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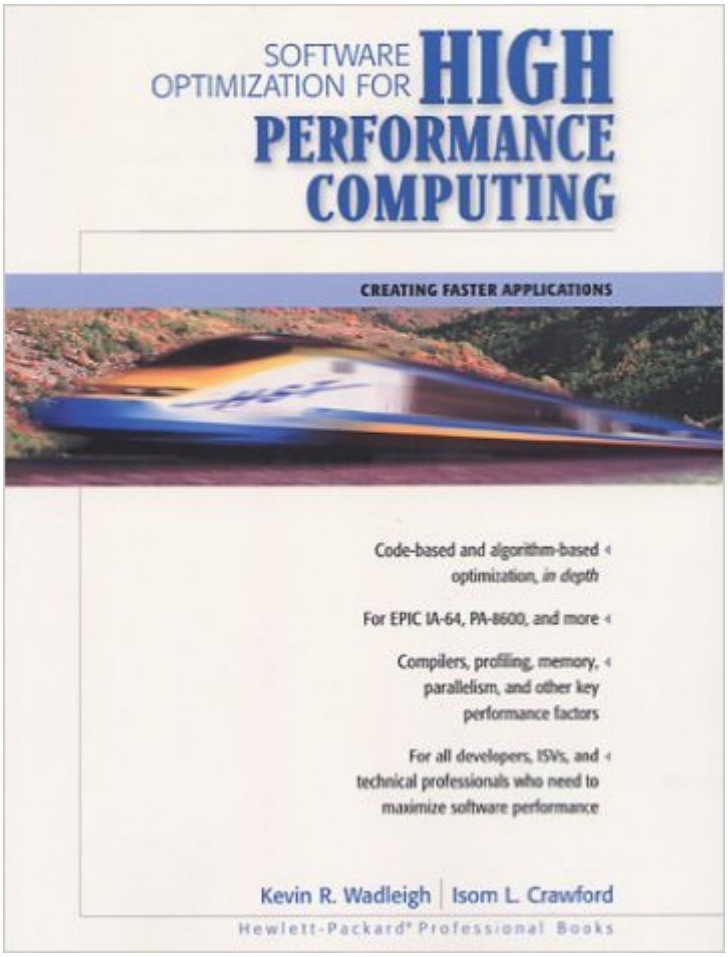
Software Optimization For High Performance Computing: Creating Faster Applications



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Synopsis

This is the most hands-on guide to writing high-performance software. Using many practical examples, two of Hewlett-Packard's leading software performance experts review both code-based and algorithm-based techniques. This book addresses every key factor that impacts software performance, from mathematical libraries to compilers to underlying hardware.The authors review the role of processor design in software performance, covering each leading approach, and offering comparative optimization strategies for CISC, RISC, vector and Long Instruction Word computing, and the new Explicitly Parallel Instruction Computing (EPIC) design used by Intel/HP IA-64 processors. They address storage devices, including cache and system memory; and review each leading approach to parallel processing, including distributed memory and shared memory (UMA and NUMA) designs. The book includes detailed chapters on compiler optimization; profiling and timing code; algorithmic approaches to parallelism such as compiler directives, threads, and message passing. It also demonstrates powerful techniques for enhancing performance through the use of mathematical libraries, mathematical kernels, and equation-solving techniques such as LU decomposition.

Book Information

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Customer Reviews

Wadleigh and Crawford have collected, organized, and presented a great deal of useful information for anyone who wants to obtain high-end performance on modern, high-end computer systems. I appreciate how the book explains and compares the approaches of various computer vendors in

high-end systems, providing some historical context along the way. Along with explanations, the authors have included numerous, relevant examples (high-level & assembly source, tables of test results) to illustrate the key factors that contribute to application performance.I think this book could easily be made into, or used with, a short course/overview on high performance computing.

My background is from 20 years of experience in high performance computing conducted in the academic, national lab, and comercial realms. I can say that this is a very enjoyable and entertaining book.There once was a time when a programmer could look at several algorithms, and decide the ones they want to use based on an analysis of the operations that were performed, those simple times are over and have been over for many years. Now, detailed attention also has to be paid to the overall system architecture, particularily the cache locality of the chosen approach. This book introduces a mental tool set to determine how to best make these tradeoffs for your application and system. The book does a good job in hammering home the point that O(n) analysis by itself no longer cuts it. You have to know how big your cache lines are and make sure you use them. If I had my way, every new hire out of college would be forced to read this book before they ever allowed to utter the words "Stassen algorithm".I didn’t give it a five because as another reviewer pointed out it is a bit rocky in parts, and the underlying analytic processes which the authors were following have to be tweaked out by the reader. None the less, procuring and reading this book was time and money well spent.

I am a physics graduate student and taking a graduate course on programming parallel machines. This course is offered by an electrical and computer engineering professor at our university.This course covers computer architectures (SMP, NUMA, et al.), theory on parallelism, OpenMP, MPI, Pthreads, and various research tools. I found this book by Drs. Wadleigh and Crawford very helpful for me to go through the entire semester.This book follows three important core issues on high performance computing. Part I includes hardware overview and basic parallel programming methodologies. I found this part help me a lot to catch the backgrounds that I don’t previously have. Part II deals with several issues on software techniques. Part II lists the tools, algorithms, and applications such as LAPACK, and fast Fourier transform.I would highly recommend this book to scientists and engineers in the areas of computational science and engineering applications. I am so glad that our physics library has ordered and placed this book on the new bookshelf.Written by sjtu from computational neutrino physics and geometric probability research group.

I don’t wish to offend the authors of this book, who I am sure are experts in this field. However, I found this book to be unnecessarily difficult to read.The the book presents inherently complex material, which testifies to the proficiency of the authors. However, it was often not clear what point the authors were trying to make, especially regarding graphs which lacked clear explanations. Often I had to to re-read an entry several times before I understood what the authors were trying to express.I am sure the book contains a wealth of valuable information (which is why I ordered it), but I personally was unwilling to invest the time and energy necessary to fathom the authors intent.I am a systems engineer for an international telecom company.

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