

Constraint Processing The Morgan Kaufmann Series In Artificial Intelligence

This volume contains the papers presented at CP 2009: The 15th International Conference on Principles and Practice of Constraint Programming. It was held from September 20–24, 2009 at the Rectory of the New University of Lisbon, Portugal. Everyone involved with the conference thanks our sponsors for their support. There were 128 submissions to the research track, of which 53 were accepted for a rate of 41.4%. Each submission was reviewed by three reviewers, with a small number of additional reviews obtained in exceptional cases. Each review was either a Programmer Committee member or by a committee member thanks to their particular expertise. Papers submitted as long papers were held to the same high standards of quality as papers. There is thus no distinction in these proceedings between long and short papers, except of course the number of pages they occupy. As it happens, the acceptance rates of short and long papers were very similar indeed. There were 13 submissions to the application track, of which 8 were accepted, for a rate of 61.5%. Papers under the same review process as regular papers, and there was not a separate committee for reviewing application track papers. However, papers in the application track were not required to be original or novel research, but to be original and novel as an application of constraints.

The authors explore and explain current techniques for handling the specialised data that describes geographical phenomena in a study that will be of great value to computer scientists and geographers working with spatial databases.

This book constitutes the refereed conference proceedings of the 23rd International Conference on Principles and Practice of Constraint Programming, CP 2017, held in Melbourne, Australia from August 28, 2017 until September 1, 2017. The conference is colocated with the 20th International Conference on Theory and Applications of Satisfiability Testing (SAT 2017) and the 33rd International Conference on Logic Programming. The 46 revised full papers presented were carefully reviewed and selected from 115 submissions. The scope of the contributions includes all aspects of computing with constraints, including theory, algorithms, environments, languages, models, systems, and applications such as decision making, resource allocation, scheduling, configuration, and planning. The papers are grouped into the following tracks: technical track; application track; machine learning & CP track; operations research & CP track; satisfiability & CP track; test and verification & CP track; journal & sister conference track.

Constraint programming is the fruit of several decades of research carried out in mathematical logic, automated deduction, operations research and artificial intelligence. The tools and programming languages arising from this research have found applications in a wide range of domains such as production planning, communication networks, robotics and bioinformatics. This volume contains the extended and reviewed versions of a selection of papers presented at the Joint ERCIM/CoLogNET International Workshop on Constraint Solving and Constraint Logic Programming (CSCLP2003), which was held from June 30 to July 2, 2003. The venue chosen for the seventh edition of this annual workshop was the Computer and Automation Research Institute of the Hungarian Academy of Sciences (MTA SZTAKI) in Budapest, Hungary. This institute is one of the 20 members of the Working Group on Constraints of the European Research Consortium for Informatics and Mathematics (ERCIM). For many participants this workshop provided the first opportunity to visit their ERCIM partner in Budapest. CoLogNET is the European-funded network of excellence dedicated to supporting and enhancing cooperation and research on all areas of computational logic, and continues the work done previously by the Compulog Net. In particular, the aim of the logic and constraint logic programming area of CoLogNET is to foster and support all research activities related to logic programming and constraint logic programming. The editors would like to take the opportunity and thank all the authors who submitted papers to this volume, as well as the reviewers for their helpful work.

Heuristic Search

Principles and Practice of Constraint Programming

Principles and Practice of Constraint Programming - CP 2004

13th International Conference, CP 2007, Providence, RI, USA, September 25-29, 2007, Proceedings

Principles and Practice of Constraint Programming - CP 2005

16th International Conference, CP 2010, St. Andrews, Scotland, September 6-10, 2010, Proceedings

Principles and Practice of Constraint Programming - CP 2009

The 10th International Conference on the Principles and Practice of Constraint Programming (CP 2003) was held in Toronto, Canada, during September 27 – October 1, 2004. Information about the conference can be found on the Web at <http://ai.uwaterloo.ca/~cp2004/> Constraint programming (CP) is about problem modelling, problem solving, programming, optimization, software engineering, databases, visualization, user interfaces, and anything to do with satisfying complex constraints. It reaches into mathematics, operations research, artificial intelligence, algorithms, complexity, modelling and programming languages, and many aspects of computer science. Moreover, CP is never far from applications, and its successful use in industry and government goes hand in hand with the success of the CP research community. Constraint programming continues to be an exciting and growing research field, as evidenced by the fact that it was the most cited area of research in the proceedings of the 10th International Conference on Principles and Practice of Constraint Programming (CP 2003). This year, from 158 submissions, we chose 46 to be published in full in the proceedings. Instead of selecting one of our best paper, we picked out four ‘distinguished’ papers – though we were tempted to select at least 12 such papers. In addition we included 16 short papers in the proceedings– these were presented as posters at CP 2004. This volume includes summaries of the four invited talks of CP 2004. Two speakers from industry were invited. However these were no ordinary industrial representatives, but two of the leading researchers in the field: Rina Dechter, Director of Parc Technologies, until its recent takeover by Cisco Systems; and Jean Franco, Director of Optimization Technology at ILOG. The other two invited speakers are also big movers and shakers in the research community.

The use of mathematical logic as a formalism for artificial intelligence was recognized by John McCarthy in 1959 in his paper on Programs with Common Sense. In a series of papers in the 1960’s he expanded upon these ideas and continues to do so to this date. It is now 41 years since the idea of using a formal mechanism for AI arose. It is therefore appropriate to consider some of the research, applications and implementations that have resulted from this idea. In early 1995 John McCarthy suggested to me that we have a workshop on Logic-Based Artificial Intelligence (LBAI). In June 1999, the Workshop on Logic-Based Artificial Intelligence was held as a consequence of McCarthy’s suggestion. The workshop came about with the support of Ephraim Glinert of the National Science Foundation (IIS-9520135), the American Association for Artificial Intelligence who provided support for graduate students to attend, and Joseph Jaja, Director of the University of Maryland Institute for Advanced Computer Studies who provided both manpower and financial support, and the Department of Computer Science. We are grateful for their support. This book consists of refereed papers based on presentations made at the Workshop. Not all of the Workshop participants were able to contribute papers for the book. The common theme of papers at the workshop and in this book is the use of logic as a formalism to solve problems in AI.

Constraint satisfaction is a simple but powerful tool. Constraints identify the impossible and reduce the realm of possibilities to effectively focus on the possible, allowing for a natural declarative formulation of what must be satisfied, without expressing how. The field of constraint reasoning has matured over the last three decades with contributions from a diverse community of researchers in artificial intelligence, databases and programming languages, operations research, management science, and applied mathematics. Today, constraint problems are used to model cognitive tasks in vision, language comprehension, default reasoning, diagnosis, scheduling, temporal and spatial reasoning. In Constraint Processing, Rina Dechter, synthesizes these contributions, along with her own significant work, to provide the first comprehensive examination of the theory that underlies constraint processing algorithms. Throughout, she focuses on fundamental tools and principles, emphasizing the representation and analysis of algorithms. Examines the basic practical aspects of each topic and then tackles more advanced issues, including current research challenges. Builds the reader’s understanding with definitions, examples, theory, algorithms and complexity analysis. Synthesizes three decades of researchers work on constraint processing in AI, databases and programming languages, operations research, management science, and applied mathematics.

The 2nd International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems (CPAIOR2005) was held in Prague, Czech Republic, during May 31–June 1, 2005. The conference is intended primarily as a forum to focus on the integration and hybridization of the approaches of constraint programming (CP), artificial intelligence (AI), and operations research (OR) technologies for solving large-scale and complex real-life optimization problems. Therefore, CPAIOR is never far from industrial applications. The high number of submissions received this year, almost 100 papers, in witness to the interest of the research community in this conference. From these submissions, we chose 26 to be published in full in the proceedings.

This volume includes summaries of the invited talks of CPAIOR: one from industry, one from the embedded system research community, and one from the operations research community. The invited speakers were: Filippo Focacci from ILOG S.A., France, one of the leading companies in the field; Paul Pop, professor in the Embedded Systems Lab in the Computer and Information Science - department, Linköping University; and Paul Williams, full professor of Operations Research at the London School of Economics. The day before CPAIOR, a Master Class was organized by Gilles Pesant, whose leading researchers gave introductory and overview talks in the area of metaheuristics and constraint programming. The Master Class was intended for PhD students, researchers, and practitioners. We are very grateful to Gilles who brought this excellent program together. For conference publicity we warmly thank Willem Jan van Hoeve and Petr Váňa who did a great job with the high number of submissions received.

Integration of Constraint Programming, Artificial Intelligence, and Operations Research

Data Mining: Concepts and Techniques

Second International Conference, CPAIOR 2005, Prague, Czech Republic, May 31 -- June 1, 2005

From Parallel Processing to the Internet of Things

Theory and Practice

Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems

Constraint programming is a powerful paradigm for solving combinatorial search problems that draws on a wide range of techniques from artificial intelligence, computer science, databases, programming languages, and operations research. Constraint programming is currently applied with success to many domains, such as scheduling, planning, vehicle routing, configuration, networks, and bioinformatics. The aim of this handbook is to capture the full breadth and depth of the constraint programming field and to be encyclopedic in its scope and coverage. While there are several excellent books on constraint programming, such books necessarily focus on the main notions and techniques and cannot cover also extensions, applications, and languages. The handbook gives a reasonably complete coverage of all these lines of work, based on constraint programming, so that a reader can have a rather precise idea of the whole field and its potential. Of course each line of work is dealt with in a survey-like style, where some details may be neglected in favor of coverage. However, the extensive bibliography of each chapter will help the interested readers to find suitable sources for the missing details. Each chapter of the handbook is intended to be a self-contained survey of a topic, and is written by one or more authors who are leading researchers in the area. The intended audience of the handbook is researchers, graduate students, high-year undergraduates and practitioners who wish to learn about the state-of-the-art in constraint programming. No prior knowledge about the field is necessary to be able to read the chapters and gather useful knowledge.

Researchers from other fields should find in this handbook an effective way to learn about constraint programming and to possibly use some of the constraint programming concepts and techniques in their work, thus providing a means for a fruitful cross-fertilization among different research areas. The handbook is organized in two parts. The first part covers the basic foundations of constraint programming, including the history, the notion of constraint propagation, basic search methods, global constraints, tractability and computational complexity, and important issues in modeling a problem as a constraint problem. The second part covers constraint languages and solver, several useful extensions to the basic framework (such as interval constraints, structured domains, and distributed CSPs), and successful application areas for constraint programming. - Covers the whole field of constraint programming - Survey-style chapters - Five chapters on applications

Constraint Processing Elsevier

Perfectly intelligent programmers often struggle when forced to work with SQL. Why? Joe Celko believes the problem lies with their procedural programming mindset, which keeps them from taking full advantage of the power of declarative languages. The result is overly complex and inefficient code, not to mention lost productivity. This book will change the way you think about the problems you solve with SQL programs..

Focusing on three key table-based techniques, Celko reveals their power through detailed examples and clear explanations. As you master these techniques, you'll find you are able to conceptualize problems as rooted in sets and solvable through declarative programming. Before long, you'll be coding more quickly, writing more efficient code, and applying the full power of SQL. - Filled with the insights of one of the world's leading SQL authorities - noted for his knowledge and his ability to teach what he knows. - Focuses on auxiliary tables (for computing functions and other values by joins), temporal tables (for temporal queries, historical data, and audit information), and virtual tables (for improved performance). - Presents clear guidance for selecting and correctly applying the right table technique.

Constraints are everywhere: most computational problems can be described in terms of restrictions imposed on the set of possible solutions, and constraint programming is a problem-solving technique that works by incorporating those restrictions in a programming environment. It draws on methods from combinatorial optimisation and artificial intelligence, and has been successfully applied in a number of fields from scheduling, computational biology, finance, electrical engineering and operations research through to numerical analysis. This textbook for upper-division students provides a thorough and structured account of the main aspects of constraint programming. The author provides many worked examples that illustrate the usefulness and versatility of this approach to programming, as well as many exercises throughout the book that illustrate techniques, test skills and extend the text. Pointers to current research, extensive historical and bibliographic notes, and a comprehensive list of references will also be valuable to professionals in computer science and artificial intelligence.

Joe Celko's SQL for Smarties

15th International Conference, CP 2009 Lisbon, Portugal, September 20-24, 2009 Proceedings

Handbook of Constraint Programming

Exact Algorithms

Essays Dedicated to Ugo Montanari on the Occasion of His 65th Birthday

Joint ERCIM/CoLogNET International Workshop on Constraint Solving and Constraint Logic Programming, CSCLP 2003, Budapest, Hungary, June 30 - July 2, 2003, Selected Papers

Reasoning with Probabilistic and Deterministic Graphical Models

Real-world problems and modern optimization techniques to solve them Here, a team of international experts brings together core ideas for solving complex problems in optimization across a wide variety of real-world settings, including computer science, engineering, transportation, telecommunications, and bioinformatics. Part One—covers methodologies for complex problem solving including genetic programming, neural networks, genetic algorithms, hybrid evolutionary algorithms, and more. Part Two—delves into applications including DNA sequencing and reconstruction, location of antennae in telecommunication networks, metaheuristics, FPGAs, problems arising in telecommunication networks, image processing, time series prediction, and more. All chapters contain examples that illustrate the applications themselves as well as the actual performance of the algorithms. Optimization Techniques for Solving Complex Problems is a valuable resource for practitioners and researchers who work with optimization in real-world settings.

The 16th Annual International Conference on the Principles and Practice of Constraint Programming (CP 2010) was held in St. Andrews, Scotland, during September 6–10, 2010. We would like to thank our sponsors for their generous support of this event. This conference is concerned with all aspects of computing with constraints, including theory, algorithms, applications, environments, languages, models, and systems. We received a wide variety of submissions, each of which was reviewed by at least three referees. Referees were chosen for each submission by an initial bidding process where Program Committee members chose papers from their area of interest. The range of expertise represented by the large Program Committee meant that almost all submissions were reviewed by subject experts on the Program Committee, or by colleagues chosen by members of the Program Committee for their particular expertise. Papers were solicited either as long (15 page), or short (8 page) submissions. Short-paper submissions were refereed to exactly the same high standards as long-paper submissions but naturally were expected to contain a smaller quantity of new material. Thus there is no distinction in these proceedings between short and long papers. I used the excellent EasyChair conference management system to support this process of reviewing, and for the collation and organization of these proceedings. Submissions were made either to the applications track or to the research track. There were 101 (23 short) research track submissions of which 36 (8 short) were accepted, which is a 36% (35% of short) acceptance rate. Application track submissions received special consideration and the acceptance rate was significantly higher than for the research track.

An industry consultant shares his most useful tips and tricks for advanced SQL programming to help the working programmer gain performance and work around system deficiencies.

Research has been vital to artificial intelligence from the very beginning as a core technique in problem solving. The authors present a thorough overview of heuristic search with a balance of discussion between theoretical analysis and efficient implementation and application to real-world problems. Current developments in search such as pattern databases and search with efficient use of external memory and parallel processing units on main boards and graphics cards are detailed. Heuristic search as a problem solving tool is demonstrated in applications for puzzle solving, game playing, constraint satisfaction and machine learning. While no previous familiarity with heuristic search is necessary the reader should have a basic knowledge of algorithms, data structures, and calculus. Real-world case studies and chapter ending exercises help to create a full and realized picture of how search fits into the world of artificial intelligence and the one around us. Provides real-world success stories and case studies for heuristic search algorithms Includes many AI developments not yet covered in textbooks such as pattern databases, symbolic search, and parallel processing units

Principles and Practice of Constraint Programming - CP 2006

14th International Conference, CPAIOR 2017, Padua, Italy, June 5-8, 2017, Proceedings

From Research to Business Cases

Exact Algorithms, Second Edition

6th International Conference, CPAIOR 2009 Pittsburgh, PA, USA, May 27-31, 2009 Proceedings

Constraint Processing

Principles and Practice of Constraint Programming - CP 2010

This book constitutes the refereed proceedings of the 6th International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems, CPAIOR 2009, held in Pittsburgh, PA, USA, in May 2009. The 20 revised full papers and 10 extended abstracts presented together with 2 invited talks were carefully reviewed and selected from 65 submissions. The papers describe current research in the fields of constraint programming, artificial intelligence, and operations research and present new techniques or new applications in combinatorial optimization, thus exploring ways of solving large-scale, practical optimization problems through integration and hybridization of the fields' different techniques.

This Festschrift volume, published in honor of Ugo Montanari on the occasion of his 65th birthday, contains 43 papers that examine the research areas to which he has contributed, from logic programming to software engineering, as well as his many achievements.

The 11th International Conference on the Principles and Practice of Constraint Programming (CP 2005) was held in Sitges (Barcelona), Spain, October 1-5, 2005. Information about the conference can be found on the web at <http://www.liaa.csic.es/cp2005/Informationaboutpastconferencesintheseriescanbefoundathttp://www.cs.uaberta.ca/~ai/cp/>. The CP conference series is the premier international conference on constraint programming and is held annually. The conference is concerned with all aspects of computing with constraints, including: algorithms, environments, languages, models and systems. This year, we received 164 submissions. All of the submitted papers received three reviews, and the best papers were extensively discussed during an online Program Committee meeting. As a result, the Program Committee chose 48 (29.3%) papers to be published in full in the proceedings and a further 22 (13.4%) papers to be published as short papers. The full papers were presented at the conference in two parallel tracks and the short papers were presented as posters during a lively evening session. Two papers were selected by a subcommittee of the Program Committee—consisting of Chris Beck, Gilles Pesant, and myself—to receive best paper awards. The conference program also included excellent invited talks by Hector Gebarner, Ian Horrocks, Francesca Rossi, and Peter J. Stuckey. As a permanent record, the proceedings contain four-page extended abstracts of the invited talks.

Publisher Description

Theory and Applications

With Application to GIS

Constraint Programming

Knowledge-Based Configuration

Spatial Databases

A Hardware/Software Approach

Automated Planning

Constraints: Simplification, optimization and implication; Finite constraint domains; Constraint logic programming; Simple modeling; Using data structures; Controlling search; Modelling with finite domain constraints; Advanced programming techniques; CLP systems; Other constraint programming languages; Constraint databases; Index.

This book constitutes the refereed proceedings of the 13th International Conference on Principles and Practice of Constraint Programming, CP 2007. It contains 51 revised full papers and 14 revised short papers presented together with eight application papers and the abstracts of two invited lectures. All current issues of computing with constraints are addressed, ranging from methodological and foundational aspects to solving real-world problems in various application fields.

Data Mining: Concepts and Techniques provides the concepts and techniques in processing gathered data or information, which will be used in various applications. Specifically, it explains data mining and the tools used in discovering knowledge from the collected data. This book is referred as the knowledge discovery from data (KDD). It focuses on the feasibility, usefulness, effectiveness, and scalability of techniques of large data sets. After describing data mining, this edition explains the methods of knowing, preprocessing, processing, and warehousing data. It then presents information about data warehouses, online analytical processing (OLAP), and data cube technology. Then, the methods involved in mining frequent patterns, associations, and correlations for large data sets are described. The book details the methods for data classification and introduces the concepts and methods for data clustering. The remaining chapters discuss the outlier detection and the trends, applications, and research frontiers in data mining. This book is intended for Computer Science students, application developers, business professionals, and researchers who seek information on data mining. Presents dozens of algorithms and implementation examples, all in pseudo-code and suitable for use in real-world, large-scale data mining projects Addresses advanced topics such as mining object-relational databases, spatial databases, multimedia databases, time-series databases, text databases, the World Wide Web, and applications in several fields Provides a comprehensive, practical look at the concepts and techniques you need to get the most out of your data **Distributed and Cloud Computing: From Parallel Processing to the Internet of Things** offers complete coverage of modern distributed computing technology including clusters, the grid, service-oriented architecture, massively parallel processors, peer-to-peer networking, and cloud computing. It is the first modern, up-to-date distributed systems textbook; it explains how to create high-performance, scalable, reliable systems, exposing the design principles, architecture, and innovative applications of parallel, distributed, and cloud computing systems. Topics covered by this book include: facilitating management, debugging, migration, and disaster recovery through virtualization; clustered systems for research or e-commerce applications; designing systems as web services; and social networking systems using peer-to-peer computing. The principles of cloud computing are discussed using examples from open-source and commercial applications, along with case studies from the leading distributed computing vendors such as Amazon, Microsoft, and Google. Each chapter includes exercises and further reading, with lecture slides and more available online. This book will be ideal for students taking a distributed systems or distributed computing course, for professional system designers and engineers looking for a reference to the latest distributed technologies including cloud, P2P and grid computing. Complete coverage of modern distributed computing technology including clusters, the grid, service-oriented architecture, massively parallel processors, peer-to-peer networking, and cloud computing Includes case studies from the leading distributed computing vendors: Amazon, Microsoft, Google, and more Explains how to use virtualization to facilitate management, debugging, migration, and disaster recovery Designed for undergraduate or graduate students taking a distributed systems course—each chapter includes exercises and further reading, with lecture slides and more available online

Integration of AI and OR Techniques in Constraint Programming

Parallel Computer Architecture

20th International Conference, CP 2014, Lyon, France, September 8-12, 2014, Proceedings

17th International Conference, CP 2011, Perugia, Italy, September 12-16, 2011, Proceedings

24th International Conference, CP 2018, Lille, France, August 27-31, 2018, Proceedings

Concurrency, Graphs and Models

15th International Conference, CPAIOR 2018, Delft, The Netherlands, June 26–29, 2018, Proceedings

The use of constraints had its scientific and commercial breakthroughs in the 1990s. Programming with constraints makes it possible to model and specify problems with uncertain, incomplete information and to solve combinatorial problems, as they are abundant in industry and commerce, such as scheduling, planning, transportation, resource allocation, layout, design, and analysis. This book is a short, concise, and complete presentation of constraint programming and reasoning, covering theoretical foundations, algorithms, implementations, examples, and applications. It is based on more than a decade of experience in teaching and research about this subject. This book is intended primarily for graduate students, researchers, and practitioners in diverse areas of computer science and related fields, including programming languages, computational logic, symbolic computation, and artificial intelligence. The book is complemented by a webpage with teaching material, software, links, and more. We take the reader on a step-by-step journey through the world of constraint-based programming and constraint reasoning. Feel free to join in ... Acknowledgements Thorn thanks his wife Andrea and his daughter Anna - for everything. He dedicates his contribution to the book to the memory of his mother, Grete. Slim thanks his wife Nabilah and his daughters Shirine and Amira for their ongoing support and patience. This book constitutes the proceedings of the 24th International Conference on Principles and Practice of Constraint Programming, CP 2018, held in Lille, France, in August 2018. The 41 full and 9 short papers presented in this volume were carefully reviewed and selected from 114 submissions. They deal with all aspects of computing with constraints including theory, algorithms, environments, languages, models, systems, and applications such as decision making, resource allocation, scheduling, configuration, and planning. The papers were organized according to the following topics/tracks: main technical track; applications track; CP and data science; CP and music; CP and operations research; CP, optimization and power system management; multiagent and parallel CP; and testing and verification.

This book constitutes the refereed conference proceedings of the 20th International Conference on Principles and Practice of Constraint Programming, CP 2014, held in Lyon, France, in September 2014. The 65 revised papers presented together with 4 invited talks were carefully selected from 108 submissions. The scope of CP 2014 includes all aspects of computing with constraints, including theory, algorithms, environments, languages, models, systems, and applications such as decision making, resource allocation, scheduling, configuration, and planning.

Graphical models (e.g., Bayesian and constraint networks, influence diagrams, and Markov decision processes) have become a central paradigm for knowledge representation and reasoning in both artificial intelligence and computer science in general. These models are used to perform many reasoning tasks, such as scheduling, planning and learning, diagnosis and prediction, design, hardware and software verification, and bioinformatics. These problems can be stated as the formal tasks of constraint satisfaction and satisfiability, combinatorial optimization, and probabilistic inference. It is well known that the tasks are computationally hard, but research during the past three decades has yielded a variety of principles and techniques that significantly advanced the state of the art. This book provides comprehensive coverage of the primary exact algorithms for reasoning with such models. The main feature exploited by the algorithms is the model's graph. We present inference-based, message-passing schemes (e.g., variable-elimination) and search-based, conditioning schemes (e.g., cycle-cutset conditioning and AND/OR search). Each class possesses distinguished characteristics and in particular has different time vs. space behavior. We emphasize the dependence of both schemes on few graph parameters such as the treewidth, cycle-cutset, and (the pseudo-tree) height. The new edition includes the notion of influence diagrams, which focus on sequential decision making under uncertainty. We believe the principles outlined in the book would serve well in moving forward to approximation and anytime-based schemes. The target audience of this book is researchers and students in the artificial intelligence and machine learning area, and beyond.

Principles and Practice of Constraint Programming -- CP 2011

Principles and Practice of Constraint Programming - CP 2007

Joe Celko's Thinking in Sets: Auxiliary, Temporal, and Virtual Tables in SQL

Programming with Constraints

Optimization Techniques for Solving Complex Problems

23rd International Conference, CP 2017, Melbourne, VIC, Australia, August 28 - September 1, 2017, Proceedings

This book introduces a new logic-based multi-paradigm programming language that integrates logic programming, functional programming, dynamic programming with tabling, and scripting, for use in solving combinatorial search problems, including CP, SAT, and MIP (mixed integer programming) based solver modules, and a module for planning that is implemented using tabling. The book is useful for undergraduate and graduate students, researchers, and practitioners.

This book constitutes the refereed proceedings of the 12th International Conference on Principles and Practice of Constraint Programming, CP 2006, held in Nantes, France in September 2006. The 42 revised full papers and 21 revised short papers presented together with extended abstracts of four invited talks were carefully reviewed and selected from 142 submissions. All current issues of computing with constraints are addressed.

This volume contains a thoroughly refereed full research papers selected from the presentations given during two workshops on constraint processing; these workshops were held in conjunction with the International Congress on Computer Systems and Applied Mathematics (St. Petersburg, Russia, July 1993) and the European Conference on Artificial Intelligence (Amsterdam, The Netherlands, August 1994). This volume essentially contributes to integrating the different approaches to the young and very active field of constraint processing by offering papers from logic programming, knowledge engineering, operations research, and other fields. Among contributions are two surveys, by Podelski and van Roy and by Freuder.

Graphical models (e.g., Bayesian and constraint networks, influence diagrams, and Markov decision processes) have become a central paradigm for knowledge representation and reasoning in both artificial intelligence and computer science in general. These models are used to perform many reasoning tasks, such as scheduling, planning and learning, diagnosis and prediction, design, hardware and software verification, and bioinformatics. These problems can be stated as the formal tasks of constraint satisfaction and satisfiability, combinatorial optimization, and probabilistic inference. It is well known that the tasks are computationally hard, but research during the past three decades has yielded a variety of principles and techniques that significantly advanced the state of the art. In this book we provide comprehensive coverage of the primary exact algorithms for reasoning with such models. The main feature exploited by the algorithms is the model's graph. We present inference-based, message-passing schemes (e.g., variable-elimination) and search-based, conditioning schemes (e.g., cycle-cutset conditioning and AND/OR search). Each class possesses distinguished characteristics and in particular has different time vs. space behavior. We emphasize the dependence of both schemes on few graph parameters such as the treewidth, cycle-cutset, and (the pseudo-tree) height. We believe the principles outlined here would serve well in moving forward to approximation and anytime-based schemes. The target audience of this book is researchers and students in the artificial intelligence and machine learning area, and beyond.

Abstract Domains in Constraint Programming

Distributed and Cloud Computing

Constraint Solving and Planning with Picat

An Introduction

Selected Papers

Principles of Constraint Programming

Advanced SQL Programming Second Edition

Constraint Programming aims at solving hard combinatorial problems, with a computation time increasing in practice exponentially. The methods are today efficient enough to solve large industrial problems, in a generic framework. However, solvers are dedicated to a single variable type: integer or real. Solving mixed problems relies on ad hoc transformations. In another field, Abstract Interpretation offers tools to prove program properties, by studying an abstraction of their concrete semantics, that is, the set of possible values of the variables during an execution. Various representations for these abstractions have been proposed. They are called abstract domains. Abstract domains can mix any type of variables, and even represent relations between the variables. In this work, we define abstract domains for Constraint Programming, so as to build a generic solving method, dealing with both integer and real variables. We also study the octagons abstract domain, already defined in Abstract Interpretation. Guiding the search by the octagonal relations, we obtain good results on a continuous benchmark. We also define a method using Abstract Interpretation techniques, in order to include existing abstract domains. Our solver, AbSolute, is able to solve mixed problems and use relational domains. Exploits the over-approximation methods to integrate AI tools in the methods of CP. Exploits the relationships captured to solve continuous problems more effectively. Learn from the developers of a solver capable of handling practically all abstract domains.

This book constitutes the refereed proceedings of the 17th International Conference on Principles and Practice of Constraint Programming, CP 2011, held in Perugia, Italy, September 12-16, 2011. The 51 revised full papers and 7 short papers presented together with three invited talks were carefully reviewed and selected from 159 submissions. The papers are organized in topical sections on algorithms, environments, languages, models and systems, applications such as decision making, resource allocation and agreement technologies.

This book constitutes the proceedings of the 15th International Conference on Integration of Artificial Intelligence and Operations Research Techniques in Constraint Programming for Combinatorial Optimization Problems, CPAIOR 2018, held in Delft, The Netherlands, in June 2018. The 47 full papers presented together with 3 abstracts of invited talks and 3 abstracts of fast-track journal papers were carefully reviewed and selected from 111 submissions. The conference brings together interested researchers from constraint programming, artificial intelligence, operations research to present new techniques or applications in the intersection of these fields and provides an opportunity for researchers in one area to learn about techniques in the others, and to show how the integration of techniques from different fields can lead to interesting results on large and complex problems.

Constraint programming is like an octopus spreading its tentacles into databases, operations research, artificial intelligence, and many other areas. The concept of constraint programming was introduced in artificial intelligence and graphics in the 1960s and 1970s. Now the related techniques are used and studied in many fields of computing. Different aspects of constraint processing are investigated in theoretical computer science, logic programming, knowledge representation, operations research, and related application domains. Constraint programming has been included in the lists of related topics of many conferences. Nevertheless, only in 1993 were the first forums held, devoted as a whole to this field of knowledge. These were the First Workshop on Principles and Practice of Constraint Programming (PPCP'93) which was held in Newport, Rhode Island, USA, April 28-30, the International Workshop on Constraint Processing (at CSAM'93) held in St. Petersburg, Russia, July 20-21, and the NATO Advanced Study Institute (NATO ASI) on Constraint Programming held in Parnu, Estonia, August 13-24. NATO ASI are aimed at bringing together leading researchers and practitioners from industry and academia in some area of knowledge to provide a concise picture of the work done and results obtained by different groups. This is intended for dissemination of advanced knowledge not yet taught regularly in of new topics university. However, ASIs must also encourage the introduction into university curricula as well as foster international scientific contacts.

10th International Conference, CP 2004, Toronto, Canada, September 27 - October 2004, Proceedings

Essentials of Constraint Programming

Recent Advances in Constraints

12th International Conference, CP 2006, Nantes, France, September 25-29, 2006, Proceedings

This book outlines a set of issues that are critical to all of parallel architecture—communication latency, communication bandwidth, and coordination of cooperative work (across modern designs). It describes the set of techniques available in hardware and in software to address each issue and explore how the various techniques interact.

Knowledge-based Configuration incorporates knowledge representation formalisms to capture complex product models and reasoning methods to provide intelligent interactive behavior with the user. This book represents the first time that corporate and academic worlds collaborate integrating research and commercial benefits of knowledge-based configuration. Foundational interdisciplinary material is provided for composing models from increasingly complex products and services. Case studies, the latest research, and graphical knowledge representations that increase understanding of knowledge-based configuration provide a toolkit to continue to push the boundaries of what configurators can do and how they enable companies and customers to thrive. Includes detailed discussion of state-of-the-art configuration knowledge engineering approaches such as automated testing and debugging, redundancy detection, and conflict management Provides an overview of the application of knowledge-based configuration technologies in the form of real-world case studies from SAP, Siemens, Kapsch, and more Explores the commercial benefits of knowledge-based configuration technologies to business sectors from services to industrial equipment Uses concepts that are based on an example personal computer configuration knowledge base that is represented in an UML-based graphical language

This book constitutes the proceedings of the 14th International Conference on Integration of Artificial Intelligence and Operations Research Techniques in Constraint Programming for Combinatorial Optimization Problems, CPAIOR 2017, held in Padua, Italy, in June 2017. The 32 full papers presented together with 6 abstracts were carefully reviewed and selected from numerous submissions. The conference brings together interested researchers from constraint programming, artificial intelligence, and operations research to present new techniques or applications in the intersection of these fields and provides an opportunity for researchers in one area to learn about techniques in the others, and to show how the integration of techniques from different fields can lead to interesting results on large and complex problems.