Symbolic Computation Applications To Scientific Computing

V.G. Ganzha,E.W. Mayr,E.V. Vorozhtsov

Symbolic Computation Applications To Scientific Computing:

Symbolic Computation Robert Grossman,1989-01-01 This is a monograph that describes current research efforts in the application of symbolic computation to several areas including dynamical systems differential geometry Lie algebras numerical analysis fluid dynamics perturbation theory control theory and mechanics The chapters which illustrate how symbolic computations can be used to study various mathematical structures are outgrowths of the invited talks that were presented at the NASA Ames Workshop on The Use of Symbolic Methods to Solve Algebraic and Geometric Problems Arising in Engineering More than 100 people participated in the two day conference which took place in January 1987 at the NASA Ames Research Center in Moffett Field California The field of symbolic computation is becoming increasingly important in science engineering and mathematics The availability of powerful computer algebra systems on workstations has made symbolic computation an important tool for many researchers   Computer Algebra in Scientific Computing Matthew England,Wolfram Koepf,Timur M. Sadykov,Werner M. Seiler,Evgenii V. Vorozhtsov,2019-07-24 This book constitutes the refereed proceedings of the 21st International Workshop on Computer Algebra in Scientific Computing CASC 2019 held in Moscow Russia in August 2019 The 28 full papers presented together with 2 invited talks were carefully reviewed and selected from 44 submissions They deal with cutting edge research in all major disciplines of computer algebra The papers cover topics such as polynomial algebra symbolic and symbolic numerical computation applications of symbolic computation for investigating and solving ordinary differential equations applications of CASs in the investigation and solution of celestial mechanics problems and in mechanics physics and robotics   *Computer Algebra in Scientific Computing CASC'99* Victor G. Ganzha,Ernst W. Mayr,Evgenii V. Vorozhtsov,2012-12-06 The development of powerful computer algebra systems has considerably ex tended the scope of problems of scientific computing which can now be solved successfully with the aid of computers However as the field of applications of computer algebra in scientific computing becomes broader and more complex there is a danger of separation between theory systems and applications For this reason we felt the need to bring together the researchers who now ap ply the tools of computer algebra for the solution of problems in scientific computing in order to foster new and closer interactions CASC 99 is the second conference devoted to applications of computer al gebra in scientific computing The first conference in this sequence CASC 98 was held 20 24 April 1998 in St Petersburg Russia This volume contains revised versions of the papers submitted by the par ticipants and accepted by the program committee after a thorough reviewing process The collection of papers included in the proceedings covers various topics of computer algebra methods algorithms and software applied to scien tific computing symbolic numeric analysis and solving differential equations efficient computations with polynomials groups matrices and other related objects special purpose programming environments application to physics mechanics optics and to other areas In particular a significant group of papers deals with applications of com puter algebra methods for the solution of current problems in group theory which mostly arise in

mathematical physics   **Computer Algebra in Scientific Computing** François Boulier,Matthew England,Timur M. Sadykov,Evgenii V. Vorozhtsov,2020-10-18 This book constitutes the refereed proceedings of the 22nd International Workshop on Computer Algebra in Scientific Computing CASC 2020 held in Linz Austria in September 2020 The conference was held virtually due to the COVID 19 pandemic The 34 full papers presented together with 2 invited talks were carefully reviewed and selected from 41 submissions They deal with cutting edge research in all major disciplines of computer algebra The papers cover topics such as polynomial algebra symbolic and symbolic numerical computation applications of symbolic computation for investigating and solving ordinary differential equations applications of CAS in the investigation and solution of celestial mechanics problems and in mechanics physics and robotics   *Computer Algebra in Scientific Computing* Viktor G. Ganzha,Ernst Mayr,Evgenii Vasilʹevich Vorozhtsov,2000-09-27 Proceedings of the Third Workshop on Computer Algebra in Scientific Computing Samarkand Octobe5r 5 9 2000   **Computer Algebra in Scientific Computing** Vladimir P. Gerdt,Ernst W. Mayr,Evgenii V. Vorozhtsov,2009-09-30 This book constitutes the refereed proceedings of the 11th International Workshop on Computer Algebra in Scientific Computing CASC 2009 held in Kobe Japan in September 2009 The 28 revised full papers presented together with 2 invited lectures were carefully reviewed and selected from numerous submissions The topics addressed are all basic areas of scientific computing as they benefit from the application of computer algebra methods and software The papers cover computer algebra methods and algorithms application of symbolic and algebraic manipulation and CA methods and results for the numerical integration of the partial differential equations of the mathematical physics   Computer Algebra in Scientific Computing Vladimir P. Gerdt,Wolfram Koepf,Ernst W. Mayr,Evgenii V. Vorozhtsov,2011-09-01 This book constitutes the refereed proceedings of the 13th International Workshop on Computer Algebra in Scientific Computing CASC 2011 held in Kassel Germany in September 2011 The 26 full papers included in the book were carefully reviewed and selected from numerous submissions The articles are organized in topical sections on the development of object oriented computer algebra software for the modeling of algebraic structures as typed objects matrix algorithms the investigation with the aid of computer algebra the development of symbolic numerical algorithms and the application of symbolic computations in applied problems of physics mechanics social science and engineering

Computer Algebra in Scientific Computing Vladimir P. Gerdt,Wolfram Koepf,Ernst W. Mayr,Evgenii V. Vorozhtsov,2013-08-15 This book constitutes the proceedings of the 14th International Workshop on Computer Algebra in Scientific Computing CASC 2013 held in Berlin Germany in September 2013 The 33 full papers presented were carefully reviewed and selected for inclusion in this book The papers address issues such as polynomial algebra the solution of tropical linear systems and tropical polynomial systems the theory of matrices the use of computer algebra for the investigation of various mathematical and applied topics related to ordinary differential equations ODEs applications of symbolic computations for solving partial differential equations PDEs in mathematical physics problems arising at the application of

computer algebra methods for finding infinitesimal symmetries applications of symbolic and symbolic numeric algorithms in mechanics and physics automatic differentiation the application of the CAS Mathematica for the simulation of quantum error correction in quantum computing the application of the CAS GAP for the enumeration of Schur rings over the group A5 constructive computation of zero separation bounds for arithmetic expressions the parallel implementation of fast Fourier transforms with the aid of the Spiral library generation system the use of object oriented languages such as Java or Scala for implementation of categories as type classes a survey of industrial applications of approximate computer algebra

Computer Algebra in Scientific Computing Vladimir P. Gerdt,Wolfram Koepf,Werner M. Seiler,Evgenii V. Vorozhtsov,2014-09-01 This book constitutes the proceedings of the 16th International Workshop on Computer Algebra in Scientific Computing CASC 2014 held in Warsaw Poland in September 2014 The 33 full papers presented were carefully reviewed and selected for inclusion in this book The papers address issues such as Studies in polynomial algebra are represented by contributions devoted to factoring sparse bivariate polynomials using the priority queue the construction of irreducible polynomials by using the Newton index real polynomial root finding by means of matrix and polynomial iterations application of the eigenvalue method with symmetry for solving polynomial systems arising in the vibration analysis of mechanical structures with symmetry properties application of Gr bner systems for computing the absolute reduction number of polynomial ideals the application of cylindrical algebraic decomposition for solving the quantifier elimination problems certification of approximate roots of overdetermined and singular polynomial systems via the recovery of an exact rational univariate representation from approximate numerical data new parallel algorithms for operations on univariate polynomials multi point evaluation interpolation based on subproduct tree techniques *Computer Algebra in Scientific Computing* V.G. Ganzha,E.W. Mayr,E.V. Vorozhtsov,2006-11-30 This volume contains revised versions of the papers submitted to the workshop by the participants and accepted by the program committee after a thorough reviewing process The collection of papers included in the proceedings covers not only various expanding applications of computer algebra to scienti c computing but also the computer algebra systems themselves and the CA algorithms The eight earlier CASC conferences CASC 1998 CASC 1999 CASC 2000 CASC 2001 CASC 2002 CASC 2003 CASC 2004 and CASC 2005 were held spectively in St Petersburg Russia in Munich Germany in Samarkand Uzb istan in Konstanz Germany in Crimea Ukraine in Passau Germany in St Petersburg Russia and in Kalamata Greece and they proved to be successful It was E A Grebenikow Computing Center of the Russian Academy of S ences Moscow who drew our attention to the group of mathematicians and c puter scientists at the Academy of Sciences of Moldova conducting research in the eld of computer algebra We were impressed that this group not only is concerned with applications of CA methods to problems of scienti c computing but also c ries out research on the fundamental principles underlying the current computer algebra systems themselves see also their papers in the present proceedings v ume It was therefore decided to organize the 9th workshop on Computer Algebra in

Scienti c Computing CASC 2006 in Chi sin au the capital of Moldova   Computer Algebra in Scientific Computing CASC 2001 Viktor G. Ganzha,Ernst W. Mayr,Evgenii V. Vorozhtsov,2012-12-06 CASC 2001 continues a tradition started in 1998 of international con ferences on the latest advances in the application of computer algebra systems to the solution of various problems in scientific computing The three ear CASs lier conferences in this sequence CASC 98 CASC 99 and CASC 2000 were held Petersburg Russia in Munich Germany and in Samarkand respectively in St Uzbekistan and proved to be very successful We have to thank the program committee listed overleaf for a tremendous job in soliciting and providing reviews for the submitted papers There were more than three reviews per submission on average The result of this job is reflected in the present volume which contains revised versions of the accepted papers The collection of papers included in the proceedings covers various topics of computer algebra methods algorithms and software applied to scientific computing In particular five papers are devoted to the implementation of the analysis of involutive systems with the aid of CASso The specific examples include new efficient algorithms for the computation of Janet bases for monomial ideals involutive division involutive reduction method etc A number of papers deal with application of CASs for obtaining and vali dating new exact solutions to initial and boundary value problems for partial differential equations in mathematical physics Several papers show how CASs can be used to obtain analytic solutions of initial and boundary value problems for ordinary differential equations and for studying their properties   **Symbolic and Numerical Computation for Artificial Intelligence** Bruce R. Donald,Deepak Kapur,Joseph L. Mundy,1992 Over the last decade there has been considerable progress in investigating methods of symbolic mathematics in many application areas of computer science and artifical intelligence such as engineering design solid and geometric modelling robotics and motion planning and machine vision This research has produced few applications within engineering and robotics because of the combinatorial cost of symbolic techniques Therefore it is essential to investigate approaches for systematic integration of symbolic with numerical techniques which are efficient for handling the huge amount of data that arises in practical applications while at the same time maintain a logically consistent solution framework Symbolic and Numerical Computation for Artificial Intelligence gives an overview of applications in machine vision robotics and engineering design where there is a need for integrating symbolic and numerical methods It also illustrates the case for an integrated symbolic and numerical environment to support the needs of these applications This book will be essential reading for researchers in applied mathematics symbolic and algebraic manipulation and applied artificial intell   **Computer Algebra in Scientific Computing** Matthew England,Wolfram Koepf,Timur M. Sadykov,Werner M. Seiler,Evgenii V. Vorozhtsov,2019-08-15 This book constitutes the refereed proceedings of the 21st International Workshop on Computer Algebra in Scientific Computing CASC 2019 held in Moscow Russia in August 2019 The 28 full papers presented together with 2 invited talks were carefully reviewed and selected from 44 submissions They deal with cutting edge research in all major disciplines of computer algebra The papers cover topics such as polynomial algebra

symbolic and symbolic numerical computation applications of symbolic computation for investigating and solving ordinary differential equations applications of CASs in the investigation and solution of celestial mechanics problems and in mechanics physics and robotics   **2020 22nd International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC)** IEEE Staff,2020-09 International Symposium on Symbolic and Numeric Algorithms for Scientific Computing is an international conference that aims to stimulate the interaction between the two scientific communities of symbolic and numeric computing and to exhibit interesting applications of the areas both in theory and in practice The choice of the topic is motivated by the belief of the organizers that the dialogue between the two communities is very necessary for accelerating the progress in making the computer a truly intelligent aid for mathematicians and engineers SYNASC 2020 is organized by Department of Computer Science West University of Timisoara Romania Research Institute for Symbolic Computation Johannes Kepler University Linz Austria Research Institute e Austria Timisoara Romania Symbolic Computation Topics computer algebra symbolic techniques applied to numerics hybrid symbolic and numeric algorithms numerics and symbolics   **SIAM Journal on Computing** Society for Industrial and Applied Mathematics,1990   Computer Algebra in Scientific Computing François Boulier,Chenqi Mou,Timur M. Sadykov,Evgenii V. Vorozhtsov,2025-12-02 This book constitutes the refereed proceedings of the 27th International Workshop on Computer Algebra in Scientific Computing CASC 2025 which took place in Dubai United Arab Emirates during November 24 28 2025 The 22 full papers and included in this book were carefully reviewed and selected from 36 submissions They focus on all aspects of computer algebra symbolic computation scientific computing and related fields alongside the country s strategic focus on advancing research and establishing itself as a regional hub and global leader in scientific computing   **Computer Science and Scientific Computing** James M. Ortega,2014-05-10 Computer Science and Scientific Computing contains the proceedings of the Third ICASE Conference on Scientific Computing held in Williamsburg Virginia on April l and 2 1976 under the auspices of the Institute for Computer Applications in Systems Engineering at the NASA Langley Research Center The conference provided a forum for reviewing all the aspects of scientific computing and covered topics ranging from computer aided design CAD and computer science technology to the design of large hydrodynamics codes Case studies in reliable computing are also presented Comprised of 13 chapters this book begins with an introduction to the use of the hierarchical family concept in the development of scientific programming systems The discussion then turns to the data structures of scientific computing and their representation and management some important CAD capabilities required to support aerospace design in the areas of interactive support information management and computer hardware advances as well as some computer science developments which may contribute significantly to making such capabilities possible and the use of symbolic computation systems for problem solving in scientific research Subsequent chapters deal with computer applications in astrophysics the possibility of computing turbulence and numerical wind tunnels and the basis for a general purpose program for finite

element analysis Software tools for computer graphics are also considered This monograph will be of value to scientists systems designers and engineers and students in computer science who have an interest in the subject of scientific computing *Computer - Human Interaction in Symbolic Computation* Norbert Kajler,2012-12-06 The well attended March 1994 HIse workshop in Amsterdam was a very lively con ference which stimulated much discussion and human human interaction As the editor of this volume points out the Amsterdam meeting was just part of a year long project that brought many people together from many parts of the world The value of the effort was not only in generating new ideas but in making people aware of work that has gone on on many fronts in using computers to make mathematics more understandable The author was very glad he attended the workshop In thinking back over the conference and in reading the papers in this collection the author feels there are perhaps four major conclusions to be drawn from the current state of work 1 graphics is very important but such features should be made as easy to use as possible 2 symbolic mathematical computation is very powerful but the user must be able to see intermediate steps 3 system design has made much progress but for semester long coursework and book length productions we need more tools to help composition and navigation 4 monolithic systems are perhaps not the best direction for the future as different users have different needs and may have to link together many kinds of tools The editor of this volume and the authors of the papers presented here have also reached and documented similar conclusions *Enabling Technologies for Computational Science* Elias N. Houstis,John R. Rice,Efstratios Gallopoulos,Randall Bramley,2012-12-06 Enabling Technologies for Computational Science assesses future application computing needs identifies research directions in problem solving environments PSEs addresses multi disciplinary environments operating on the Web proposes methodologies and software architectures for building adaptive and human centered PSEs and describes the role of symbolic computing in scientific and engineering PSEs The book also includes an extensive bibliography of over 400 references Enabling Technologies for Computational Science illustrates the extremely broad and interdisciplinary nature of the creation and application of PSEs Authors represent academia government laboratories and industry and come from eight distinct disciplines chemical engineering computer science ecology electrical engineering mathematics mechanical engineering psychology and wood sciences This breadth and diversity extends into the computer science aspects of PSEs These papers deal with topics such as artificial intelligence computer human interaction control data mining graphics language design and implementation networking numerical analysis performance evaluation and symbolic computing Enabling Technologies for Computational Science provides an assessment of the state of the art and a road map to the future in the area of problem solving environments for scientific computing This book is suitable as a reference for scientists from a variety of disciplines interested in using PSEs for their research *2023 25th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC)* IEEE Staff,2023-09-11 Symbolic Computation computer algebra symbolic analysis symbolic combinatorics symbolic techniques applied to numerics hybrid

symbolic and numeric algorithms numerics and symbolics for geometry programming with constraints narrowing applications of symbolic computation to artificial intelligence and vice versa Numerical Computing iterative approximation of fixed points solving systems of nonlinear equations numerical and symbolic algorithms for differential equations numerical and symbolic algorithms for optimization parallel algorithms for numerical computing scientific visualization and image processing Logic and Programming automatic reasoning formal system verification formal verification and synthesis software quality assessment static analysis timing analysis automated testing Distributed Computing

Reviewing **Symbolic Computation Applications To Scientific Computing**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Symbolic Computation Applications To Scientific Computing**," an enthralling opus penned by a highly acclaimed wordsmith, readers attempt an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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Table of Contents Symbolic Computation Applications To Scientific Computing

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