

Unlock the Power of Wavelet Methods: Solving Partial Differential Equations and Fractional Equations

Partial differential equations (PDEs) and fractional equations are ubiquitous in science and engineering, governing a wide range of phenomena from fluid dynamics to quantum mechanics. Analytical solutions to these equations are often intractable, necessitating the use of numerical methods for their approximation. Wavelet methods have emerged as a powerful tool for solving PDEs and fractional equations due to their ability to efficiently handle complex geometries, discontinuities, and oscillations.



Wavelet Methods for Solving Partial Differential Equations and Fractional Differential Equations

★★★★★ 5 out of 5
Language : English
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Screen Reader : Supported
Print length : 311 pages



This comprehensive guide, "Wavelet Methods For Solving Partial Differential Equations And Fractional," provides a thorough exposition of wavelet methods, equipping readers with the theoretical foundations and practical techniques for applying these methods to solve a variety of scientific and engineering problems.

Chapter 1: An to Wavelets

- Basic concepts of wavelets: definition, construction, and properties
- Types of wavelets: Daubechies, Biorthogonal, and Coiflets
- Multiresolution analysis and wavelet decomposition
- Applications of wavelets in signal processing and image processing

Chapter 2: Wavelet Galerkin Methods for PDEs

- Derivation of the wavelet Galerkin method for solving PDEs
- Error analysis and convergence properties
- Adaptive wavelet methods for increased efficiency
- Applications to a variety of PDEs, including elliptic, parabolic, and hyperbolic equations

Chapter 3: Wavelet Collocation Methods for Fractional Equations

- to fractional calculus and fractional equations
- Wavelet collocation method for solving fractional equations
- Convergence analysis and stability properties
- Applications to fractional diffusion equations, fractional differential equations, and fractional integral equations

Chapter 4: Applications in Science and Engineering

- Wavelet methods for fluid dynamics: Navier-Stokes equations, turbulence modeling
- Wavelet methods for solid mechanics: elasticity, fracture mechanics

- Wavelet methods for electromagnetics: Maxwell's equations, antenna design
- Wavelet methods for quantum mechanics: Schrödinger equation, particle simulations

Chapter 5: Advanced Topics

- Multi-scale wavelet methods for multi-scale phenomena
- Wavelet-based optimization techniques for solving inverse problems
- Adaptive wavelet methods for time-dependent PDEs
- Wavelet methods for solving stochastic PDEs

"Wavelet Methods For Solving Partial Differential Equations And Fractional" is an indispensable resource for researchers, engineers, and students working in the fields of scientific computing, numerical analysis, and applied mathematics. By mastering the techniques presented in this book, readers will gain the ability to effectively solve complex PDEs and fractional equations that arise in a wide range of scientific and engineering disciplines.



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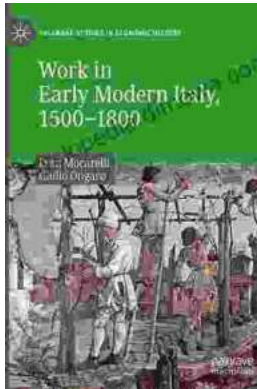
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