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Nota di contenuto	Front Cover; Contents; List of Figures; List of Tables; Preface; I. Presentation of GPUs; 1. Presentation of the GPU architecture and of the CUDA environment; 2. Introduction to CUDA; II. Image processing; 3. Setting up the environment; 4. Implementing a fast median filter; 5. Implementing an efficient convolution operation on GPU; III. Software development; 6. Development of software components for heterogeneous many-core architectures; 7. Development methodologies for GPU and cluster of GPUs; IV. Optimization; 8. GPU-accelerated tree-based exact optimization methods 9. Parallel GPU-accelerated metaheuristics10. Linear programming on a GPU: a case study; V. Numerical applications; 11. Fast hydrodynamics on heterogeneous many-core hardware; 12. Parallel monotone spline interpolation and approximation on GPUs; 13. Solving sparse linear systems with GMRES and CG methods on GPU clusters; 14. Solving sparse nonlinear systems of obstacle problems on GPU clusters; 15.

Ludwig: multiple GPUs for a complex fluid lattice Boltzmann application; 16. Numerical validation and performance optimization on GPUs of an application in atomic physics
17. A GPU-accelerated envelope-following method for switching power converter simulationVI. Other; 18. Implementing multi-agent systems on GPU; 19. Pseudorandom number generator on GPU; 20. Solving large sparse linear systems for integer factorization on GPUs

Sommario/riassunto

This book covers designs of scientific applications for GPUs, beginning with a review of the principles of GPU programming. It then describes various scientific applications for GPUs and presents lessons learned. Scientific applications covered include computations on matrix operations, linear system solving, nonlinear system solving, image processing, and pseudo random number generation. Expert contributors discuss applications and the GPU porting in a pedagogical way, focusing their attention on the mechanisms they have used to obtain fast and interesting results--