Programming is now parallel programming. Much as structured programming revolutionized traditional serial programming decades ago, a new kind of structured programming, based on patterns, is relevant to parallel programming today. Parallel computing experts and industry insiders Michael McCool, Arch Robison, and James Reinders describe how to design and implement maintainable and efficient parallel algorithms using a pattern-based approach. They present both theory and practice, and give detailed concrete examples using multiple programming models. Examples are primarily given using two of the most popular and cutting edge programming models for parallel programming: Threading Building Blocks, and Cilk Plus. These architecture-independent models enable easy integration into existing applications, preserve investments in existing code, and speed the development of parallel applications. Examples from realistic contexts illustrate patterns and themes in parallel algorithm design that are widely applicable regardless of implementation technology. The patterns-based approach offers structure and insight that developers can apply to a variety of parallel programming models. Develops a composable, structured, scalable, and machine-independent approach to parallel computing. Includes detailed examples in both Cilk Plus and the latest Threading Building Blocks, which support a wide variety of computers.

Parallel Programming: Concepts and Practice provides an upper level introduction to parallel programming. In addition to covering general parallelism concepts, this text teaches practical programming skills for both shared memory and distributed memory architectures. The authors’ open-source system for automated code evaluation provides easy access to parallel computing resources, making the book particularly suitable for classroom settings. Covers parallel programming approaches for single computer nodes and HPC clusters: OpenMP, multithreading, SIMD vectorization, MPI, UPC++. Contains numerous practical parallel programming exercises. Includes access to an automated code evaluation tool that enables students the opportunity to program in a web browser and receive immediate feedback on the result validity of their program. Features an example-based teaching of concept to enhance learning outcomes.

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

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

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 Rünger 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.

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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.

What does Google’s management of billions of Web pages have in common with analysis of a genome with billions of nucleotides? Both apply methods that coordinate many processors to accomplish a single task. From mining genomes to the World Wide Web, from modeling financial markets to global weather patterns, parallel computing enables computations that would otherwise be impractical if not impossible with sequential approaches alone. Its fundamental role as an enabler of simulations and data analysis continues an advance in a wide range of application areas. Scientific Parallel Computing is the first textbook to integrate all the fundamentals of parallel computing in a single volume while also providing a basis for a deeper understanding of
the subject. Designed for graduate and advanced undergraduate courses in the sciences and in engineering, computer science, and mathematics, it focuses on the three key areas of algorithms, architecture, languages, and their crucial synthesis in performance. The book’s computational examples, whose math prerequisites are not beyond the level of advanced calculus, derive from a breadth of topics in scientific and engineering simulation and data analysis. The programming exercises presented early in the book are designed to bring students up to speed quickly, while the book later develops projects challenging enough to guide students toward research questions in the field. The new paradigm of cluster computing is fully addressed. A supporting web site provides access to all the codes and software mentioned in the book, and offers topical information on popular parallel computing systems. Integrates all the fundamentals of parallel computing essential for today’s high-performance requirements Ideal for graduate and advanced undergraduate students in the sciences and in engineering, computer science, and mathematics Extensive programming and theoretical exercises enable students to write parallel codes quickly More challenging projects later in the book introduce research questions New paradigm of cluster computing fully addressed Supporting web site provides access to all the codes and software mentioned in the book

Advancements in microprocessor architecture, interconnection technology, and software development have fueled rapid growth in parallel and distributed computing. However, this development is only of practical benefit if it is accompanied by progress in the design, analysis and programming of parallel algorithms. This concise textbook provides, in one place, three mainstream parallelization approaches, Open MPP, MPI and OpenCL, for multicore computers, interconnected computers and graphical processing units. An overview of practical parallel computing and principles will enable the reader to design efficient parallel programs for solving various computational problems on state-of-the-art personal computers and computing clusters. Topics covered range from parallel algorithms, programming tools, OpenMP, MPI and OpenCL, followed by experimental measurements of parallel programs’ run-times, and by engineering analysis of obtained results for improved parallel execution performances. Many examples and exercises support the exposition.

Topics in Parallel and Distributed Computing provides resources and guidance for those learning PDC as well as those teaching students new to the discipline. The pervasiveness of computing devices containing multicore CPUs and GPUs, including home and office PCs, laptops, and mobile devices, is making even common users dependent on parallel processing. Certainly, it is no longer sufficient for even basic programmers to acquire only the traditional sequential programming skills. The preceding trends point to the need for imparting a broad-based skill set in PDC technology. However, the rapid changes in computing hardware platforms and devices, languages, supporting programming environments, and research advances, poses a challenge both for newcomers and seasoned computer scientists. This edited collection has been developed over the past several years in conjunction with the IEEE technical committee on parallel processing (TCPP), which held several workshops and discussions on learning parallel computing and integrating parallel concepts into courses throughout computer science curricula. Contributed and developed by the leading minds in parallel computing research and instruction Provides resources and guidance for those learning PDC as well as those teaching students new to the discipline Succinctly addresses a range of parallel and distributed computing topics Pedagogically designed to ensure understanding by experienced engineers and newcomers Developed over the past several years in conjunction with the IEEE technical committee on parallel processing (TCPP), which held several workshops and discussions on learning parallel computing and integrating parallel concepts

This book provides a comprehensive overview of both the hardware and software issues involved in designing state-of-the-art distributed and parallel computing systems. Essential for both students and practitioners, this book explores distributed computing from the bottom-up approach, starting with computing organization, communications and networks, and then discussing operating systems, client/server architectures, distributed databases and other applications. The book also includes coverage of parallel language design, including Occam and Linda. Each chapter ends with questions, and the book contains an extensive glossary and list of reference sources.

Parallel and High Performance Computing offers techniques guaranteed to boost your code’s effectiveness. Summary Complex calculations, like training deep learning models or running large-scale simulations, can take an extremely long time. Efficient parallel programming can save hours—or even days—of computing time. Parallel and High Performance Computing shows you how to deliver faster run-times, greater scalability, and increased energy efficiency to your programs by mastering parallel techniques for multicore processor and GPU hardware. About the technology Write fast, powerful, energy efficient programs that scale to tackle huge volumes of data. Using parallel programming, your code spreads data processing tasks across multiple CPUs for radically better
performance. With a little help, you can create software that maximizes both speed and efficiency. About the book
Parallel and High Performance Computing offers techniques guaranteed to boost your code's effectiveness.
You'll learn to evaluate hardware architectures and work with industry standard tools such as OpenMP and
MPI. You'll master the data structures and algorithms best suited for high performance computing and learn
techniques that save energy on handheld devices. You'll even run a massive tsunami simulation across a bank of
GPUs. What's inside Planning a new parallel project Understanding differences in CPU and GPU architecture
Addressing underperforming kernels and loops Managing applications with batch scheduling About the reader
For experienced programmers proficient with a high-performance computing language like C, C++, or Fortran.
About the author Robert Robey works at Los Alamos National Laboratory and has been active in the field of
parallel computing for over 30 years. Yuliana Zamora is currently a PhD student and Siebel Scholar at the
University of Chicago, and has lectured on programming modern hardware at numerous national conferences.
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Parallel Programming with OpenACC is a modern, practical guide to implementing dependable computing
systems. The book explains how anyone can use OpenACC to quickly ramp-up application performance using
high-level code directives called pragmas. The OpenACC directive-based programming model is designed to
provide a simple, yet powerful, approach to accelerators without significant programming effort. Author Rob
Farber, working with a team of expert contributors, demonstrates how to turn existing applications into portable
GPU accelerated programs that demonstrate immediate speedups. The book also helps users get the most from the
latest NVIDIA and AMD GPU plus multicore CPU architectures (and soon for Intel® Xeon Phi™ as well).
Downloadable example codes provide hands-on OpenACC experience for common problems in scientific,
commercial, big-data, and real-time systems. Topics include writing reusable code, asynchronous capabilities,
using libraries, multicore clusters, and much more. Each chapter explains how a specific aspect of OpenACC
technology fits, how it works, and the pitfalls to avoid. Throughout, the book demonstrates how the use of simple
working examples that can be adapted to solve application needs. Presents the simplest way to leverage GPUs to
achieve application speedups Shows how OpenACC works, including working examples that can be adapted for
application needs Allows readers to download source code and slides from the book’s companion web page
Heterogeneous Computing with OpenCL 2.0 teaches OpenCL and parallel programming for complex systems that
may include a variety of device architectures: multi-core CPUs, GPUs, and fully-integrated Accelerated
Processing Units (APUs). This fully-revised edition includes the latest enhancements in OpenCL 2.0 including: •
Shared virtual memory to increase programming flexibility and reduce data transfers that consume resources •
Dynamic parallelism which reduces processor load and avoids bottlenecks • Improved imaging support and
integration with OpenGL Designed to work on multiple platforms, OpenCL will help you more effectively
program for a heterogeneous future. Written by leaders in the parallel computing and OpenCL communities, this
book explores memory spaces, optimization techniques, extensions, debugging and profiling. Multiple case studies
and examples illustrate high-performance algorithms, distributing work across heterogeneous systems, embedded
domain-specific languages, and will give you hands-on OpenCL experience to address a range of fundamental
parallel algorithms. Updated content to cover the latest developments in OpenCL 2.0, including improvements in
memory handling, parallelism, and imaging support. Example code covering image analytics, web plugins, particle simulations, video editing,
performance optimization, and more
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.
Today all computers, from tablet/desktop computers to super computers, work in parallel. A basic knowledge of the architecture of parallel computers and how to program them, is thus, essential for students of computer science and IT professionals. In its second edition, the book retains the lucidity of the first edition and has added new material to reflect the advances in parallel computers. It is designed as text for the final year undergraduate students of computer science and engineering and information technology. It describes the principles of designing parallel computers and how to program them. This second edition, while retaining the general structure of the earlier book, has added two new chapters, ‘Core Level Parallel Processing’ and ‘Grid and Cloud Computing’ based on the emergence of parallel computers on a single silicon chip popularly known as multicore processors and the rapid developments in Cloud Computing. All chapters have been revised and some chapters are re-written to reflect the emergence of multicore processors and the use of MapReduce in processing vast amounts of data. The new edition begins with an introduction to how to solve problems in parallel and describes how parallelism is used in improving the performance of computers. The topics discussed include instruction level parallel processing, architecture of parallel computers, multicore processors, grid and cloud computing, parallel algorithms, parallel programming, compiler transformations, operating systems for parallel computers, and performance evaluation of parallel computers.

Parallel Sorting Algorithms explains how to use parallel algorithms to sort a sequence of items on a variety of parallel computers. The book reviews the sorting problem, the parallel models of computation, parallel algorithms, and the lower bounds on the parallel sorting problems. The text also presents twenty different algorithms, such as linear arrays, mesh-connected computers, cube-connected computers. Another example where algorithm can be applied is on the shared-memory SIMD (single instruction stream multiple data stream) computers in which the whole sequence to be sorted can fit in the respective primary memories of the computers (random access memory), or in a single shared memory. SIMD processors communicate through an interconnection network or the processors communicate through a common and shared memory. The text also investigates the case of external sorting in which the sequence to be sorted is bigger than the available primary memory. In this case, the algorithms used in external sorting is very similar to those used to describe internal sorting, that is, when the sequence can fit in the primary memory. The book explains that an algorithm can reach its optimum possible operating time for sorting when it is running on a particular set of architecture, depending on a constant multiplicative factor. The text is suitable for computer engineers and scientists interested in parallel algorithms.

Written by high performance computing (HPC) experts, Introduction to High Performance Computing for Scientists and Engineers provides a solid introduction to current mainstream computer architecture, dominant parallel programming models, and useful optimization strategies for scientific HPC. From working in a scientific computing center, the author

THE CONTEXT OF PARALLEL PROCESSING The field of digital computer architecture has grown explosively in the past two decades. Through a steady stream of experimental research, tool-building efforts, and theoretical studies, the design of an instruction-set architecture, once considered an art, has been transformed into one of the most quantitative branches of computer technology. At the same time, better understanding of various forms of concurrency, from standard pipelining to massive parallelism, and invention of architectural structures to support a reasonably efficient and user-friendly programming model for such systems, has allowed hardware performance to continue its exponential growth. This trend is expected to continue in the near future. This explosive growth, linked with the expectation that performance will continue its exponential rise with each new generation of hardware and that (in stark contrast to software) computer hardware will function correctly as soon as it comes off the assembly line, has its down side. It has led to unprecedented hardware complexity and almost intolerable dev- opment costs. The challenge facing current and future computer designers is to institute simplicity where we now have complexity; to use fundamental theories being developed in this area to gain performance and ease-of-use benefits from simpler circuits; to understand the interplay between technological capabilities and limitations, on the one hand, and design decisions based on user and application requirements on the other.

A clear illustration of how parallel computers can be successfully applied to large-scale scientific computations. This book demonstrates how a variety of applications in physics, biology, mathematics and other sciences were implemented on real parallel computers to produce new scientific results. It investigates issues of fine-grained parallelism relevant for future supercomputers with particular emphasis on hypercube architecture. The authors describe how they used an experimental approach to configure different massively parallel machines, design and implement basic system software, and develop algorithms for frequently used mathematical computations. They
also devise performance models, measure the performance characteristics of several computers, and create a high-performance computing facility based exclusively on parallel computers. By addressing all issues involved in scientific problem solving, Parallel Computing Works? provides valuable insight into computational science for large-scale parallel architectures. For those in the sciences, the findings reveal the usefulness of an important experimental tool. Anyone in supercomputing and related computational fields will gain a new perspective on the potential contributions of parallelism. Includes over 30 full-color illustrations.

The constantly increasing demand for more computing power can seem impossible to keep up with. However, multicore processors capable of performing computations in parallel allow computers to tackle ever larger problems in a wide variety of applications. This book provides a comprehensive introduction to parallel computing, discussing theoretical issues such as the fundamentals of concurrent processes, models of parallel and distributed computing, and metrics for evaluating and comparing parallel algorithms, as well as practical issues, including methods of designing and implementing shared- and distributed-memory programs, and standards for parallel program implementation, in particular MPI and OpenMP interfaces. Each chapter presents the basics in one place followed by advanced topics, allowing novices and experienced practitioners to quickly find what they need. A glossary and more than 80 exercises with selected solutions aid comprehension. The book is recommended as a text for advanced undergraduate or graduate students and as a reference for practitioners.

Programming Massively Parallel Processors: A Hands-on Approach, Second Edition, teaches students how to program massively parallel processors. It offers a detailed discussion of various techniques for constructing parallel programs. Case studies are used to demonstrate the development process, which begins with computational thinking and ends with effective and efficient parallel programs. This guide shows both student and professional alike the basic concepts of parallel programming and GPU architecture. Topics of performance, floating-point format, parallel patterns, and dynamic parallelism are covered in depth. This revised edition contains more parallel programming examples, commonly-used libraries such as Thrust, and explanations of the latest tools. It also provides new coverage of CUDA 5.0, improved performance, enhanced development tools, increased hardware support, and more; increased coverage of related technology, OpenCL and new material on algorithm patterns, GPU clusters, host programming, and data parallelism; and two new case studies (on MRI reconstruction and molecular visualization) that explore the latest applications of CUDA and GPUs for scientific research and high-performance computing. This book should be a valuable resource for advanced students, software engineers, programmers, and hardware engineers. New coverage of CUDA 5.0, improved performance, enhanced development tools, increased hardware support, and more; Increased coverage of related technology, OpenCL and new material on algorithm patterns, GPU clusters, host programming, and data parallelism; New two new case studies (on MRI reconstruction and molecular visualization) explore the latest applications of CUDA and GPUs for scientific research and high-performance computing.

An In-Depth View of Hardware Issues, Programming Practices, and Implementation of Key Methods Exploring the challenges of parallel programming from the perspective of quantum chemists, Parallel Computing in Quantum Chemistry thoroughly covers topics relevant to designing and implementing parallel quantum chemistry programs. Focusing on good parallel program design and performance analysis, the first part of the book deals with parallel computer architectures and parallel computing concepts and terminology. The authors discuss trends in hardware, methods, and algorithms; parallel computer architectures and the overall system view of a parallel computer; message-passing; parallelization via multi-threading; measures for predicting and assessing the performance of parallel algorithms; and fundamental issues of designing and implementing parallel programs. The second part contains detailed discussions and performance analyses of parallel algorithms for a number of important and widely used quantum chemistry procedures and methods. The book presents schemes for the parallel computation of two-electron integrals, details the Hartree–Fock procedure, considers the parallel computation of second-order Møller–Plesset energies, and examines the difficulties of parallelizing local correlation methods. Through a solid assessment of parallel computing hardware issues, parallel programming practices, and implementation of key methods, this invaluable book enables readers to develop efficient quantum chemistry software capable of utilizing large-scale parallel computers.

There is a software gap between the hardware potential and the performance that can be attained using today’s software parallel program development tools. The tools need manual intervention by the programmer to parallelize the code. Programming a parallel computer requires closely studying the target algorithm or application, more so than in the traditional sequential programming we have all learned. The programmer must
be aware of the communication and data dependencies of the algorithm or application. This book provides the techniques to explore the possible ways to program a parallel computer for a given application.

Designed for introductory parallel computing courses at the advanced undergraduate or beginning graduate level, Elements of Parallel Computing presents the fundamental concepts of parallel computing not from the point of view of hardware, but from a more abstract view of algorithmic and implementation patterns. The aim is to facilitate the teaching of parallel programming by surveying some key algorithmic structures and programming models, together with an abstract representation of the underlying hardware. The presentation is friendly and informal. The content of the book is language neutral, using pseudocode that represents common programming language models. The first five chapters present core concepts in parallel computing. SIMD, shared memory, and distributed memory machine models are covered, along with a brief discussion of what their execution models look like. The book also discusses decomposition as a fundamental activity in parallel algorithmic design, starting with a naive example, and continuing with a discussion of some key algorithmic structures. Important programming models are presented in depth, as well as important concepts of performance analysis, including work-depth analysis of task graphs, communication analysis of distributed memory algorithms, key performance metrics, and a discussion of barriers to obtaining good performance. The second part of the book presents three case studies that reinforce the concepts of the earlier chapters. One feature of these chapters is to contrast different solutions to the same problem, using select problems that aren’t discussed frequently in parallel computing textbooks. They include the Single Source Shortest Path Problem, the Eikonal equation, and a classical computational geometry problem: computation of the two-dimensional convex hull. After presenting the problem and sequential algorithms, each chapter first discusses the sources of parallelism then surveys parallel algorithms.

A complete source of information on almost all aspects of parallel computing from introduction, to architectures, to programming paradigms, to algorithms, to programming standards. It covers traditional Computer Science algorithms, scientific computing algorithms and data intensive algorithms.

Mathematics of Computing -- Parallelism.

This book constitutes the refereed proceedings of the 7th International Conference on Applied Parallel Computing, PARA 2004, held in June 2004. The 118 revised full papers presented together with five invited lectures and 15 contributed talks were carefully reviewed and selected for inclusion in the proceedings. The papers are organized in topical sections.

Heterogeneous Computing with OpenCL, Second Edition teaches OpenCL and parallel programming for complex systems that may include a variety of device architectures: multi-core CPUs, GPUs, and fully-integrated Accelerated Processing Units (APUs) such as AMD Fusion technology. It is the first textbook that presents OpenCL programming appropriate for the classroom and is intended to support a parallel programming course. Students will come away from this text with hands-on experience and significant knowledge of the syntax and use of OpenCL to address a range of fundamental parallel algorithms. Designed to work on multiple platforms and with wide industry support, OpenCL will help you more effectively program for a heterogeneous future. Written by leaders in the parallel computing and OpenCL communities, Heterogeneous Computing with OpenCL explores memory spaces, optimization techniques, graphics interoperability, extensions, and debugging and profiling. It includes detailed examples throughout, plus additional online exercises and other supporting materials that can be downloaded at http://www.heterogeneouscompute.org/?page_id=7 This book will appeal to software engineers, programmers, hardware engineers, and students/advanced students. Explains principles and strategies to learn parallel programming with OpenCL, from understanding the four abstraction models to thoroughly testing and debugging complete applications. Covers image processing, web plugins, particle simulations, video editing, performance optimization, and more. Shows how OpenCL maps to an example target architecture and explains some of the tradeoffs associated with mapping to various architectures Addresses a range of fundamental programming techniques, with multiple examples and case studies that demonstrate OpenCL extensions for a variety of hardware platforms

This book introduces the basic concepts of parallel and vector computing in the context of an introduction to numerical methods. It contains chapters on parallel and vector matrix multiplication and solution of linear systems by direct and iterative methods. It is suitable for advanced undergraduate and beginning graduate courses in computer science, applied mathematics, and engineering. Ideally, students will have access to a parallel or Vector computer, but the material can be studied profitably in any case. Gives a modern overview of
scientific computing including parallel and vector computation. Introduces numerical methods for both ordinary and partial differential equations. Has considerable discussion of both direct and iterative methods for linear systems of equations, including parallel and vector algorithms. Covers most of the main topics for a first course in numerical methods and can serve as a text for this course.

With its cogent overview of the essentials of parallel computation as well as lists of P-complete and open problems, extensive remarks corresponding to each problem, and extensive references, this book is the ideal introduction to parallel computing.

Parallel Computing for Data Science: With Examples in R, C++, and CUDA is one of the first parallel computing books to concentrate exclusively on parallel data structures, algorithms, software tools, and applications in data science. It includes examples not only from the classic "n observations, p variables" matrix format but also from time series.

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 how 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, Atomic memory, Streams, CUDA C on multiple GPUs, Advanced atomic memory, and 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

Since the publication of the first edition, parallel computing technology has gained considerable momentum. A large proportion of this has come from the improvement in VLSI techniques, offering one to two orders of magnitude more devices than previously possible. A second contributing factor in the fast development of the subject is commercialization. The supercomputer is no longer restricted to a few well-established research institutions and large companies. A new computer breed combining the architectural advantages of the supercomputer with the advance of VLSI technology is now available at very attractive prices. A pioneering device in this development is the transputer, a VLSI processor specifically designed to operate in large concurrent systems. Parallel Computers 2: Architecture, Programming and Algorithms reflects the shift in emphasis of parallel computing. It looks at large-scale parallelism as found in transputer ensembles. This extensively rewritten second edition includes major new sections on the transputer and the OCCAM language. The book contains specific information on the various types of machines available, details of computer architecture and technologies, and descriptions of programming languages and algorithms. Aimed at an advanced undergraduate and postgraduate level, this handbook is also useful for research workers, machine designers, and programmers concerned with parallel computers. In addition, it will serve as a guide for potential parallel computer users, especially in disciplines where large amounts of computer time are regularly used.

Written with a straightforward and student-centred approach, this extensively revised, updated and enlarged edition presents a thorough coverage of the various aspects of parallel processing including parallel processing architectures, programmability issues, data dependency analysis, shared memory programming, thread-based implementation, distributed computing, algorithms, parallel programming languages, debugging, and parallelism paradigms. Distributed databases as well as distributed operating systems. The book, now in its second edition, not only provides sufficient practical exposure to the programming issues but also enables its readers to make realistic attempts at writing parallel programs using easily available software tools. With all the latest information incorporated and several key pedagogical attributes included, this textbook is an invaluable learning tool for the
undergraduate and postgraduate students of computer science and engineering. It also caters to the students pursuing master of computer application. What’s New to the Second Edition • A new chapter named Using Parallelism Effectively has been added covering a case study of parallelising a sorting program, and introducing commonly used parallelism models. • Sections describing the map-reduce model, top-500.org initiative, Indian efforts in supercomputing, OpenMP system for shared memory programming, etc. have been added. • Numerous sections have been updated with current information. • Several questions have been incorporated in the chapter-end exercises to guide students from examination and practice points of view.

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