Numerical Methods for Evolutionary Differential Equations (Computational Science and Engineering)

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Methods for the numerical simulation of dynamic mathematical models have been the focus of intensive research for well over 60 years, and the demand for better and more efficient methods has grown as the range of applications has increased. Mathematical models involving evolutionary partial differential equations (PDEs) as well as ordinary differential equations (ODEs) arise in diverse applica¬tions such as ?uid ?ow, image processing and computer vision, physics-based animation, mechanical systems, relativity, earth sciences, and mathematical ?nance.

This textbook develops, analyzes, and applies numerical methods for evolutionary, or time-dependent, differential problems. Both PDEs and ODEs are discussed from a unified viewpoint. The author emphasizes finite difference and finite volume methods, specifically their principled derivation, stability, accuracy, efficient implementation, and practical performance in various fields of science and engineering. Smooth and nonsmooth solutions for hyperbolic PDEs, parabolic-type PDEs, and initial value ODEs are treated, and a practical introduction to geometric integration methods is included as well.

The author bridges theory and practice by developing algorithms, concepts, and analysis from basic principles while discussing efficiency and performance issues and demonstrating methods through examples and case studies from numerous application areas.

Audience: This textbook is suitable for researchers and graduate students from a variety of fields including computer science, applied mathematics, physics, earth and ocean sciences, and various engineering disciplines. Gradute students at the beginning or advanced level (depending on the discipline) and researchers in a variety of fields in science and engineering will find this book useful. Researchers who simulate processes that are modeled by evolutionary differential equations will find material on the principles underlying the appropriate method to use and the pitfalls that accompany each method.

Contents: Preface; 1 Introduction; 2 Methods and Concepts for ODEs; 3 Finite Difference and Finite Volume Methods; 4 Stability for Constant Coefficient Problems; 5 Variable Coefficient and Nonlinear Problems; 6 Hamiltonian Systems and Long Time Integration; 7 Dispersion and Dissipation; 8 More on Handling Boundary Conditions; 9 Several Space Variables and Splitting Methods; 10 Discontinuities and Almost Discontinuities; 11 Additional Topics; Bibliography; Index.

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Spent a free time and energy to be fun activity to try and do! A lot of people spent their free time with their family, or their friends. Usually they carrying out activity like watching television, going to beach, or picnic in the park. They actually doing ditto every week. Do you feel it? Will you something different to fill your personal free time/ holiday? May be reading a book may be option to fill your free time/ holiday. The first thing that you will ask may be what kinds of reserve that you should read. If you want to try look for book, may be the reserve untitled Numerical Methods for Evolutionary Differential Equations (Computational Science and Engineering) can be good book to read. May be it can be best activity to you.

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