Reliable Numerical Computation

Edited by
M. G. COX
and
S. HAMMARLING

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Jianyong Qiao,Xinchao Zhao,Linqiang Pan,Xingquan Zuo,Xingyi Zhang,Qingfu Zhang,Shanguo Huang

Reliable Numerical Computation:

   Reliable Numerical Computation M. G. Cox,S. J. Hammarling,1990 Published to honor the late Jim Wilkinson the respected pioneer in numerical analysis this book includes contributions from his colleagues and collaborators leading experts in their own right The breadth of Wilkinson s research is reflected in the topics covered which include linear algebra error analysis and computer arithmetic algorithms and mathematical software An invaluable reference the book is completely up to date with the latest developments on the Lanczos algorithm QR factorizations error propagation models parameter estimation problems sparse systems and shape preserving splines Reflecting the current growth and vitality of this field the volume is an essential reference for all numerical analysts   **Reliable Numerical Computation** Sven Hammarling,James Hardy Wilkinson,2023 A collection of research papers based on talks given in honour of Jim Wilkinson a pioneer of numerical analysis These papers provide information on new techniques in numerical analysis written by his colleagues and collaborators   **Accuracy and Reliability in Scientific Computing** Bo Einarsson,2005-08-01 This book investigates some of the difficulties related to scientific computing describing how these can be overcome   Advances in Reliable Numerical Computation M. G. Cox,National Physical Laboratory (Great Britain). Division of Information Technology and Computing,1987   *Accuracy and Reliability in Scientific Computing* Bo Einarsson,2005-01-01 Numerical software is used to test scientific theories design airplanes and bridges operate manufacturing lines control power plants and refineries analyze financial derivatives identify genomes and provide the understanding necessary to derive and analyze cancer treatments Because of the high stakes involved it is essential that results computed using software be accurate reliable and robust Unfortunately developing accurate and reliable scientific software is notoriously difficult This book investigates some of the difficulties related to scientific computing and provides insight into how to overcome them and obtain dependable results The tools to assess existing scientific applications are described and a variety of techniques that can improve the accuracy and reliability of newly developed applications is discussed Accuracy and Reliability in Scientific Computing can be considered a handbook for improving the quality of scientific computing It will help computer scientists address the problems that affect software in general as well as the particular challenges of numerical computation approximations occurring at all levels continuous functions replaced by discretized versions infinite processes replaced by finite ones and real numbers replaced by finite precision numbers Divided into three parts it starts by illustrating some of the difficulties in producing robust and reliable scientific software Well known cases of failure are reviewed and the what and why of numerical computations are considered The second section describes diagnostic tools that can be used to assess the accuracy and reliability of existing scientific applications In the last section the authors describe a variety of techniques that can be employed to improve the accuracy and reliability of newly developed scientific applications The authors of the individual chapters are international experts many of them members of the IFIP Working Group on Numerical Software   *Reliability in Computing* Ramon E.

Moore,2014-05-10 Perspectives in Computing Vol 19 Reliability in Computing The Role of Interval Methods in Scientific Computing presents a survey of the role of interval methods in reliable scientific computing including vector arithmetic language description convergence and algorithms The selection takes a look at arithmetic for vector processors FORTRAN SC and reliable expression evaluation in PASCAL SC Discussions focus on interval arithmetic optimal scalar product matrix and vector arithmetic transformation of arithmetic expressions development of FORTRAN SC and language description with examples The text then examines floating point standards algorithms for verified inclusions applications of differentiation arithmetic and interval acceleration of convergence The book ponders on solving systems of linear interval equations interval least squares existence of solutions and iterations for nonlinear equations and interval methods for algebraic equations Topics include interval methods for single equations diagnosing collinearity interval linear equations effects of nonlinearity and bounding the solutions The publication is a valuable source of data for computer science experts and researchers interested in the role of interval methods in reliable scientific computing **Reliable Engineering Computing** ,

Computational Physics Devang Patil,2025-02-20 Computational Physics Basic Concepts serves as an indispensable guide for students researchers and enthusiasts exploring the intersection of physics and computational methods This book offers a comprehensive exploration of the fundamental principles of computational physics providing a solid foundation to tackle complex problems in various branches of physics The book begins by elucidating the foundational principles and theoretical underpinnings essential for effective computational simulations It covers a variety of numerical techniques including finite difference methods and Monte Carlo simulations with practical examples and applications Recognizing the importance of coding skills it includes a section on programming tailored for physicists teaching readers to implement numerical algorithms using popular programming languages Computational Physics Basic Concepts extends its coverage to diverse branches of physics such as classical mechanics electromagnetism quantum mechanics and statistical physics illustrating the versatility of computational techniques Each chapter includes problem solving exercises designed to reinforce understanding and enhance computational skills Techniques for data visualization and interpretation are discussed enabling effective communication of findings The book also shares practical tips and best practices to optimize computational workflows and avoid common pitfalls Whether you re a student new to computational physics or a seasoned researcher Computational Physics Basic Concepts provides a thorough and accessible resource for mastering the essential elements of this dynamic field Progress In Analysis And Its Applications - Proceedings Of The 7th International Isaac Congress Michael Ruzhansky,Jens Wirth,2010-07-29 The International Society for Analysis its Applications and Computation ISAAC has held its international congresses biennially since 1997 This proceedings volume reports on the progress in analysis applications and computation in recent years as covered and discussed at the 7th ISAAC Congress This volume includes papers on partial differential equations function spaces operator theory integral transforms and equations potential theory complex analysis

and generalizations stochastic analysis inverse problems homogenization continuum mechanics mathematical biology and medicine With over 500 participants from almost 60 countries attending the congress the book comprises a broad selection of contributions in different topics   **Mathematical and Computational Modeling** Roderick Melnik,2015-05-21 Mathematical and Computational Modeling Illustrates the application of mathematical and computational modeling in a variety of disciplines With an emphasis on the interdisciplinary nature of mathematical and computational modeling Mathematical and Computational Modeling With Applications in the Natural and Social Sciences Engineering and the Arts features chapters written by well known international experts in these fields and presents readers with a host of state of theart achievements in the development of mathematical modeling and computational experiment methodology The book is a valuable guide to the methods ideas and tools of applied and computational mathematics as they apply to other disciplines such as the natural and social sciences engineering and technology The book also features Rigorous mathematical procedures and applications as the driving force behind mathematical innovation and discovery Numerous examples from a wide range of disciplines to emphasize the multidisciplinary application and universality of applied mathematics and mathematical modeling Original results on both fundamental theoretical and applied developments in diverse areas of human knowledge Discussions that promote interdisciplinary interactions between mathematicians scientists and engineers Mathematical and Computational Modeling With Applications in the Natural and Social Sciences Engineering and the Arts is an ideal resource for professionals in various areas of mathematical and statistical sciences modeling and simulation physics computer science engineering biology and chemistry and industrial and computational engineering The book also serves as an excellent textbook for graduate courses in mathematical modeling applied mathematics numerical methods operations research and optimization   *Bio-inspired Computing: Theories and Applications* Jianyong Qiao,Xinchao Zhao,Linqiang Pan,Xingquan Zuo,Xingyi Zhang,Qingfu Zhang,Shanguo Huang,2018-10-17 This two volume set CCIS 951 and CCIS 952 constitutes the proceedings of the 13th International Conference on Bio inspired Computing Theories and Applications BIC TA 2018 held in Beijing China in November 2018 The 88 full papers presented in both volumes were selected from 206 submissions The papers deal with studies abstracting computing ideas such as data structures operations with data ways to control operations computing models from living phenomena or biological systems such as evolution cells neural networks immune systems swarm intelligence   **Lectures on Finite Precision Computations** Francoise Chaitin-Chatelin,Valérie Frayssé,1996-01-01 Finite precision computations are at the heart of the daily activities of many engineers and researchers in all branches of applied mathematics Written in an informal style the book combines techniques from engineering and mathematics to describe the rigorous and novel theory of computability in finite precision In the challenging cases of nonlinear problems theoretical analysis is supplemented by software tools to explore the stability on the computer   **Developments in Reliable Computing** Tibor Csendes,2013-04-17 The SCAN conference the International Symposium

on Scientific Com puting Computer Arithmetic and Validated Numerics takes place bian nually under the joint auspices of GAMM Gesellschaft fiir Angewandte Mathematik und Mechanik and IMACS International Association for Mathematics and Computers in Simulation SCAN 98 attracted more than 100 participants from 21 countries all over the world During the four days from September 22 to 25 nine highlighted plenary lectures and over 70 contributed talks were given These figures indicate a large participation which was partly caused by the attraction of the organizing country Hungary but also the effec tive support system have contributed to the success The conference was substantially supported by the Hungarian Research Fund OTKA GAMM the National Technology Development Board OMFB and by the J6zsef Attila University Due to this funding it was possible to subsidize the participation of over 20 scientists mainly from Eastern European countries It is important that the possibly first participation of 6 young researchers was made possible due to the obtained support The number of East European participants was relatively high These results are especially valuable since in contrast to the usual 2 years period the present meeting was organized just one year after the last SCAN xx conference **Qualitative Computing** Françoise Chatelin,Françoise Chaitin-Chatelin,2012 Introduction to Qualitative Computing Hypercomputation in Dickson Algebras Scales of Complexity and Linear Reachability Singular Values for the Multiplication Maps Computation Beyond Classical Logic Complexification of the Arithmetic Homotopic Deviation in Linear Algebra The Discrete and the Continuous Arithmetic in the Alternative Dickson Division Algebras The Real and the Complex **Innovative Approaches in Computational Structural Engineering** George C. Tsiatas,Vagelis Plevris,2020-04-22 Nowadays numerical computation has become one of the most vigorous tools for scientists researchers and professional engineers following the enormous progress made during the last decades in computing technology in terms of both computer hardware and software development Although this has led to tremendous achievements in computer based structural engineering the increasing necessity of solving complex problems in engineering requires the development of new ideas and innovative methods for providing accurate numerical solutions in affordable computing times This collection aims at providing a forum for the presentation and discussion of state of the art innovative developments concepts methodologies and approaches in scientific computation applied to structural engineering It involves a wide coverage of timely issues on computational structural engineering with a broad range of both research and advanced practical applications This Research Topic encompasses but is not restricted to the following scientific areas modeling in structural engineering finite element methods boundary element methods static and dynamic analysis of structures structural stability structural mechanics meshless methods smart structures and systems fire engineering blast engineering structural reliability structural health monitoring and control optimization and composite materials with application to engineering structures Scientific and Technical Aerospace Reports ,1995 *Randomization, Relaxation, and Complexity in Polynomial Equation Solving* Leonid Gurvits,2011 This volume corresponds to the Banff International Research Station Workshop on Randomization Relaxation and Complexity held

from February 28 March 5 2010 It contains a sample of advanced algorithmic techniques underpinning the solution of systems of polynomial equations The papers are written by leading experts in algorithmic algebraic geometry and examine core topics   Artificial Neural Nets and Genetic Algorithms Rudolf F. Albrecht,Colin R. Reeves,Nigel C. Steele,2012-12-06 Artificial neural networks and genetic algorithms both are areas of research which have their origins in mathematical models constructed in order to gain understanding of important natural processes By focussing on the process models rather than the processes themselves significant new computational techniques have evolved which have found application in a large number of diverse fields This diversity is reflected in the topics which are the subjects of contributions to this volume There are contributions reporting theoretical developments in the design of neural networks and in the management of their learning In a number of contributions applications to speech recognition tasks control of industrial processes as well as to credit scoring and so on are reflected Regarding genetic algorithms several methodological papers consider how genetic algorithms can be improved using an experimental approach as well as by hybridizing with other useful techniques such as tabu search The closely related area of classifier systems also receives a significant amount of coverage aiming at better ways for their implementation Further while there are many contributions which explore ways in which genetic algorithms can be applied to real problems nearly all involve some understanding of the context in order to apply the genetic algorithm paradigm more successfully That this can indeed be done is evidenced by the range of applications covered in this volume   Reliable Plan Selection By Intelligent Machines John E Mclnroy,Joseph C Musto,George N Saridis,1996-02-29 This book derives techniques which allow reliable plans to be automatically selected by Intelligent Machines It concentrates on the uncertainty analysis of candidate plans so that a highly reliable candidate may be identified and used For robotic components such as a particular vision algorithm for pose estimation or a joint controller methods are explained for directly calculating the reliability However these methods become excessively complex when several components are used together to complete a plan Consequently entropy minimization techniques are used to estimate which complex tasks will perform reliably The book first develops tools for directly calculating the reliability of sub systems and methods of using entropy minimization to greatly facilitate the analysis are explained Since these sub systems are used together to accomplish complex tasks the book then explains how complex tasks can be efficiently evaluated   Computational Science and Its Applications - ICCSA 2008 Osvaldo Gervasi,Beniamino Murgante,Antonio Laganà,Youngsong Mun,David Taniar,2008-06-24 The two volume set LNCS 5072 and 5073 constitutes the refereed proceedings of the International Conference on Computational Science and Its Applications ICCSA 2008 held in Perugia Italy in June July 2008 The two volumes contain papers presenting a wealth of original research results in the field of computational science from foundational issues in computer science and mathematics to advanced applications in virtually all sciences making use of computational techniques The topics of the fully refereed papers are structured according to the five major conference themes computational methods algorithms and scientific

applications high performance technical computing and networks advanced and emerging applications geometric modelling graphics and visualization as well as information systems and information technologies Moreover submissions from more than 20 workshops and technical sessions in the areas such as embedded systems geographical analysis computational geometry computational geomatics computer graphics virtual reality computer modeling computer algebra mobile communications wireless networks computational forensics data storage information security web learning software engineering computational intelligence digital security biometrics molecular structures material design ubiquitous computing symbolic computations web systems and intelligence and e education contribute to this publication

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