Elliptic Problem Solvers II

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Elliptic Problem Solvers:

Elliptic Problem Solvers Martin H. Schultz,2014-05-10 Elliptic Problem Solvers provides information pertinent to some aspects of the numerical solution of elliptic partial differential equations This book presents the advances in developing elliptic problem solvers and analyzes their performance Organized into 40 chapters this book begins with an overview of the approximate solution of using a standard Galerkin method employing piecewise linear triangular finite elements This text then defines the types of vector architecture and discusses the variation in performance that can occur on a vector processor as a function of algorithm and implementation Other chapters consider the implementation of techniques for elliptical problems This book discusses as well the six techniques for the solution of nonsymmetric linear systems arising from finite difference discretization of the convection diffusion equation The final chapter deals with the basic semiconductor device equations This book is a valuable resource for electrical and computer engineers scientists computer programmers pure mathematicians and research workers   Elliptic Problem Solvers Garrett Birkhoff,Arthur Schoenstadt,2014-05-10 Elliptic Problem Solvers II covers the proceedings of the Elliptic Problem Solvers Conference held at the Naval Postgraduate School in Monterey California from January 10 to 12 1983 The book focuses on various aspects of the numerical solution of elliptic boundary value problems The selection first offers information on building elliptic problem solvers with ELLPACK presentation and evolution of the club module and a fourth order accurate fast direct method for the Helmholtz equation The text then examines the ITPACK project CMMPAK solving elliptic problems on an array processor system and parallel architectures for iterative methods on adaptive block structured grids Topics include adaptive solution algorithm data structure elliptic problem solvers input data and vector ITPACK The publication ponders on conjugate gradient preconditioners for vector and parallel processors an algebra for systolic computation and an incomplete Cholesky factorization by a matrix partition algorithm The book also tackles the numerical solution of a model equation near the onset of the Rayleigh Benard instability numerical methods for solving coupled semiconductor equations on a minicomputer and analysis of nonlinear elliptic systems arising in reaction diffusion modeling The selection is highly recommended for researchers interested in elliptic problem solvers   Elliptic Problem Solvers ,1985   *Algorithms for Elliptic Problems* Marián Vajtersic,2013-03-09 This volume deals with problems of modern effective algorithms for the numerical solution of the most frequently occurring elliptic partial differential equations From the point of view of implementation attention is paid to algorithms for both classical sequential and parallel computer systems The first two chapters are devoted to fast algorithms for solving the Poisson and biharmonic equation In the third chapter parallel algorithms for model parallel computer systems of the SIMD and MIMD types are described The implementation aspects of parallel algorithms for solving model elliptic boundary value problems are outlined for systems with matrix pipeline and multiprocessor parallel computer architectures A modern and popular multigrid computational principle which offers a good opportunity for a parallel

realization is described in the next chapter More parallel variants based in this idea are presented whereby methods and assignments strategies for hypercube systems are treated in more detail The last chapter presents VLSI designs for solving special tridiagonal linear systems of equations arising from finite difference approximations of elliptic problems For researchers interested in the development and application of fast algorithms for solving elliptic partial differential equations using advanced computer systems **Elliptic Problem Solvers Conference** ,1981 **On Some Trends in Elliptic Problem Solvers** S. C. Eisenstat,M. H. Schultz,YALE UNIV NEW HAVEN CT DEPT OF COMPUTER SCIENCE.,1981 Elliptic boundary value problems are at the core of many systems of partial differential equations occurring in mechanics Examples of applications include fluid dynamics semiconductor device modelling and structural analysis Thus it is important to have efficient and robust elliptic problem solvers In this paper we discuss some of the issues involved in the design of a high technology elliptic problem solver In particular we will concentrate our attention on the design of a modular heterogeneous multi processor elliptic problem solver consisting of a host computer and one or more peripheral processors ELLIPTIC PROBLEM SOLVERS II Garrett Birkhoff,Arthur Schoenstadt,1984 *Solving Elliptic Problems Using ELLPACK* John R. Rice,Ronald F. Boisvert,2012-12-06 ELLP ACK is a many faceted system for solving elliptic partial differential equations It is a forerunner of the very high level problem solving environments or expert systems that will become common in the next decade While it is still far removed from the goals of the future it is also far advanced compared to the Fortran library approach in common current use Many people will find ELLP ACK an easy way to solve simple or moderately complex elliptic problems Others will be able to solve really hard problems by digging a little deeper into ELLP ACK ELLP ACK is a research tool for the study of numerical methods for solving elliptic problems Its original purpose was for the evaluation and comparison of numerical software for elliptic problems Simple examples of this use are given in Chapters 9 11 The general conclusion is that there are many ways to solve most elliptic problems there are large differences in their efficiency and the most common ways are often less efficient sometimes dramatically so **Elliptic Problem Solvers** ,1984 Elliptic Problem Solvers Garrett Birkhoff,Elliptic Problem Solvers Conference,1984 Elliptic Problem Solvers II Arthur Schoenstadt,Garrett Birkhoff,1984 **Solving Elliptic Problems Using ELLPACK** John Rischard Rice,Ronald F. Boisvert,1985 **Elliptic Problem Solvers** Garrett Birkhoff,1984 **Experiments with Elliptic Problem Solvers on the Cedar Multicluster** G. Frank,Efstratios J. Gallopoulos,U. von Meier,1990 Abstract The implementation and performance of algorithms for the solution of elliptic problems on the Cedar multiprocessor is examined The algorithms considered are conjugate gradient schemes with or without preconditioning on a rectangular domain and domain decomposition techniques with overlapping Schwarz Alternating Method and nonoverlapping subdomains on a T shaped domain We present some preliminary results from our current research effort Proceedings of the Elliptic Problem Solvers Conference ,1981 **Intelligent Mathematical Software Systems** E.N. Houstis,R. Vichnevetsky,J.R. Rice,1990-07-03 Most of the well

known mathematical software systems are batch oriented though in the past few years there have been attempts to incorporate knowledge or expertise into these systems A number of developments have helped in making the systems more powerful and user friendly algorithm parameter selection for the solution of well defined mathematical engineering problems parallel computing computer graphics technology interface development tools and of course the years of experience with these systems and the increase in available computing power have made it practical to fulfill the potential seen in the early years of their development This book covers four main areas of the subject Application Oriented Expert Systems Advisory Systems Knowledge Manipulation Issues and User Interfaces   Fast Direct Solvers for Elliptic PDEs Per-Gunnar Martinsson,2019-12-16 Fast solvers for elliptic PDEs form a pillar of scientific computing They enable detailed and accurate simulations of electromagnetic fields fluid flows biochemical processes and much more This textbook provides an introduction to fast solvers from the point of view of integral equation formulations which lead to unparalleled accuracy and speed in many applications The focus is on fast algorithms for handling dense matrices that arise in the discretization of integral operators such as the fast multipole method and fast direct solvers While the emphasis is on techniques for dense matrices the text also describes how similar techniques give rise to linear complexity algorithms for computing the inverse or the LU factorization of a sparse matrix resulting from the direct discretization of an elliptic PDE This is the first textbook to detail the active field of fast direct solvers introducing readers to modern linear algebraic techniques for accelerating computations such as randomized algorithms interpolative decompositions and data sparse hierarchical matrix representations Written with an emphasis on mathematical intuition rather than theoretical details it is richly illustrated and provides pseudocode for all key techniques Fast Direct Solvers for Elliptic PDEs is appropriate for graduate students in applied mathematics and scientific computing engineers and scientists looking for an accessible introduction to integral equation methods and fast solvers and researchers in computational mathematics who want to quickly catch up on recent advances in randomized algorithms and techniques for working with data sparse matrices   **Multigrid Methods** Stephen F. McCormick,1987-12-01 A thoughtful consideration of the current level of development of multigrid methods this volume is a carefully edited collection of papers that addresses its topic on several levels The first three chapters orient the reader who is familiar with standard numerical techniques to multigrid methods first by discussing multigrid in the context of standard techniques second by detailing the mechanics of use of the method and third by applying the basic method to some current problems in fluid dynamics The fourth chapter provides a unified development complete with theory of algebraic multigrid AMG which is a linear equation solver based on multigrid principles The last chapter is an ambitious development of a very general theory of multigrid methods for variationally posed problems Included as an appendix is the latest edition of the Multigrid Bibliography an attempted compilation of all existing research publications on multigrid   First International Symposium on Domain Decomposition Methods for Partial Differential Equations R. Glowinski,Groupe pour l'avancement des

m?thodes num?riques dans les sciences de l'ing?nieur,Soci?t? de math?matiques appliqu?es et industrielles,1988-01-01

Optimization in Solving Elliptic Problems Eugene G. D'yakonov,2018-05-04 Optimization in Solving Elliptic Problems focuses on one of the most interesting and challenging problems of computational mathematics the optimization of numerical algorithms for solving elliptic problems It presents detailed discussions of how asymptotically optimal algorithms may be applied to elliptic problems to obtain numerical solutions meeting certain specified requirements Beginning with an outline of the fundamental principles of numerical methods this book describes how to construct special modifications of classical finite element methods such that for the arising grid systems asymptotically optimal iterative methods can be applied Optimization in Solving Elliptic Problems describes the construction of computational algorithms resulting in the required accuracy of a solution and having a pre determined computational complexity Construction of asymptotically optimal algorithms is demonstrated for multi dimensional elliptic boundary value problems under general conditions In addition algorithms are developed for eigenvalue problems and Navier Stokes problems The development of these algorithms is based on detailed discussions of topics that include accuracy estimates of projective and difference methods topologically equivalent grids and triangulations general theorems on convergence of iterative methods mixed finite element methods for Stokes type problems methods of solving fourth order problems and methods for solving classical elasticity problems Furthermore the text provides methods for managing basic iterative methods such as domain decomposition and multigrid methods These methods clearly developed and explained in the text may be used to develop algorithms for solving applied elliptic problems The mathematics necessary to understand the development of such algorithms is provided in the introductory material within the text and common specifications of algorithms that have been developed for typical problems in mathema

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