

Designing Scientific Applications on GPUs (Chapman & Hall/CRC Numerical Analysis and Scientific Computing Series)

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Many of today’s complex scientific applications now require a vast amount of computational power. General purpose graphics processing units (GPGPUs) enable researchers in a variety of fields to benefit from the computational power of all the cores available inside graphics cards.

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The first part of the book introduces the GPUs and Nvidia’s CUDA programming model, currently the most widespread environment for designing GPU applications. The second part focuses on significant image processing applications on GPUs. The third part presents general methodologies for software development on GPUs and the fourth part describes the use of GPUs for addressing several optimization problems. The fifth part covers many numerical applications, including obstacle problems, fluid simulation, and atomic physics models. The last part illustrates agent-based simulations, pseudorandom number generation, and the solution of large sparse linear systems for integer factorization. Some of the codes presented in the book are available online.

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Editorial Review

Review

"This book covers not only the knowledge of GPU and CUDA programming, but also provides successful real applications in many domains, including signal processing, image processing, physics, and artificial intelligence. The most recent research outcome and the most recent progress of GPU architectures are included, such as multi-GPU programming and GPU clusters. I believe it is a very good reference for GPU and CUDA parallel programming courses as it provides detailed illustration of the architectures of GPU, programming principles of CUDA, CUDA libraries for algebra, and a series of real applications. In addition, it will definitely contribute to the progress of research in CUDA-enabled parallel computing."
?Professor Ying Liu, School of Computer and Control, University of Chinese Academy of Sciences

About the Author

Raphaël Couturier is a professor of computer science at the University of Franche-Comte and vice head of the Computer Science Department at FEMTO-ST Institute. He has co-authored over 80 articles in peer-reviewed journals and conferences. He received a Ph.D. from Henri Poincaré University. His research interests include parallel and distributed computation, numerical algorithms, GPU and FPGA computing, and asynchronous iterative algorithms.

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