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KEY=PETER - JAYCE HALLIE

An Introduction to Parallel Programming

Morgan Kaufmann An Introduction to Parallel Programming, Second Edition presents a tried-and-true tutorial approach that shows students how to develop effective parallel programs with MPI, Pthreads and OpenMP. As the first undergraduate text to directly address compiling and running parallel programs on multi-core and cluster architecture, this second edition carries forward its clear explanations for designing, debugging and evaluating the performance of distributed and shared-memory programs while adding coverage of accelerators via new content on GPU programming and heterogeneous programming. New and improved user-friendly exercises teach students how to compile, run and modify example programs. Takes a tutorial approach, starting with small programming examples and building progressively to more challenging examples Explains how to develop parallel programs using MPI, Pthreads and OpenMP programming models A robust package of online ancillaries for instructors and students includes lecture slides, solutions manual, downloadable source code, and an image bank New to this edition: New chapters on GPU programming and heterogeneous programming New examples and exercises related to parallel algorithms

Parallel Programming with MPI

Morgan Kaufmann Mathematics of Computing -- Parallelism.

An Introduction to Parallel Programming

Lulu.com An introduction to parallel programming with openmpi using C. It is written so that someone with even a basic understanding of programming can begin to write mpi based parallel programs.

A Practical Approach to High-Performance Computing

Springer Nature The book discusses the fundamentals of high-performance computing. The authors combine visualization, comprehensibility, and strictness in their material presentation, and thus influence the reader towards practical application and learning how to solve real computing problems. They address both key approaches to programming modern computing systems: multithreading-based parallelizing in shared memory systems, and applying message-passing technologies in distributed systems. The book is suitable for undergraduate and graduate students, and for researchers and practitioners engaged with high-performance computing systems. Each chapter begins with a theoretical part, where the relevant terminology is introduced along with the basic theoretical results and methods of parallel programming, and concludes with a list of test questions and problems of varying difficulty. The authors include many solutions and hints, and often sample code.

Parallel Programming

for Multicore and Cluster Systems

Springer Science & Business Media Innovations in hardware architecture, like hyper-threading or multicore processors, mean that parallel computing resources are available for inexpensive desktop computers. In only a few years, many standard software products will be based on concepts of parallel programming implemented on such hardware, and the range of applications will be much broader than that of scientific computing, up to now the main application area for parallel computing. Rauber and Runger take up these recent developments in processor architecture by giving detailed descriptions of parallel programming techniques that are necessary for developing efficient programs for multicore processors as well as for parallel cluster systems and supercomputers. Their book is structured in three main parts, covering all areas of parallel computing: the architecture of parallel systems, parallel programming models and environments, and the implementation of efficient application algorithms. The emphasis lies on parallel programming techniques needed for different architectures. The main goal of the book is to present parallel programming techniques that can be used in many situations for many application areas and which enable the reader to develop correct and efficient parallel programs. Many examples and exercises are provided to show how to apply the techniques. The book can be used as both a textbook for students and a reference book for professionals. The presented material has been used for courses in parallel programming at

different universities for many years.

Introduction to Parallel Computing

Cambridge University Press A comprehensive guide for students and practitioners to parallel computing models, processes, metrics, and implementation in MPI and OpenMP.

Jets From Young Stars V

High Performance Computing and Applications

Springer Science & Business Media Studying the complex physical systems of stellar jets necessitates the incorporation of nonlinear effects which occur on a wide variety of length and timescales. One of the primary methods used to study the physics of jets is numerical simulations that apply high performance computing techniques. Such techniques are also required for analysing the huge modern astrophysical datasets. This book examines those computing techniques. It is a collection of the lectures from the fifth and final school of the JETSET network, "Jets From Young Stars V: High Performance Computing in Astrophysics." It begins with an introduction to parallel programming techniques, with an emphasis on Message Passing Interface (MPI), before it goes on to review grid technology techniques and offer a practical introduction to Virtual Observatory. The second half of the book, then, is devoted to applications of high performance computing techniques, including 3D radiation transfer, to jet and star formation processes. Aimed at graduate students in astrophysics, this book presents state-of-the-art methods, thereby offering interesting new insights to researchers in the field.

Computational Methods of Linear Algebra

John Wiley & Sons

Euro-Par' 99 Parallel Processing

5th International Euro-Par Conference Toulouse, France, August 31–September 3, 1999 Proceedings

Springer Science & Business Media Euro-Par is an international conference dedicated to the promotion and advancement of all aspects of parallel computing. The major themes can be divided into the broad categories of hardware, software, algorithms and applications for parallel computing. The objective of Euro-Par is to provide a forum within which to promote the development of parallel computing both as an industrial technique and an academic discipline, extending the frontier of both the state of the art and the state of the practice. This is particularly important at a time when parallel computing is undergoing strong and sustained development and experiencing real industrial take-up. The main audience for and participants in Euro-Par are seen as researchers in academic departments, government laboratories and industrial organisations. Euro-Par's objective is to become the primary choice of such professionals for the presentation of new results in their specific areas. Euro-Par is also interested in applications which demonstrate the effectiveness of the main Euro-Par themes. There is now a permanent Web site for the series <http://brahms.fmi.uni-passau.de/cl/europar> where the history of the conference is described. Euro-Par is now sponsored by the Association of Computer Machinery and the International Federation of Information Processing. Euro-Par'99 The format of Euro-Par'99 follows that of the past four conferences and consists of a number of topics each individually monitored by a committee of four. There were originally 23 topics for this year's conference. The call for papers attracted 343 submissions of which 188 were accepted. Of the papers accepted, 4 were judged as distinguished, 111 as regular and 73 as short papers.

Computational Methods of Linear Algebra

Third Edition

World Scientific Publishing Company This book presents methods for the computational solution of some important problems of linear algebra: linear systems, linear least squares problems, eigenvalue problems, and linear programming problems. The book also includes a chapter on the fast Fourier transform and a very practical introduction to the solution of linear algebra problems on modern supercomputers. The book contains the relevant theory for most of the methods employed. It also emphasizes the practical aspects involved in implementing the methods. Students using this book will actually see and write programs for solving linear algebraic problems. Highly readable FORTRAN and MATLAB codes are presented which solve all of the main problems studied.

A Tutorial on Elliptic PDE Solvers and Their

Parallelization

SIAM A Tutorial on Elliptic PDE Solvers and Their Parallelization is a valuable aid for learning about the possible errors and bottlenecks in parallel computing. One of the highlights of the tutorial is that the course material can run on a laptop, not just on a parallel computer or cluster of PCs, thus allowing readers to experience their first successes in parallel computing in a relatively short amount of time. This tutorial is intended for advanced undergraduate and graduate students in computational sciences and engineering; however, it may also be helpful to professionals who use PDE-based parallel computer simulations in the field.

Parallel Programming in C with MPI and OpenMP

McGraw-Hill Education The era of practical parallel programming has arrived, marked by the popularity of the MPI and OpenMP software standards and the emergence of commodity clusters as the hardware platform of choice for an increasing number of organizations. This exciting new book, Parallel Programming in C with MPI and OpenMP addresses the needs of students and professionals who want to learn how to design, analyze, implement, and benchmark parallel programs in C using MPI and/or OpenMP. It introduces a rock-solid design methodology with coverage of the most important MPI functions and OpenMP directives. It also demonstrates, through a wide range of examples, how to develop parallel programs that will execute efficiently on today's parallel platforms. If you are an instructor who has adopted the book and would like access to the additional resources, please contact your local sales rep. or Michelle Flomenhoft at: michelle_flomenhoft@mcgraw-hill.com.

Vector and Parallel Processing - VECPAR'98

Third International Conference Porto, Portugal, June 21-23, 1998 Selected Papers and Invited Talks

Springer This book constitutes the thoroughly refereed post-conference proceedings of the Third International Conference on Vector and Parallel Processing, VECPAR'98, held in Porto, Portugal, in June 1998. The 41 revised full papers presented were carefully selected during two rounds of reviewing and revision. Also included are six invited papers and introductory chapter surveys. The papers are organized in sections on eigenvalue problems and solutions of linear systems; computational fluid dynamics, structural analysis, and mesh partitioning; computing in education; computer organization, programming and benchmarking; image analysis and synthesis; parallel database servers; and nonlinear problems.

Computational Biomedicine

Oxford University Press Computational Biomedicine unifies the different strands of a broad-ranging subject to demonstrate the power of a tool that has the potential to revolutionise our understanding of the human body, and the therapeutic strategies available to maintain and protect it.

An Introduction to Computational Physics

Cambridge University Press Textbook introducing basic methods of computational physics and giving overview of several advanced topics; for advanced undergraduate or beginning graduate students.

Computer Science

The Hardware, Software and Heart of It

Springer Science & Business Media Computer Science: The Hardware, Software and Heart of It focuses on the deeper aspects of the two recognized subdivisions of Computer Science, Software and Hardware. These subdivisions are shown to be closely interrelated as a result of the stored-program concept. Computer Science: The Hardware, Software and Heart of It includes certain classical theoretical computer science topics such as Unsolvability (e.g. the halting problem) and Undecidability (e.g. Godel's incompleteness theorem) that treat problems that exist under the Church-Turing thesis of computation. These problem topics explain inherent limits lying at the heart of software, and in effect define boundaries beyond which computer science professionals cannot go beyond. Newer topics such as Cloud Computing are also covered in this book. After a survey of traditional programming languages (e.g. Fortran and C++), a new kind of computer Programming for parallel/distributed computing is presented using the message-passing paradigm which is at the heart of large clusters of computers. This leads to descriptions of current hardware platforms for large-scale computing, such as clusters of as many as one thousand which are the new generation of supercomputers. This also leads to a consideration of future quantum computers and a possible escape from the Church-Turing thesis to a new computation paradigm. The book's historical context is especially helpful during this, the centenary of Turing's birth. Alan Turing is widely regarded as the father of Computer Science, since many concepts in both the hardware and software of Computer Science can be traced to his pioneering research. Turing was a multi-faceted mathematician-engineer and was able to work on both concrete and abstract levels. This book shows how these two seemingly disparate aspects of Computer Science are intimately related. Further, the book treats the theoretical side of Computer Science as well, which also derives from Turing's research. Computer Science: The Hardware, Software and Heart of

It is designed as a professional book for practitioners and researchers working in the related fields of Quantum Computing, Cloud Computing, Computer Networking, as well as non-scientist readers. Advanced-level and undergraduate students concentrating on computer science, engineering and mathematics will also find this book useful.

Parallel Computer Architecture

A Hardware/Software Approach

Gulf Professional Publishing 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 issues and explore how the various techniques interact.

Forthcoming Books

Parallel Programming in OpenMP

*Elsevier The rapid and widespread acceptance of shared-memory multiprocessor architectures has created a pressing demand for an efficient way to program these systems. At the same time, developers of technical and scientific applications in industry and in government laboratories find they need to parallelize huge volumes of code in a portable fashion. OpenMP, developed jointly by several parallel computing vendors to address these issues, is an industry-wide standard for programming shared-memory and distributed shared-memory multiprocessors. It consists of a set of compiler directives and library routines that extend FORTRAN, C, and C++ codes to express shared-memory parallelism. Parallel Programming in OpenMP is the first book to teach both the novice and expert parallel programmers how to program using this new standard. The authors, who helped design and implement OpenMP while at SGI, bring a depth and breadth to the book as compiler writers, application developers, and performance engineers. * Designed so that expert parallel programmers can skip the opening chapters, which introduce parallel programming to novices, and jump right into the essentials of OpenMP. * Presents all the basic OpenMP constructs in FORTRAN, C, and C++. * Emphasizes practical concepts to address the concerns of real application developers. * Includes high quality example programs that illustrate concepts of parallel programming as well as all the constructs of OpenMP. * Serves as both an effective teaching text and a compact reference. * Includes end-of-chapter programming exercises.*

Parallel Scientific Computing

Theory, Algorithms, and Applications of Mesh Based and Meshless Methods

Springer This book is concentrated on the synergy between computer science and numerical analysis. It is written to provide a firm understanding of the described approaches to computer scientists, engineers or other experts who have to solve real problems. The meshless solution approach is described in more detail, with a description of the required algorithms and the methods that are needed for the design of an efficient computer program. Most of the details are demonstrated on solutions of practical problems, from basic to more complicated ones. This book will be a useful tool for any reader interested in solving complex problems in real computational domains.

Parallel Scientific Computing in C++ and MPI

A Seamless Approach to Parallel Algorithms and their Implementation

Cambridge University Press Numerical algorithms, modern programming techniques, and parallel computing are often taught serially across different courses and different textbooks. The need to integrate concepts and tools usually comes only in employment or in research - after the courses are concluded - forcing the student to synthesise what is perceived to be three independent subfields into one. This book provides a seamless approach to stimulate the student simultaneously through the eyes of multiple disciplines, leading to enhanced understanding of scientific computing as a whole. The book includes both basic as well as advanced topics and places equal emphasis on the discretization of partial differential equations and on solvers. Some of the advanced topics include wavelets, high-order methods, non-symmetric systems, and parallelization of sparse systems. The material covered is suited to students from engineering, computer science, physics and mathematics.

Handbook of Parallel Computing and Statistics

CRC Press Technological improvements continue to push back the frontier of processor speed in modern computers. Unfortunately, the computational intensity demanded by modern research problems grows even faster. Parallel computing has emerged as the most

successful bridge to this computational gap, and many popular solutions have emerged based on its concepts

Introduction to Parallel Computing

Oxford University Press This is a practical student guide to scientific computing on parallel computers, working up from a hardware instruction level, to shared memory machines, and finally to distributed memory machines.

Parallele Programmierung

Springer-Verlag Multiprozessor-Desktoprechner, Cluster von PCs und Innovationen wie Hyperthreading oder Multicore-Prozessoren machen parallele Rechenressourcen allgegenwärtig. Die Ausnutzung dieser Rechenleistung ist jedoch nur durch parallele Programmier Techniken möglich. Das Buch stellt diese Techniken für herkömmliche Parallelrechner und für neuartige Plattformen umfassend dar. Neben den Grundlagen der parallelen Programmierung werden Programmierumgebungen wie Pthreads, Java-Threads, OpenMP, MPI oder PVM sowie die zugehörigen Programmiermodelle behandelt.

The Art of Multiprocessor Programming, Revised Reprint

Elsevier Revised and updated with improvements conceived in parallel programming courses, *The Art of Multiprocessor Programming* is an authoritative guide to multicore programming. It introduces a higher level set of software development skills than that needed for efficient single-core programming. This book provides comprehensive coverage of the new principles, algorithms, and tools necessary for effective multiprocessor programming. Students and professionals alike will benefit from thorough coverage of key multiprocessor programming issues. This revised edition incorporates much-demanded updates throughout the book, based on feedback and corrections reported from classrooms since 2008 Learn the fundamentals of programming multiple threads accessing shared memory Explore mainstream concurrent data structures and the key elements of their design, as well as synchronization techniques from simple locks to transactional memory systems Visit the companion site and download source code, example Java programs, and materials to support and enhance the learning experience

Using MPI

Portable Parallel Programming with the Message-passing Interface

MIT Press The authors introduce the core function of the Message Printing Interface (MPI). This edition adds material on the C++ and Fortran 90 binding for MPI.

Introduction to Parallel Computing

A practical guide with examples in C

OUP Oxford In the last few years, courses on parallel computation have been developed and offered in many institutions in the UK, Europe and US as a recognition of the growing significance of this topic in mathematics and computer science. There is a clear need for texts that meet the needs of students and lecturers and this book, based on the author's lecture at ETH Zurich, is an ideal practical student guide to scientific computing on parallel computers working up from a hardware instruction level, to shared memory machines, and finally to distributed memory machines. Aimed at advanced undergraduate and graduate students in applied mathematics, computer science, and engineering, subjects covered include linear algebra, fast Fourier transform, and Monte-Carlo simulations, including examples in C and, in some cases, Fortran. This book is also ideal for practitioners and programmers.

Parallele und verteilte Programmierung

Springer-Verlag Das Buch behandelt die praktischen Aspekte paralleler und verteilter Programmierung und stellt die zugrundeliegenden Konzepte in angemessener Tiefe dar. Wesentlich ist dabei das Zusammenspiel der parallelen Eigenschaften des jeweiligen Anwendungsproblems, der Programmierumgebung und der Architektur des Parallelrechners. Dementsprechend werden in den einzelnen Kapiteln die unterschiedlichen Typen von Parallelrechnern und parallelen Plattformen betrachtet, ein Überblick über parallele Programmierumgebungen gegeben und Charakteristika wichtiger Anwendungsalgorithmen beschrieben. Breiten Raum nehmen die Darstellung und der Vergleich portabler Programmierplattformen wie PVM und MPI ein. Das Buch enthält insbesondere einen genauen Effizienzvergleich dieser Plattformen für viele aktuelle Parallelrechner und diskutiert die Anwendung auf Probleme, die für die Praxis der Natur- und Ingenieurwissenschaften sowie des Wissenschaftlichen Rechnens relevant sind.

Applied Parallel Computing

World Scientific The book provides a practical guide to computational scientists and engineers to help advance their research by exploiting the superpower of supercomputers with many processors and complex networks. This book focuses on the design and analysis of basic parallel algorithms, the key components for composing larger packages for a wide range of applications.

A Field Guide to Genetic Programming

Lulu.com Genetic programming (GP) is a systematic, domain-independent method for getting computers to solve problems automatically starting from a high-level statement of what needs to be done. Using ideas from natural evolution, GP starts from an ooze of random computer programs, and progressively refines them through processes of mutation and sexual recombination, until high-fitness solutions emerge. All this without the user having to know or specify the form or structure of solutions in advance. GP has generated a plethora of human-competitive results and applications, including novel scientific discoveries and patentable inventions. This unique overview of this exciting technique is written by three of the most active scientists in GP. See www.gp-field-guide.org.uk for more information on the book.

Computing the Electrical Activity in the Heart

Springer Science & Business Media This book describes mathematical models and numerical techniques for simulating the electrical activity in the heart. It gives an introduction to the most important models, followed by a detailed description of numerical techniques. Particular focus is on efficient numerical methods for large scale simulations on both scalar and parallel computers. The results presented in the book will be of particular interest to researchers in bioengineering and computational biology.

The Proceedings of the Twenty-ninth SIGCSE Technical Symposium on Computer Science Education

Parallel Processing and Applied Mathematics

4th International Conference, PPAM 2001 Naleczow, Poland, September 9-12, 2001 Revised Papers

Springer Science & Business Media This book constitutes the thoroughly refereed post-proceedings of the 4th International Conference on Parallel Processing and Applied Mathematics, PPAM 2002, held in Naleczow, Poland, in September 2001. The 101 papers presented were carefully reviewed and improved during two rounds of reviewing and revision. The book offers topical sections on distributed and grid architectures, scheduling and load balancing, performance analysis and prediction, parallel non-numerical algorithms, parallel programming, tools and environments, parallel numerical algorithms, applications, and evolutionary computing and neural networks.

The Future of Computing Performance

Game Over or Next Level?

National Academies Press The end of dramatic exponential growth in single-processor performance marks the end of the dominance of the single microprocessor in computing. The era of sequential computing must give way to a new era in which parallelism is at the forefront. Although important scientific and engineering challenges lie ahead, this is an opportune time for innovation in programming systems and computing architectures. We have already begun to see diversity in computer designs to optimize for such considerations as power and throughput. The next generation of discoveries is likely to require advances at both the hardware and software levels of computing systems. There is no guarantee that we can make parallel computing as common and easy to use as yesterday's sequential single-processor computer systems, but unless we aggressively pursue efforts suggested by the recommendations in this book, it will be "game over" for growth in computing performance. If parallel programming and related software efforts fail to become widespread, the development of exciting new applications that drive the computer industry will stall; if such innovation stalls, many other parts of the economy will follow suit. The Future of Computing Performance describes the factors that have led to the future limitations on growth for single processors that are based on complementary metal oxide semiconductor (CMOS) technology. It explores challenges inherent in parallel computing and architecture, including ever-increasing power consumption and the escalated requirements for heat dissipation. The book delineates a research, practice, and education agenda to help overcome these challenges. The Future of Computing Performance will guide researchers, manufacturers, and information technology professionals in the right direction for sustainable growth in computer performance, so that we may all enjoy the next level of benefits to society.

The Proceedings of the Twenty-ninth SIGCSE Technical Symposium on Computer Science Education

February 25 - March 1, 1998 Atlanta, Georgia

Proceedings -- General.

CUDA by Example

An Introduction to General-Purpose GPU Programming, Portable Documents

Addison-Wesley Professional CUDA is a computing architecture designed to facilitate the development of parallel programs. In conjunction with a comprehensive software platform, the CUDA Architecture enables programmers to draw on the immense power of graphics processing units (GPUs) when building high-performance applications. GPUs, of course, have long been available for demanding graphics and game applications. CUDA now brings this valuable resource to programmers working on applications in other domains, including science, engineering, and finance. No knowledge of graphics programming is required—just the ability to program in a modestly extended version of C. CUDA by Example, written by two senior members of the CUDA software platform team, shows programmers how to employ this new technology. The authors introduce each area of CUDA development through working examples. After a concise introduction to the CUDA platform and architecture, as well as a quick-start guide to CUDA C, the book details the techniques and trade-offs associated with each key CUDA feature. You'll discover when to use each CUDA C extension and how to write CUDA software that delivers truly outstanding performance. Major topics covered include Parallel programming Thread cooperation Constant memory and events Texture memory Graphics interoperability Atomics Streams CUDA C on multiple GPUs Advanced atomics Additional CUDA resources All the CUDA software tools you'll need are freely available for download from NVIDIA. <http://developer.nvidia.com/object/cuda-by-example.html>

A Tutorial on Elliptic PDE Solvers and Their Parallelization

SIAM This compact yet thorough tutorial is the perfect introduction to the basic concepts of solving partial differential equations (PDEs) using parallel numerical methods. In just eight short chapters, the authors provide readers with enough basic knowledge of PDEs, discretization methods, solution techniques, parallel computers, parallel programming, and the run-time behavior of parallel algorithms to allow them to understand, develop, and implement parallel PDE solvers. Examples throughout the book are intentionally kept simple so that the parallelization strategies are not dominated by technical details.

Parallel Programming in MPI and OpenMP

Lulu.com

Numerical Mathematics and Computing

Cengage Learning Authors Ward Cheney and David Kincaid show students of science and engineering the potential computers have for solving numerical problems and give them ample opportunities to hone their skills in programming and problem solving. NUMERICAL MATHEMATICS AND COMPUTING, 7th Edition also helps students learn about errors that inevitably accompany scientific computations and arms them with methods for detecting, predicting, and controlling these errors. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Advanced Computational Infrastructures for Parallel and Distributed Adaptive Applications

John Wiley & Sons A unique investigation of the state of the art in design, architectures, and implementations of advanced computational infrastructures and the applications they support Emerging large-scale adaptive scientific and engineering applications are requiring an increasing amount of computing and storage resources to provide new insights into complex systems. Due to their runtime adaptivity, these applications exhibit complicated behaviors that are highly dynamic, heterogeneous, and unpredictable—and therefore require full-fledged computational infrastructure support for problem solving, runtime management, and dynamic partitioning/balancing. This book presents a comprehensive study of the design, architecture, and implementation of advanced computational infrastructures as well as the adaptive applications developed and deployed using these infrastructures from different perspectives, including system architects, software engineers, computational scientists, and application scientists. Providing insights into recent research efforts and projects, the authors include descriptions and experiences pertaining to the realistic modeling of adaptive applications on parallel and distributed systems. The first part of the book focuses on high-performance adaptive scientific applications and includes chapters that describe high-impact, real-world application scenarios in order to motivate the need for advanced computational engines as well as to outline their requirements. The second part identifies popular and widely used adaptive computational infrastructures. The third part focuses on the more specific partitioning and runtime management schemes underlying

these computational toolkits. Presents representative problem-solving environments and infrastructures, runtime management strategies, partitioning and decomposition methods, and adaptive and dynamic applications Provides a unique collection of selected solutions and infrastructures that have significant impact with sufficient introductory materials Includes descriptions and experiences pertaining to the realistic modeling of adaptive applications on parallel and distributed systems The cross-disciplinary approach of this reference delivers a comprehensive discussion of the requirements, design challenges, underlying design philosophies, architectures, and implementation/deployment details of advanced computational infrastructures. It makes it a valuable resource for advanced courses in computational science and software/systems engineering for senior undergraduate and graduate students, as well as for computational and computer scientists, software developers, and other industry professionals.