第一图书网, tushu007.com

# <<流体动力学中的计算方法>>

## 图书基本信息

书名：<<流体动力学中的计算方法>>

13位ISBN编号：9787510048012

10位ISBN编号：751004801X

出版时间：2012-9

出版时间：弗兹格 世界图书出版公司 (2012-09出版)

作者：弗兹格

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：http://www.tushu007.com

第一图书网, tushu007.com

# <<流体动力学中的计算方法>>

## 内容概要

力学

第一图书网, tushu007.com


## 作者简介

作者:(美)弗兹格

第一图书网, tushu007.com

# <<流体动力学中的计算方法>>

## 书籍目录

Preface1.Basic Concepts of Fluid Flow 1.1 Introduction 1.2 Conservation Principles 1.3 Mass Conservation 1.4 Momentum Conservation 1.5 Conservation of Scalar Quantities 1.6 Dimensionless Form of Equations 1.7 Simplified Mathematical Models 1.7.1 Incompressible Flow 1.7.2 Inviscid (Euler) Flow 1.7.3 Potential Flow 1.7.4 Creeping (Stokes) Flow 1.7.5 Boussinesq Approximation 1.7.6 Boundary Layer Approximation 1.7.7 Modeling of Complex Flow Phenomena 1.8 Mathematical Classification of Flows 1.8.1 Hyperbolic Plows 1.8.2 Parabolic Flows 1.8.3 Elliptic Flows 1.8.4 Mixed Flow Types 1.9 Plan of This Book2.Introduction to Numerical Methods 2.1 Approaches to Fluid Dynamical Problems 2.2 What is CFD? 2.3 Possibilities and Limitations of Numerical Methods 2.4 Components of a Numerical Solution Method 2.4.1 Mathematical Model 2.4.2 Discretization Method 2.4.3 Coordinate and Basis Vector Systems 2.4.4 Numerical Grid 2.4.5 Finite Approximations 2.4.6 Solution Method 2.4.7 Convergence Criteria 2.5 Properties of Numerical Solution Methods 2.5.1 Consistency 2.5.2 Stability 2.5.3 Convergence 2.5.4 Conservation 2.5.5 Boundedness 2.5.6 Realizability 2.5.7 Accuracy 2.6 Discretization Approaches 2.6.1 Finite Difference Method 2.6.2 Finite Volume Method 2.6.3 Finite Element Method3.Finite Difference Methods 3.1 Introduction 3.2 Basic Concept 3.3 Approximation of the First Derivative 3.3.1 Taylor Series Expansion 3.3.2 Polynomial Fitting 3.3.3 Compact Schemes 3.3.4 Non-Uniform Grids 3.4 Approximation of the Second Derivative 3.5 Approximation of Mixed Derivatives 3.6 Approximation of Other Terms 3.7 Implementation of Boundary Conditions 3.8 The Algebraic Equation System 3.9 Discretization Errors 3.10 An Introduction to Spectral Methods 3.10.1 Basic Concept 3.10.2 Another View of Discretization Error 3.11 Example4.Finite Volume Methods 4.1 Introduction 4.2 Approximation of Surface Integrals 4.3 Approximation of Volume Integrals 4.4 Interpolation and Differentiation Practices 4.4.1 Upwind Interpolation (UDS) 4.4.2 Linear Interpolation (CDS) 4.4.3 Quadratic Upwind Interpolation (QUICK).. 4.4.4 Higher-Order Schemes 4.4.5 Other Schemes 4.5 Implementation of Boundary Conditions 4.6 The Algebraic Equation System 4.7 Examples Solution of Linear Equation Systems5.1 Introduction 5.2 Direct Methods 5.2.1 Gauss Elimination 5.2.2 LU Decomposition 5.2.3 Tridiagonal Systems 5.2.4 Cyclic Reduction 5.3 Iterative Methods 5.3.1 Basic Concept 5.3.2 Convergence 5.3.3 Some Basic Methods 5.3.4 Incomplete LU Decomposition: Stone's Method 5.3.5 ADI and Other Splitting Methods 5.3.6 Conjugate Gradient Methods 5.3.7 Biconjugate Gradients and CGSTAB 5.3.8 Multigrid Methods 5.3.9 Other Iterative Solvers 5.4 Coupled Equations and Their Solution 5.4.1 Simultaneous Solution 5.4.2 Sequential Solution 5.4.3 Under-Relaxation 5.5 Non-Linear Equations and their Solution 5.5.1 Newton-like Techniques 5.5.2 Other Techniques 5.6 Deferred-Correction Approaches 5.7 Convergence Criteria and Iteration Errors 5.8 Examples Methods for Unsteady Problems6.1 Introduction 6.2 Methods for Initial Value Problems in ODEs 6.2.1 Two-Level Methods 6.2.2 Predictor-Corrector and Multipoint Methods 6.2.3 Runge-Kutta Methods 6.2.4 Other Methods 6.3 Application to the Generic Transport Equation 6.3.1 Explicit Methods 6.3.2 Implicit Methods 6.3.3 Other Methods 5.4 Examples7.Solution of the Navier-Stokes Equations 7.1 Special Features of the Navier-Stokes Equations 7.1.1 Discretization of Convective and Viscous Terms 7.1.2 Discretization of Pressure Terms and Body Forces 7.1.3 Conservation Properties 7.2 Choice of Variable Arrangement on the Grid 7.2.1 Colocated Arrangement 7.2.2 Staggered Arrangements 7.3 Calculation of the Pressure 7.3.1 The Pressure Equation and its Solution 7.3.2 A Simple Explicit Time Advance Scheme 7.3.3 A Simple Implicit Time Advance Method 7.3.4 Implicit Pressure-Correction Methods 7.4 Other Methods 7.4.1 Fractional Step Methods 7.4.2 Streamfunction-Vorticity Methods 7.4.3 Artificial Compressibility Methods 7.5 Solution Methods for the Navier-Stokes Equations 7.5.1 Implicit Scheme Using Pressure-Correction and a Stag- gered Grid 7.5.2 Treatment of Pressure for Colocated Variables 7.5.3 SIMPLE Algorithm for a Colocated Variable Arrange- ment 7.6 Note on Pressure and Incompressibility 7.7 Boundary Conditions for the Navier-Stokes Equations 7.8 Examples8.Complex Geometries 8.1 The Choice of Grid 8.1.1 Stepwise Approximation Using Regular Grids 8.1.2 Overlapping Grids 8.1.3 Boundary-Fitted Non-Orthogonal Grids 8.2 Grid Generation 8.3 The Choice of Velocity Components 8.3.1 Grid-Oriented Velocity Components 8.3.2 Cartesian Velocity Components 8.4

第一图书网, tushu007.com


The Choice of Variable Arrangement 8.4.1 Staggered Arrangements 8.4.2 Colocated Arrangement 8.5 Finite Difference Methods 8.5.1 Methods Based on Coordinate Transformation 8.5.2 Method Based on Shape Functions 8.6 Finite Volume Methods 8.6.1 Approximation of Convective Fluxes 8.6.2 Approximation of Diffusive Fluxes 8.6.3 Approximation of Source Terms 8.6.4 Three-Dimensional Grids 8.6.5 Block-Structured Grids 8.6.6 Unstructured Grids 8.7 Control-Volume-Based Finite Element Methods 8.8 Pressure-Correction Equation 8.9 Axi-Symmetric Problems 8.10 Implementation of Boundary Conditions 8.10.1 Inlet 8.10.2 Outlet 8.10.3 Impermeable Walls 8.10.4 Symmetry Planes 8.10.5 Specified Pressure 8.11 Examples9.Turbulent Flows 9.1 Introduction 9.2 Direct Numerical Simulation (DNS) 9.2.1 Example: Spatial Decay of Grid Turbulence 9.3 Large Eddy Simulation (LES) 9.3.1 Smagorinsky and Related Models 9.3.2 Dynamic Models 9.3.3 Deconvolution Models 9.3.4 Example: Flow Over a Wall-Mounted Cube 9.3.5 Example: Stratified Homogeneous Shear Flow 9.4 RANS Models 9.4.1 Reynolds-Averaged Navier-Stokes (RANS) Equations 9.4.2 Simple Turbulence Models and their Application 9.4.3 The v2f Model 9.4.4 Example: Flow Around an Engine Valve 9.5 Reynolds Stress Models 9.6 Very Large Eddy Simulation10. Compressible Flow 10.1 Introduction 10.2 Pressure-Correction Methods for Arbitrary Mach Number 10.2.1 Pressure-Velocity-Density Coupling 10.2.2 Boundary Conditions 10.2.3 Examples 10.3 Methods Designed for Compressible Flow 10.3.1 An Overview of Some Specific Methods11. Efficiency and Accuracy Improvement 11.1 Error Analysis and Estimation 11.1.1 Description of Errors 11.1.2 Estimation of Errors 11.1.3 Recommended Practice for CFD Uncertainty Analysis 11.2 Grid quality and optimization 11.3 Multigrid Methods for Flow Calculation 11.4 Adaptive Grid Methods and Local Grid Refinement 11.5 Parallel Computing in CFD 11.5.1 Iterative Schemes for Linear Equations 11.5.2 Domain Decomposition in Space 11.5.3 Domain Decomposition in Time 11.5.4 Efficiency of Parallel Computing12. Special Topics 12.1 Introduction 12.2 Heat and Mass Transfer 12.3 Flows With Variable Fluid Properties 12.4 Moving Grids 12.5 Free-Surface Flows 12.5.1 Interface-Tracking Methods 12.5.2 Hybrid Methods 12.6 Meteorological and Oceanographic Applications 12.7 Multiphase flows 12.8 CombustionA. Appendices A.1 List of Computer Codes and How to Access Them A.2 List of Frequently Used AbbreviationsReferencesIndex

第一图书网, tushu007.com

# <<流体动力学中的计算方法>>

## 编辑推荐

弗兹格编著的《流体动力学中的计算方法》内容介绍：Computational fluid dynamics, commonly known by the acronym ‘ CFD ’,is undergoing significant expansion in terms of both the number of courses offered at universities and the number of researchers active in the field. There are a number of software packages available that solve fluid flow problems; the market is not quite as large as the one for structural mechanics codes, in which finite element methods are well established. The lag can be explained by the [act that CFD problems are, in general, more difficult to solve. However, CFD codes are slowly being accepted as design tools by industrial users. At present,users of CFD need to be fairly knowledgeable, which requires education of both students and working engineers. The present book is an attempt to fill this need.

第一图书网, tushu007.com

# <<流体动力学中的计算方法>>

## 版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:http://www.tushu007.com