EFFECTIVE POLYNOMIAL COMPUTATION

Richard Zippel

Effective Polynomial Computation

Alberto Bemporad,Giorgio C Buttazzo,Antonio Bicchi

Effective Polynomial Computation:

Effective Polynomial Computation Richard Zippel,2012-12-06 Effective Polynomial Computation is an introduction to the algorithms of computer algebra It discusses the basic algorithms for manipulating polynomials including factoring polynomials These algorithms are discussed from both a theoretical and practical perspective Those cases where theoretically optimal algorithms are inappropriate are discussed and the practical alternatives are explained Effective Polynomial Computation provides much of the mathematical motivation of the algorithms discussed to help the reader appreciate the mathematical mechanisms underlying the algorithms and so that the algorithms will not appear to be constructed out of whole cloth Preparatory to the discussion of algorithms for polynomials the first third of this book discusses related issues in elementary number theory These results are either used in later algorithms e g the discussion of lattices and Diophantine approximation or analogs of the number theoretic algorithms are used for polynomial problems e g Euclidean algorithm and p adic numbers Among the unique features of Effective Polynomial Computation is the detailed material on greatest common divisor and factoring algorithms for sparse multivariate polynomials In addition both deterministic and probabilistic algorithms for irreducibility testing of polynomials are discussed **Polynomial and Matrix Computations** Dario Bini,Victor Y. Pan,2012-12-06 Our Subjects and Objectives This book is about algebraic and symbolic computation and numerical computing with matrices and polynomials It greatly extends the study of these topics presented in the celebrated books of the seventies AHU and BM these topics have been under represented in CLR which is a highly successful extension and updating of AHU otherwise Compared to AHU and BM our volume adds extensive material on parallel com putations with general matrices and polynomials on the bit complexity of arithmetic computations including some recent techniques of data compres sion and the study of numerical approximation properties of polynomial and matrix algorithms and on computations with Toeplitz matrices and other dense structured matrices The latter subject should attract people working in numerous areas of application in particular coding signal processing control algebraic computing and partial differential equations The au thors teaching experience at the Graduate Center of the City University of New York and at the University of Pisa suggests that the book may serve as a text for advanced graduate students in mathematics and computer science who have some knowledge of algorithm design and wish to enter the exciting area of algebraic and numerical computing The potential readership may also include algorithm and software designers and researchers specializing in the design and analysis of algorithms computational complexity alge braic and symbolic computing and numerical computation *Polynomial Algorithms in Computer Algebra* Franz Winkler,2012-12-06 For several years now I have been teaching courses in computer algebra at the Universitat Linz the University of Delaware and the Universidad de Alcala de Henares In the summers of 1990 and 1992 I have organized and taught summer schools in computer algebra at the Universitat Linz Gradually a set of course notes has emerged from these activities People have asked me for copies of the

course notes and different versions of them have been circulating for a few years Finally I decided that I should really take the time to write the material up in a coherent way and make a book out of it Here now is the result of this work Over the years many students have been helpful in improving the quality of the notes and also several colleagues at Linz and elsewhere have contributed to it I want to thank them all for their effort in particular I want to thank B Buchberger who taught me the theory of Grabner bases nearly two decades ago B F Caviness and B D Saunders who first stimulated my interest in various problems in computer algebra G E Collins who showed me how to compute in algebraic domains and J R Sendra with whom I started to apply computer algebra methods to problems in algebraic geometry Several colleagues have suggested improvements in earlier versions of this book However I want to make it clear that I am responsible for all remaining mistakes **Algorithms and Theory of Computation Handbook - 2 Volume Set** Mikhail J. Atallah,Marina Blanton,2022-05-29 Algorithms and Theory of Computation Handbook Second Edition in a two volume set provides an up to date compendium of fundamental computer science topics and techniques It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems New to the Second Edition Along with updating and revising many of the existing chapters this second edition contains more than 20 new chapters This edition now covers external memory parameterized self stabilizing and pricing algorithms as well as the theories of algorithmic coding privacy and anonymity databases computational games and communication networks It also discusses computational topology computational number theory natural language processing and grid computing and explores applications in intensity modulated radiation therapy voting DNA research systems biology and financial derivatives This best selling handbook continues to help computer professionals and engineers find significant information on various algorithmic topics The expert contributors clearly define the terminology present basic results and techniques and offer a number of current references to the in depth literature They also provide a glimpse of the major research issues concerning the relevant topics **Solving Polynomial Equations** Alicia Dickenstein,2005-04-27 This book provides a general introduction to modern mathematical aspects in computing with multivariate polynomials and in solving algebraic systems It presents the state of the art in several symbolic numeric and symbolic numeric techniques including effective and algorithmic methods in algebraic geometry and computational algebra complexity issues and applications ranging from statistics and geometric modelling to robotics and vision Graduate students as well as researchers in related areas will find an excellent introduction to currently interesting topics These cover Groebner and border bases multivariate resultants residues primary decomposition multivariate polynomial factorization homotopy continuation complexity issues and their applications **Algorithms and Theory of Computation Handbook** Mikhail J. Atallah,1998-11-23 Algorithms and Theory of Computation Handbook is a comprehensive collection of algorithms and data structures that also covers many theoretical issues It offers a balanced perspective that reflects the needs of practitioners including emphasis on applications within discussions on theoretical

issues Chapters include information on finite precision issues as well as discussion of specific algorithms where algorithmic techniques are of special importance including graph drawing robotics forming a VLSI chip vision and image processing data compression and cryptography The book also presents some advanced topics in combinatorial optimization and parallel distributed computing applications areas where algorithms and data structuring techniques are of special importance graph drawing robot algorithms VLSI layout vision and image processing algorithms scheduling electronic cash data compression dynamic graph algorithms on line algorithms multidimensional data structures cryptography advanced topics in combinatorial optimization and parallel distributed computing *Hybrid Systems: Computation and Control* Alberto Bemporad,Giorgio C Buttazzo,Antonio Bicchi,2007-05-31 This book constitutes the refereed proceedings of the 10th International Conference on Hybrid Systems Computation and Control HSCC 2007 held in Pisa Italy in April 2007 Among the topics addressed are models of heterogeneous systems computability and complexity issues real time computing and control embedded and resource aware control control and estimation over wireless networks and programming languages support and implementation **Algorithms and Theory of Computation Handbook, Volume 1** Mikhail J. Atallah,Marina Blanton,2009-11-20 Algorithms and Theory of Computation Handbook Second Edition General Concepts and Techniques provides an up to date compendium of fundamental computer science topics and techniques It also illustrates how the topics and techniques come together to deliver efficient solutions to important practical problems Along with updating and revising many Artificial Intelligence and Symbolic Computation Jaques Calmet,2006-09-13 This book constitutes the refereed proceedings of the 8th International Conference on Artificial Intelligence and Symbolic Computation AISC 2006 held in Beijing China in September 2006 The 18 revised full papers presented together with 4 invited papers were carefully reviewed and selected from 39 submissions Based on heuristics and mathematical algorithmics artificial intelligence and symbolic computation are two views and approaches for automating mathematical problem solving The papers address all current aspects in the area of symbolic computing and AI mathematical foundations implementations and applications in industry and academia The papers are organized in topical sections on artificial intelligence and theorem proving symbolic computation constraint satisfaction solving and mathematical knowledge management **Modern Computer Algebra** Joachim von zur Gathen,Jürgen Gerhard,2003-07-03 Computer algebra systems are gaining importance in all areas of science and engineering This textbook gives a thorough introduction to the algorithmic basis of the mathematical engine in computer algebra systems It is designed to accompany one or two semester courses for advanced undergraduate or graduate students in computer science or mathematics Its comprehensiveness and authority also make it an essential reference for professionals in the area Special features include detailed study of algorithms including time analysis implementation reports on several topics complete proofs of the mathematical underpinnings a wide variety of applications among others in chemistry coding theory cryptography computational logic and the design of calendars and musical scales Some of this material has never appeared

before in book form For the new edition errors have been corrected the text has been smoothed and updated and new sections on greatest common divisors and symbolic integration have been added   **Symbolic-Numeric Computation** Dongming Wang,Li-Hong Zhi,2007-06-25 The growing demand of speed accuracy and reliability in scientific and engineering computing has been accelerating the merging of symbolic and numeric computations These two types of computation coexist in mathematics yet are separated in traditional research of mathematical computation This book presents 27 research articles on the integration and interaction of symbolic and numeric computation   Proceedings of International Conference on Frontiers in Computing and Systems Ram Sarkar,Sujata Pal,Subhadip Basu,Dariusz Plewczynski,Debotosh Bhattacharjee,2023-07-31 This book gathers high quality research papers presented at the 3rd International Conference on Frontiers in Computing and Systems COMSYS 2022 held at Indian Institute of Technology Ropar Punjab India during December 19 21 2022 The book covers research in cyber physical systems for real life applications pertaining to AI machine learning and data science devices circuits and systems computational biology biomedical informatics and network medicine communication networks cloud computing and IoT image video and signal processing and security and privacy

Structured Matrices and Polynomials Victor Y. Pan,2012-12-06 Structured matrices serve as a natural bridge between the areas of algebraic computations with polynomials and numerical matrix computations allowing cross fertilization of both fields This book covers most fundamental numerical and algebraic computations with Toeplitz Hankel Vandermonde Cauchy and other popular structured matrices Throughout the computations the matrices are represented by their compressed images called displacements enabling both a unified treatment of various matrix structures and dramatic saving of computer time and memory The resulting superfast algorithms allow further dramatic parallel acceleration using FFT and fast sine and cosine transforms Included are specific applications to other fields in particular superfast solutions to various fundamental problems of computer algebra the tangential Nevanlinna Pick and matrix Nehari problems The primary intended readership for this work includes researchers algorithm designers and advanced graduate students in the fields of computations with structured matrices computer algebra and numerical rational interpolation The book goes beyond research frontiers and apart from very recent research articles includes yet unpublished results To serve a wider audience the presentation unfolds systematically and is written in a user friendly engaging style Only some preliminary knowledge of the fundamentals of linear algebra is required This makes the material accessible to graduate students and new researchers who wish to study the rapidly exploding area of computations with structured matrices and polynomials Examples tables figures exercises extensive bibliography and index lend this text to classroom use or self study   **Automata, Languages and Programming** Pierpaolo Degano,1997-06-18 This book constitutes the refereed proceedings of the 24th International Colloquium on Automata Languages and Programming ICALP 97 held in Bologna Italy in July 1997 ICALP 97 celebrated the 25th anniversary of the European Association for Theoretical Computer Science EATCS which has sponsored the ICALP meetings

since 1972 The volume presents 73 revised full papers selected from a total of 197 submissions Also included are six invited contributions ICALP is one of the few flagship conferences in the area The book addresses all current topics in theoretical computer science   Computing Methods in Applied Sciences and Engineering R. Glowinski,A. Lichnewsky,1990-01-01 Proceedings of the Ninth International Conference on Computing Methods in Applied Sciences and Engineering Paris France January 29 February 2 1990 T p verso   **Algorithmic Number Theory** Wieb Bosma,2006-12-30 This book constitutes the refereed proceedings of the 4th International Algorithmic Number Theory Symposium ANTS IV held in Leiden The Netherlands in July 2000 The book presents 36 contributed papers which have gone through a thorough round of reviewing selection and revision Also included are 4 invited survey papers Among the topics addressed are gcd algorithms primality factoring sieve methods cryptography linear algebra lattices algebraic number fields class groups and fields elliptic curves polynomials function fields and power sums   Computer Algebra Methods for Equivariant Dynamical Systems Karin Gatermann,2007-05-06 This book starts with an overview of the research of Gr bner bases which have many applications in various areas of mathematics since they are a general tool for the investigation of polynomial systems The next chapter describes algorithms in invariant theory including many examples and time tables These techniques are applied in the chapters on symmetric bifurcation theory and equivariant dynamics This combination of different areas of mathematics will be interesting to researchers in computational algebra and or dynamics   *Intelligent Computation in Big Data Era* Hongzhi Wang,Haoliang Qi,Wanxiang Che,Zhaowen Qiu,Leilei Kong,Zhongyuan Han,Junyu Lin,Zeguang Lu,2014-12-29 This book constitutes the refereed proceedings of the International Conference of Young Computer Scientists Engineers and Educators ICYCSEE 2015 held in Harbin China in January 2015 The 61 revised full papers presented were carefully reviewed and selected from 200 submissions The papers cover a wide range of topics related to intelligent computation in Big Data era such as artificial intelligence machine learning algorithms natural language processing image processing MapReduce social network   **Algorithms and Computation** Toshihide Ibaraki,Naoki Katoh,Hirotaka Ono,2003-11-24 This volume contains the proceedings of the 14th Annual International S posium on Algorithms and Computation ISAAC 2003 held in Kyoto Japan 15 17 December 2003 In the past it was held in Tokyo 1990 Taipei 1991 Nagoya 1992 Hong Kong 1993 Beijing 1994 Cairns 1995 Osaka 1996 Singapore 1997 Taejon 1998 Chennai 1999 Taipei 2000 Christchurch 2001 and Vancouver 2002 ISAACisanannualinternationalsymposiumthatcoverstheverywiderange of topics in algorithms and computation The main purpose of the symposium is to provide a forum for researchers working in algorithms and the theory of computation where they can exchange ideas in this active research community In response to our call for papers we received unexpectedly many subm sions 207 papers The task of selecting the papers in this volume was done by our program committee and referees After a thorough review process the committee selected 73 papers The selection was done on the basis of originality and relevance to the eld of algorithms and computation We hope all accepted papers will eventually appear in scienti c journals in

more polished forms The best paper award was given for On the Geometric Dilation of Finite Point Sets to Annette Ebbers Baumann Ansgar Grune and Rolf Klein Two eminent invited speakers Prof Andrew Chi Chih Yao of Princeton University and Prof Takao Nishizeki of Tohoku University contributed to this proceedings   **Computing Handbook** Teofilo Gonzalez,Jorge Diaz-Herrera,Allen Tucker,2014-05-07 The first volume of this popular handbook mirrors the modern taxonomy of computer science and software engineering as described by the Association for Computing Machinery ACM and the IEEE Computer Society IEEE CS Written by established leading experts and influential young researchers it examines the elements involved in designing and implementing software new areas in which computers are being used and ways to solve computing problems The book also explores our current understanding of software engineering and its effect on the practice of software development and the education of software professionals

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