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| Altri autori (Persone) | JolyPascal<br>KaberSidi Mahmoud<br>PostelMarie |
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| Soggetti | Mathematics<br>Mathematics - Data processing<br>Computational intelligence<br>Mathematical physics<br>Numerical analysis<br>Applications of Mathematics<br>Computational Mathematics and Numerical Analysis<br>Computational Intelligence<br>Theoretical, Mathematical and Computational Physics<br>Numerical Analysis<br>Anàlisi numèrica<br>Processament de dades<br>Llibres electrònics |
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| Nota di contenuto | Numerical Approximation of Model Partial Differential Equations -- Nonlinear Differential Equations: Application to Chemical Kinetics -- Polynomial Approximation -- Solving an Advection-Diffusion Equation by a Finite Element Method -- Solving a Differential Equation by a Spectral Method -- Signal Processing: Multiresolution Analysis -- Elasticity: Elastic Deformation of a Thin Plate -- Domain Decomposition |

Using a Schwarz Method -- Geometrical Design: Bézier Curves and Surfaces -- Gas Dynamics: The Riemann Problem and Discontinuous Solutions: Application to the Shock Tube Problem -- Thermal Engineering: Optimization of an Industrial Furnace -- Fluid Dynamics: Solving the Two-Dimensional Navier-Stokes Equations.

Sommario/riassunto

This book provides fifteen computational projects aimed at numerically solving problems from a broad range of applications including Fluid Mechanics, Chemistry, Elasticity, Thermal Science, Computer Aided Design, Signal and Image Processing. For each project the reader is guided through the typical steps of scientific computing from physical and mathematical description of the problem to numerical formulation and programming and finally to critical discussion of numerical results. Considerable emphasis is placed on practical issues of computational methods. The last section of each project contains the solutions to all proposed exercises and guides the reader in using the MATLAB scripts. The mathematical framework provides a basic foundation in numerical analysis of partial differential equations and main discretization techniques, such as finite differences, finite elements, spectral methods and wavelets. The book is primarily intended as a graduate-level text inapplied mathematics, but it may also be used by students in engineering or physical sciences. It will also be a useful reference for researchers and practicing engineers. The second edition builds upon its earlier material (revised and updated) with three all-new chapters intended to reinforce the presentation of mathematical aspects on numerical methods: Fourier approximation, high-order finite difference methods, and basic tools for numerical optimization. Corresponding new applications and programs concern spectral Fourier methods to solve ordinary differential equations, finite difference methods up to sixth-order to solve boundary value problems and, finally, optimization strategies to fit parameters of an epidemiological model.