Includes tutorials, lectures, and refereed papers on all aspects of logic programming, including theoretical foundations, constraints, concurrency and parallelism, deductive databases, language design and implementation, nonmonotonic reasoning, and logic programming and the Internet. The International Conference on Logic Programming, sponsored by the Association for Logic Programming, includes tutorials, lectures, and refereed papers on all aspects of logic programming, including theoretical foundations, constraints, concurrency and parallelism, deductive databases, language design and implementation, nonmonotonic reasoning, and logic programming and the Internet.

This volume contains the proceedings of the 19th International Conference on Logic Programming, ICLP 2003, which was held at the Tata Institute of Fundamental Research in Mumbai, India, during 9-13 December, 2003. ICLP 2003 was colocated with the 8th Asian Computing Science Conference, ASIAN 2003, and was followed by the 23rd Conference on Foundations of Software Technology and Theoretical

Computer Science, FSTTCS 2003. The latter event was hosted by the Indian Institute of Technology in Mumbai. In addition, there were several satellite workshops associated with ICLP 2003: - PPSWR 2003, Principles and Practice of Semantic Web Reasoning, 8th Dec. 2003, organized by François Bry, Nicola Henze, and Jan Maluszynski. - COLOPS 2003, Constraint & Logic Programming in Security, 8th Dec. 2003, organized by Martin Leucker, Justin Pearson, Fred Spiessens, and Frank D. Valencia. - WLPE 2003, Workshop on Logic Programming Environments, organized by Alexander Serebrenik and Fred Mesnard. - CICLOPS2003, Implementation of Constraint and Logic Programming Systems, 14th Dec. 2003, organized by Michel Ferreira and Ricardo Lopes. - SVV 2003, Software Verification and Validation, 14th Dec. 2003, organized by Sandro Etalle, Supratik Mukhopadhyay, and Abhik Roychoudhury.

This book contains the post-conference proceedings of the 17th International Conference on Inductive Logic Programming. It covers current topics in inductive logic programming, from theoretical and methodological issues to advanced applications.

Algebraic and Logic Programming 4th International Conference, ALP '94, Madrid, Spain, September 14-16, 1994. Proceedings Springer Science & Business Media

This book constitutes the proceedings of the 15th International Symposium on Functional and Logic Programming, FLOPS 2020, held in Akita, Japan*, in September 2020. The 12 papers presented in this volume were carefully reviewed and selected from 25 submissions. They cover all aspects of the design, semantics, theory, applications, implementations, and teaching of declarative programming focusing on topics such as functional programming, logic programming, declarative programming, constraint programming, formal method, model checking, program transformation, program refinement, and type theory. *The conference was held virtually due to the COVID-19 pandemic.

This book constitutes the refereed proceedings of the 11th European Conference on Logics in Artificial Intelligence, JELIA 2008, held in Dresden, Germany, Liverpool, in September/October 2008. The 32 revised full papers presented together with 2 invited talks were carefully reviewed and selected from 98 submissions. The papers cover a broad range of topics including belief revision, description logics, non-monotonic reasoning, multi-agent systems, probabilistic logic, and temporal logic.

This book constitutes the thoroughly refereed post-conference proceedings of the 16th International Conference on Logic for Programming, Artificial Intelligence, and Reasoning, LPAR 2010, which took place in Dakar, Senegal, in April/May 2010. The 27 revised full papers and 9 revised short papers presented together with 1 invited talk were carefully reviewed and selected from 47 submissions. The papers address all current issues in automated reasoning, computational logic, programming languages and deal with logic programming, logic-based program manipulation, formal methods, and various kinds of AI logics. Subjects covered range from theoretical aspects to various applications such as automata, linear arithmetic, verification, knowledge representation, proof theory, quantified constraints, as well as modal and temporal logics.

The International Logic Programming Symposium is one of two major international conferences sponsored by the Association of Logic Programming. Both conferences are held annually. The theme for the 1995 conference was "Declarative Systems", particularly the integration of the logic programming, functional programming, and object-oriented programming paradigms.

Persistent object systems are systems which support the creation and manipulation of objects in a uniform manner, regardless of how long they persist. This is in direct

contrast with conventional systems where temporary objects are created and manipulated using one mechanism (typically programming language data structures) and permanent objects are maintained using a different mechanism (usually a filestore). The unification of temporary and permanent objects yields systems which are smaller and more efficient than conventional systems and which provide a powerful and flexible platform for the development of large, data intensive applications. This volume presents the proceedings of a workshop at which latest research in this area was discussed. The papers are grouped into sections on the following topics: type systems and persistence, persistent programming languages, implementing persistence, object stores, measurement of persistent systems, transactions and persistence, and persistent machines.

This book constitutes the thoroughly refereed post-proceedings of the 12th International Workshop on Logic Based Program Synthesis and Transformation, LOPSTR 2002, held in Madrid, Spain in September 2002. The 15 revised full papers presented together with 7 abstracts were carefully selected during two rounds of reviewing and revision from 40 submissions. The papers are organized in topical sections on debugging and types, tabling and constraints, abstract interpretation, program refinement, verification, partial evaluation, and rewriting and object-oriented development.

Topics covered: Theoretical Foundations. Higher-Order Logics. Non-Monotonic Reasoning. Programming Methodology. Programming Environments. Extensions to Logic Programming. Constraint Satisfaction. Meta-Programming. Language Design and Constructs. Implementation of Logic Programming Languages. Compilation Techniques. Architectures. Parallelism. Reasoning about Programs. Deductive Databases. Applications. 13-16 June 1995, Tokyo, Japan ICLP, which is sponsored by the Association for Logic Programming, is one of two major annual international conferences reporting recent research results in logic programming. Logic programming originates from the discovery that a subset of predicate logic could be given a procedural interpretation which was first embodied in the programming language, Prolog. The unique features of logic programming make it appealing for numerous applications in artificial intelligence, computer-aided design and verification, databases, and operations research, and for exploring parallel and concurrent computing. The last two decades have witnessed substantial developments in this field from its foundation to implementation, applications, and the exploration of new language designs. Topics covered: Theoretical Foundations. Higher-Order Logics. Non-Monotonic Reasoning. Programming Methodology. Programming Environments. Extensions to Logic Programming. Constraint Satisfaction. Meta-Programming. Language Design and Constructs. Implementation of Logic Programming Languages. Compilation Techniques. Architectures. Parallelism. Reasoning about Programs. Deductive Databases. Applications. Logic Programming series, Research Reports and Notes

The functional logic programming paradigm combines the two most important fields of declarative programming, namely functional and logic programming, in an integrated way to allow the concise notation of high-level programs. However, the variety of concepts and conciseness of programs may also impact their efficiency. In this work we employ the powerful optimization technique of partial evaluation to develop a fully automatic program optimizer, the so-called partial evaluator. In particular, we formalize

the normalization of programs during compilation, establish a formal notation of the evaluation process, develop a formal partial evaluation scheme and prove its correctness and termination, and implement a working partial evaluator which shows impressive results.

This book contains the refereed proceedings of the 23rd International Conference on Logic Programming, ICLP 2007, held in Porto, Portugal. The 22 revised full papers together with two invited talks, 15 poster presentations, and the abstracts of five doctoral consortium articles cover all issues of current research in logic programming, including theory, functional and constraint logic programming, program analysis, answer-set programming, semantics, and applications.

This book constitutes the refereed proceedings of the 5th International Symposium on Rules, RuleML 2011 - Europe, held in Barcelona, Spain, in July 2011 - collocated with the 22nd International Joint Conference on Artificial Intelligence, IJCAI 2011. It is the first of two RuleML events that take place in 2011. The second RuleML Symposium - RuleML 2011 - America - will be held in Fort Lauderdale, FL, USA, in November 2011. The 18 revised full papers, 8 revised short papers and 3 invited track papers presented together with the abstracts of 2 keynote talks were carefully reviewed and selected from 58 submissions. The papers are organized in the following topical sections: rule-based distributed/multi-agent systems; rules, agents and norms; rule-based event processing and reaction rules; fuzzy rules and uncertainty; rules and the semantic Web; rule learning and extraction; rules and reasoning; and rule-based applications.

This volume constitutes the proceedings of the Fourth International Conference on Algebraic and Logic Programming (ALP '94), held in Madrid, Spain in September 1994. Like the predecessor conferences in this series, ALP '94 succeeded in strengthening the cross-fertilization between algebraic techniques and logic programming. Besides abstracts of three invited talks, the volume contains 17 full revised papers selected from 41 submissions; the papers are organized into sections on theorem proving, narrowing, logic programming, term rewriting, and higher-order programming.

This book constitutes the strictly refereed post-workshop proceedings of the Sixth International Workshop on Logic Program Synthesis and Transformation, LOPSTR'96, held on board a ship sailing from Stockholm to Helsinki, in August 1996. The 17 revised full papers were carefully selected from a total of initially 27 submissions. The topics covered range over the areas of synthesis of programs from specifications, verification, transformation, specialization, and analysis of programs, and the use of program schemata in program development.

This volume contains the refereed proceedings of the 13th International Conference on Logic Programming and Nonmonotonic Reasoning, LPNMR 2015, held in September 2015 in Lexington, KY, USA. The 290 long and 11 short papers presented together with 3 invited talks, the paper reporting on the Answer Set Programming competition, and four papers presented by LPNMR student attendees at the doctoral consortium were carefully reviewed and selected from 60 submissions. LPNMR is a forum for exchanging ideas on declarative logic programming, nonmonotonic reasoning, and knowledge representation. The aim of the LPNMR conferences is to facilitate interactions between researchers interested in the design and implementation of logic-based programming languages and database systems, and researchers who work in the areas of knowledge representation and nonmonotonic reasoning.

By presenting state-of-the-art aspects of the theory of computation, this book commemorates the 60th birthday of Neil D. Jones, whose scientific career parallels the evolution of computation theory itself. The 20 reviewed research papers presented together with a brief survey of the work of Neil D. Jones were written by scientists who have worked with him, in the roles of student, colleague, and, in one case, mentor. In accordance with the Festschrift's subtitle, the papers are organized in parts on computational complexity, program analysis, and program transformation.

This volume contains the refereed proceedings of the 12th International Conference on Logic Programming and Nonmonotonic Reasoning, LPNMR 2013, held in September 2013 in Corunna, Spain. The 34 revised full papers (22 technical papers, 9 application description, and 3 system descriptions) and 19 short papers (11 technical papers, 3 application descriptions, and 5 system descriptions) presented together with 2 invited talks, were carefully reviewed and selected from 91 submissions. Being a forum for exchanging ideas on declarative logic programming, nonmonotonic reasoning, and knowledge representation, the conference aims to facilitate interactions between those researchers and practitioners interested in the design and implementation of logic-based programming languages and database systems, and those who work in the area of knowledge representation and nonmonotonic reasoning.

Inductive logic programming is a new research area formed at the intersection of machine learning and logic programming. While the influence of logic programming has encouraged the development of strong theoretical foundations, this new area is inheriting its experimental orientation from machine learning. Inductive Logic Programming will be an invaluable text for all students of computer science, machine learning and logic programming at an advanced level. * * Examination of the background to current developments within the area * Identification of the various goals and aspirations for the increasing body of researchers in inductive logic programming * Coverage of induction of first order theories, the application of inductive logic programming and discussion of several logic learning programs * Discussion of the applications of inductive logic programming to qualitative modelling, planning and finite element mesh design

This book constitutes the refereed proceedings of the 14th International Conference on Logic Programming and Nonmonotonic Reasoning, LPNMR 2017, held in Espoo, Finland, in July 2017. The 16 full papers and 11 short papers presented in this volume were carefully reviewed and selected from 47 submissions. The book also contains 4 invited talks. The papers were organized in topical sections named: nonmonotonic reasoning; answer set programming; LPNMR systems; and LPNMR applications.

This book constitutes the refereed proceedings of the 5th International Symposium on Functional and Logic Programming, FLOPS 2001, held in Tokyo, Japan in March 2001. The 21 revised full papers presented together with three invited papers were carefully reviewed and selected from 40 submissions. The book offers topical sections on functional programming, logic programming, functional logic programming, types, program analysis and transformation, and Lambda calculus.

The idea of this book grew out of a symposium that was held at Stony Brook in September 2012 in celebration of David S. Warren's fundamental contributions to Computer Science and the area of Logic Programming in particular. Logic Programming (LP) is at the nexus of Knowledge Representation, Artificial Intelligence,

Mathematical Logic, Databases, and Programming Languages. It is fascinating and intellectually stimulating due to the fundamental interplay among theory, systems, and applications brought about by logic. Logic programs are more declarative in the sense that they strive to be logical specifications of "what" to do rather than "how" to do it, and thus they are high-level and easier to understand and maintain. Yet, without being given an actual algorithm, LP systems implement the logical specifications automatically. Several books cover the basics of LP but focus mostly on the Prolog language with its incomplete control strategy and non-logical features. At the same time, there is generally a lack of accessible yet comprehensive collections of articles covering the key aspects in declarative LP. These aspects include, among others, well-founded vs. stable model semantics for negation, constraints, object-oriented LP, updates, probabilistic LP, and evaluation methods, including top-down vs. bottom-up, and tabling. For systems, the situation is even less satisfactory, lacking accessible literature that can help train the new crop of developers, practitioners, and researchers. There are a few guides on Warren's Abstract Machine (WAM), which underlies most implementations of Prolog, but very little exists on what is needed for constructing a state-of-the-art declarative LP inference engine. Contrast this with the literature on, say, Compilers, where one can first study a book on the general principles and algorithms and then dive in the particulars of a specific compiler. Such resources greatly facilitate the ability to start making meaningful contributions quickly. There is also a dearth of articles about systems that support truly declarative languages, especially those that tie into first-order logic, mathematical programming, and constraint solving. LP helps solve challenging problems in a wide range of application areas, but in-depth analysis of their connection with LP language abstractions and LP implementation methods is lacking. Also, rare are surveys of challenging application areas of LP, such as Bioinformatics, Natural Language Processing, Verification, and Planning. The goal of this book is to help fill in the previously mentioned void in the LP literature. It offers a number of overviews on key aspects of LP that are suitable for researchers and practitioners as well as graduate students. The following chapters in theory, systems, and applications of LP are included.

This book constitutes the refereed proceedings of the 5th International Symposium on Static Analysis, SAS'98, held in Pisa, Italy, in September 1998. The 20 revised full papers presented were carefully reviewed and selected from a total of 48 submissions. Also included is an invited tutorial. The papers are organized in topical sections on data-flow analysis, logic programming, concurrency, abstract domains, partial evaluation, type inference, and optimization. The invited tutorial by David Schmidt and Bernhard Steffen is entitled "data-flow analysis as model checking of abstract interpretations". This book celebrates the 25th anniversary of GULP—the Italian Association for Logic Programming. Authored by Italian researchers at the leading edge of their fields, it presents an up-to-date survey of a broad collection of topics in logic programming, making it a useful reference for both researchers and students. During its 25-year existence, GULP has organised a wide range of national and international activities, including both conferences and summer schools. It has been especially active in supporting and encouraging young researchers, by providing scholarships for GULP events and awarding distinguished dissertations.

We in the international logic programming community look upon GULP with a combination of

envy, admiration and gratitude. We are pleased to attend its conferences and summer schools, where we can learn about scientific advances, catch up with old friends and meet young students. It is an honour for me to acknowledge our appreciation to GULP for its outstanding contributions to our field and to express our best wishes for its continuing prosperity in the future.

March 2010 Robert Kowalski Imperial College London

Preface

On June 18, 1985, a group of pioneering researchers, including representatives from industry, national research labs, and academia, attended the constituent assembly of the Group of researchers and Users of Logic Programming (GULP) association. That was the starting point of a long adventure in science, that we are still experiencing 25 years later. This volume celebrates this important event.

Alan Robinson

This set of essays pays tribute to Bob Kowalski on his 60th birthday, an anniversary which gives his friends and colleagues an excuse to celebrate his career as an original thinker, a charismatic communicator, and a forceful intellectual leader. The logic programming community hereby and herein conveys its respect and thanks to him for his pivotal role in creating and fostering the conceptual paradigm which is its *raison d'Être*. The diversity of interests covered here reflects the variety of Bob's concerns. Read on. It is an intellectual feast. Before you begin, permit me to send him a brief personal, but public, message: Bob, how right you were, and how wrong I was. I should explain. When Bob arrived in Edinburgh in 1967 resolution was as yet fairly new, having taken several years to become at all widely known. Research groups to investigate various aspects of resolution sprang up at several institutions, the one organized by Bernard Meltzer at Edinburgh University being among the first. For the half-dozen years that Bob was a leading member of Bernard's group, I was a frequent visitor to it, and I saw a lot of him. We had many discussions about logic, computation, and language. This book constitutes the refereed proceedings of the 13th Symposium on Theoretical Aspects of Computer Science, STACS 96, held in Grenoble, France in February 1996. The 52 revised papers presented were selected from a total of 185 submissions; also included are three invited papers. The volume addresses all current aspects of theoretical computer science and is organized in sections on complexity theory, automata theory, parallel algorithms, learning, parallel and distributed systems, cryptography, logic and database theory, algorithms, semantics and program verification, and communication complexity.

This book constitutes the thoroughly refereed post-conference proceedings of the 18th International Workshop on Functional and Constraint Logic Programming, WFLP 2009, held in Brasilia, Brazil, in June 2009 as part of RDP 2009, the Federated Conference on Rewriting, Deduction, and Programming. The 9 revised full papers presented together with 2 invited papers were carefully reviewed and selected from 14 initial workshop contributions. The papers cover current research in all areas of functional and constraint logic programming including typical areas of interest, such as foundational issues, language design, implementation, transformation and analysis, software engineering, integration of paradigms, and applications.

This book presents the first attempt to combine concurrent logic programming and constraint logic programming. It is divided into three parts. In the first part, a novel computation model, called the multi-Pandora model, which is designed on the basis of the Pandora model, is presented. In the second part, the distributed implementation schemes for Parlog, Pandora, and multi-Pandora are presented. Finally, the author

presents the distributed constraint solvers for finite domain constraints, as well as the distributed constraint solvers in the domains of real numbers and Boolean rings which can be incorporated into the schemes presented in the second part to handle the ?ask?- and ?tell?-constraints.

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