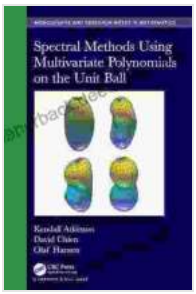
Spectral Methods Using Multivariate Polynomials On The Unit Ball: Chapman Hall/CRC Applied Mathematics & Nonlinear Science



Spectral Methods Using Multivariate Polynomials On The Unit Ball (Chapman & Hall/CRC Monographs and Research Notes in Mathematics) by Carol Cassella

4.4 out of 5

Language	: English
File size	: 12377 KB
Screen Reader	: Supported
Print length	: 274 pages

Spectral Methods Using Multivariate Polynomials On The Unit Ball provides a comprehensive overview of spectral methods for solving partial differential equations on the unit ball. The text begins with a detailed to the theory of multivariate orthogonal polynomials, including the classical orthogonal polynomials and their generalizations. It then discusses the construction of spectral methods for a wide range of problems, including elliptic, parabolic, and hyperbolic equations. The text also includes a number of applications, such as the numerical solution of the Navier-Stokes equations and the simulation of fluid flow.

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3. Spectral Methods for Elliptic Equations
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Spectral methods are a class of numerical methods that use orthogonal polynomials to approximate solutions to partial differential equations. Spectral methods are particularly well-suited for problems on domains with simple geometries, such as the unit ball. In this book, we will develop spectral methods for solving a variety of partial differential equations on the unit ball.

Multivariate Orthogonal Polynomials

The theory of multivariate orthogonal polynomials is a fundamental tool for spectral methods. In this chapter, we will introduce the basic concepts of multivariate orthogonal polynomials, including the classical orthogonal polynomials and their generalizations. We will also discuss the properties of multivariate orthogonal polynomials that make them useful for spectral methods.

Spectral Methods for Elliptic Equations

In this chapter, we will discuss the construction of spectral methods for elliptic equations on the unit ball. We will begin by introducing the Galerkin method, which is a general framework for constructing spectral methods. We will then discuss the application of the Galerkin method to a variety of

elliptic equations, including the Poisson equation, the Helmholtz equation, and the Stokes equations.

Spectral Methods for Parabolic Equations

In this chapter, we will discuss the construction of spectral methods for parabolic equations on the unit ball. We will begin by introducing the method of lines, which is a general framework for constructing spectral methods for parabolic equations. We will then discuss the application of the method of lines to a variety of parabolic equations, including the heat equation, the diffusion equation, and the Navier-Stokes equations.

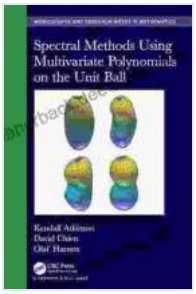
Spectral Methods for Hyperbolic Equations

In this chapter, we will discuss the construction of spectral methods for hyperbolic equations on the unit ball. We will begin by introducing the discontinuous Galerkin method, which is a general framework for constructing spectral methods for hyperbolic equations. We will then discuss the application of the discontinuous Galerkin method to a variety of hyperbolic equations, including the wave equation, the Maxwell equations, and the Euler equations.

Applications

In this chapter, we will discuss a number of applications of spectral methods to problems in science and engineering. We will begin by discussing the numerical solution of the Navier-Stokes equations, which is a fundamental problem in fluid mechanics. We will then discuss the simulation of fluid flow, which is a challenging problem that is essential for a wide range of applications, such as the design of aircraft and the prediction of weather patterns.

Spectral Methods Using Multivariate Polynomials On The Unit Ball provides a comprehensive overview of spectral methods for solving partial differential equations on the unit ball. The text is suitable for graduate students and researchers in applied mathematics, computational science, and engineering.



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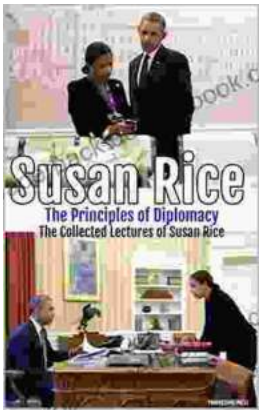

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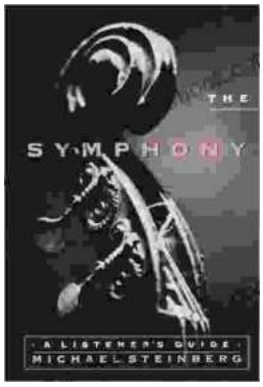

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