Synchronization Algorithms And Concurrent Programming

Synchronization Algorithms and Concurrent ProgrammingAlgorithms for Concurrent SystemsAlgorithms for Concurrent SystemsConcurrent ComputationsConcurrent Programming: Algorithms, Principles, and FoundationsAutomated Verification of Concurrent Search StructuresAlgorithms and Data StructuresIntroduction to Concurrency in Programming LanguagesPrinciples of Concurrent and Distributed ProgrammingConcurrent Programming on WindowsAdvances in Parallel and Vector Processing for Structural MechanicsProceedings of the 1983 International Conference on Parallel ProcessingNew Parallel Algorithms for Direct Solution of Linear EquationsThe Papers of the Sixteenth SIGCSE Technical Symposium on Computer Science EducationLogic Programming and Its ApplicationsAtomic Transactions: In Concurrent and Distributed SystemsConcurrent Algorithms for Binary Search TreesConcurrencyHighly Parallel Signal Processing ArchitecturesThe Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications: Software, applications Gadi Taubenfeld Rachid Guerraoui Rachid Guerraoui Stuart K. Tewksbury Michel Raynal Siddharth Krishna Matthew J. Sottile M. Ben-Ari Joe Duffy B. H. V. Topping Howard Jay Siegel C. Siva Ram Murthy Harriet G. Taylor Michel van Caneghem Nancy A. Lynch Aravind Natarajan Dahlia Malkhi Keith Bromley

Synchronization Algorithms and Concurrent Programming Algorithms for Concurrent Systems Algorithms for Concurrent Systems Concurrent Computations Concurrent Programming: Algorithms, Principles, and Foundations Automated Verification of Concurrent Search Structures Algorithms and Data Structures Introduction to Concurrency in Programming Languages Principles of Concurrent and Distributed Programming Concurrent Programming on Windows Advances in Parallel and Vector Processing for Structural Mechanics Proceedings of the 1983 International Conference on Parallel Processing New Parallel Algorithms for Direct Solution of Linear Equations The Papers of the Sixteenth SIGCSE Technical Symposium on Computer Science Education Logic Programming and Its Applications Atomic Transactions: In Concurrent and Distributed Systems Concurrent Algorithms for Binary Search Trees Concurrency Highly Parallel Signal

Processing Architectures The Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications: Software, applications *Gadi Taubenfeld Rachid Guerraoui Rachid Guerraoui Stuart K. Tewksbury Michel Raynal Siddharth Krishna Matthew J. Sottile M. Ben-Ari Joe Duffy B. H. V. Topping Howard Jay Siegel C. Siva Ram Murthy Harriet G. Taylor Michel van Caneghem Nancy A. Lynch Aravind Natarajan Dahlia Malkhi Keith Bromley*

the first textbook that focuses purely on synchronization a fundamental challenge in computer science that is fast becoming a major performance and design issue for concurrent programming on modern architectures and for the design of distributed systems

the 1987 princeton workshop on algorithm architecture and technology issues for models of concurrent computation was organized as an interdisciplinary work shop emphasizing current research directions toward concurrent computing systems with participants from several different fields of specialization the workshop cov ered a wide variety of topics though by no means a complete cross section of issues in this rapidly moving field the papers included in this book were prepared for the workshop and taken together provide a view of the broad range of issues and alternative directions being explored to organize the various papers the book has been divided into five parts part i considers new technology directions part ii emphasizes underlying theoretical issues communication issues which are ad dressed in the majority of papers are specifically highlighted in part iii part iv includes papers stressing the fault tolerance and reliability of systems finally part v includes systems oriented papers where the system ranges from vlsi circuits through powerful parallel computers much of the initial planning of the workshop was completed through an informal at t bell laboratories group consisting of mehdi hatamian vijay kumar adri aan ligtenberg sailesh rao p subrahmanyam and myself we are grateful to stuart schwartz both for the support of princeton university and for his orga nizing local arrangements for the workshop and to the members of the organizing committee whose recommendations for participants and discussion topics were par ticularly helpful a rosenberg and a t

this book is devoted to the most difficult part of concurrent programming namely synchronization concepts techniques and principles when the cooperating entities are asynchronous communicate through a shared memory and may experience failures synchronization is no longer a set of tricks but due to research results in

recent decades it relies today on sane scientific foundations as explained in this book in this book the author explains synchronization and the implementation of concurrent objects presenting in a uniform and comprehensive way the major theoretical and practical results of the past 30 years among the key features of the book are a new look at lock based synchronization mutual exclusion semaphores monitors path expressions an introduction to the atomicity consistency criterion and its properties and a specific chapter on transactional memory an introduction to mutex freedom and associated progress conditions such as obstruction freedom and wait freedom a presentation of lamport s hierarchy of safe regular and atomic registers and associated wait free constructions a description of numerous wait free constructions of concurrent objects queues stacks weak counters snapshot objects renaming objects etc a presentation of the computability power of concurrent objects including the notions of universal construction consensus number and the associated herlihy s hierarchy and a survey of failure detector based constructions of consensus objects the book is suitable for advanced undergraduate students and graduate students in computer science or computer engineering graduate students in mathematics interested in the foundations of process synchronization and practitioners and engineers who need to produce correct concurrent software the reader should have a basic knowledge of algorithms and operating systems

search structures support the fundamental data storage primitives on key value pairs insert a pair delete by key search by key and update the value associated with a key concurrent search structures are parallel algorithms to speed access to search structures on multicore and distributed servers these sophisticated algorithms perform fine grained synchronization between threads making them notoriously difficult to design correctly indeed bugs have been found both in actual implementations and in the designs proposed by experts in peer reviewed publications the rapid development and deployment of these concurrent algorithms has resulted in a rift between the algorithms that can be verified by the state of the art techniques and those being developed and used today the goal of this book is to show how to bridge this gap in order to bring the certified safety of formal verification to high performance concurrent search structures similar techniques and frameworks can be applied to concurrent graph and network algorithms beyond search structures

illustrating the effect of concurrency on programs written in familiar languages this text focuses on novel language abstractions that truly bring concurrency into the language and aid analysis and compilation tools in

generating efficient correct programs it also explains the complexity involved in taking advantage of concurrency with regard to program correctness and performance the book describes the historical development of current programming languages and the common threads that exist among them it also contains several chapters on design patterns for parallel programming and includes quick reference guides to openmp erlang and cilk ancillary materials are available on the book s website

principles of concurrent and distributed programming provides an introduction to concurrent programming focusing on general principles and not on specific systems software today is inherently concurrent or distributed from event based gui designs to operating and real time systems to internet applications this edition is an introduction to concurrency and examines the growing importance of concurrency constructs embedded in programming languages and of formal methods such as model checking

when you begin using multi threading throughout an application the importance of clean architecture and design is critical this places an emphasis on understanding not only the platform s capabilities but also emerging best practices joe does a great job interspersing best practices alongside theory throughout his book from the foreword by craig mundie chief research and strategy officer microsoft corporation author joe duffy has risen to the challenge of explaining how to write software that takes full advantage of concurrency and hardware parallelism in concurrent programming on windows he explains how to design implement and maintain large scale concurrent programs primarily using c and c for windows duffy aims to give application system and library developers the tools and techniques needed to write efficient safe code for multicore processors this is important not only for the kinds of problems where concurrency is inherent and easily exploitable such as server applications compute intensive image manipulation financial analysis simulations and ai algorithms but also for problems that can be speeded up using parallelism but require more effort such as math libraries sort routines report generation xml manipulation and stream processing algorithms concurrent programming on windows has four major sections the first introduces concurrency at a high level followed by a section that focuses on the fundamental platform features inner workings and api details next there is a section that describes common patterns best practices algorithms and data structures that emerge while writing concurrent software the final section covers many of the common system wide architectural and process concerns of concurrent programming this is the only book you ll need in order to learn the best

practices and common patterns for programming with concurrency on windows and net

includes a selection of papers that were presented at the second international conference on computational structures technology held in athens greece from 30 august 1 september 1994

rather than parallelizing sequential algorithms the authors develop new back substitution free parallel algorithms using a bidirectional elimination technique for the solution of both dense and sparse linear equations they provide full coverage of bidirectional parallel algorithms based on gaussian elimination lu factorization householder reductions and modified gram schmidt orthogonalization givens rotations sparse cholesky factorization and sparse factorization clearly demonstrating how the bidirectional approach allows for improved speedup numerical stability and efficient implementation on multiprocessor systems plus the book offers a useful survey of the vast literature on direct methods introductory material on solving systems of linear equations and exercises it is an invaluable resource for computer scientists researchers in parallel linear algebra and anyone with an interest in parallel programming book jacket

logic programming is an emerging approach to computer science where programs are viewed as sets of logical axioms and computation is viewed as carefully controlled logical deduction the approach currently finds practical realization in the programming language prolog this volume contains details of research in the field with a special emphasis on applications including expert systems natural language parsing and analysis database management and knowledge acquisition circuit analysis and hardware verification

this book develops a theory for transactions that provides practical solutions for system developers focusing on the interface between the user and the database that executes transactions atomic transactions are a useful abstraction for programming concurrent and distributed data processing systems presents many important algorithms which provide maximum concurrency for transaction processing without sacrificing data integrity the authors include a well developed data processing case study to help readers understand transaction processing algorithms more clearly the book offers conceptual tools for the design of new algorithms and for devising variations on the familiar algorithms presented in the discussions whether your background is in the development of practical systems or formal methods this book will offer you a new way to view distributed

systems

with processor designers shifting their focus to multi core architectures concurrent data structures have acquired new importance multiple processes may operate in parallel on such a data structure and contention between them must be managed such that all operations complete successfully and leave the data structure in a valid state concurrent algorithms may be blocking or non blocking in a blocking algorithm two processes may not operate concurrently on the same part of the data structure only the process that successfully obtains a lock on that portion of the data structure may modify it other processes need to wait until the lock is released and are thus blocked by the process owning the lock in a non blocking algorithm a suspended process does not inhibit other processes from making progress this is typically achieved through the technique of helping where a process makes information about the operation it is trying to execute globally available whenever another process encounters this operation it helps move it out of the way we present new blocking and non blocking algorithms for concurrently manipulating a binary search tree in an asynchronous shared memory system a binary search tree is a fundamental data structure in computer science and is commonly used to implement the dictionary abstract data type red black trees are a type of self balancing binary search tree that provide logarithmic worst case time complexities for operations we consider both unbalanced binary search trees as well as red black trees and develop concurrent algorithms for them all our algorithms are direct they can be implemented on commonly available hardware without assuming any underlying system support such as software transactional memory we also present an experimental comparison of our algorithms against other known algorithms for binary search trees experiments reveal that our algorithms perform best in most if not all cases

this book is a celebration of leslie lamport s work on concurrency interwoven in four and a half decades of an evolving industry from the introduction of the first personal computer to an era when parallel and distributed multiprocessors are abundant his works lay formal foundations for concurrent computations executed by interconnected computers some of the algorithms have become standard engineering practice for fault tolerant distributed computing distributed systems that continue to function correctly despite failures of individual components he also developed a substantial body of work on the formal specification and verification of concurrent systems and has contributed to the development of automated tools applying these

methods part i consists of technical chapters of the book and a biography the technical chapters of this book present a retrospective on lamport s original ideas from experts in the field through this lens it portrays their long lasting impact the chapters cover timeless notions lamport introduced the bakery algorithm atomic shared registers and sequential consistency causality and logical time byzantine agreement state machine replication and paxos temporal logic of actions tla the professional biography tells of lamport s career providing the context in which his work arose and broke new grounds and discusses latex perhaps lamport s most influential contribution outside the field of concurrency this chapter gives a voice to the people behind the achievements notably lamport himself and additionally the colleagues around him who inspired collaborated and helped him drive worldwide impact part ii consists of a selection of leslie lamport s most influential papers this book touches on a lifetime of contributions by leslie lamport to the field of concurrency and on the extensive influence he had on people working in the field it will be of value to historians of science and to researchers and students who work in the area of concurrency and who are interested to read about the work of one of the most influential researchers in this field

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