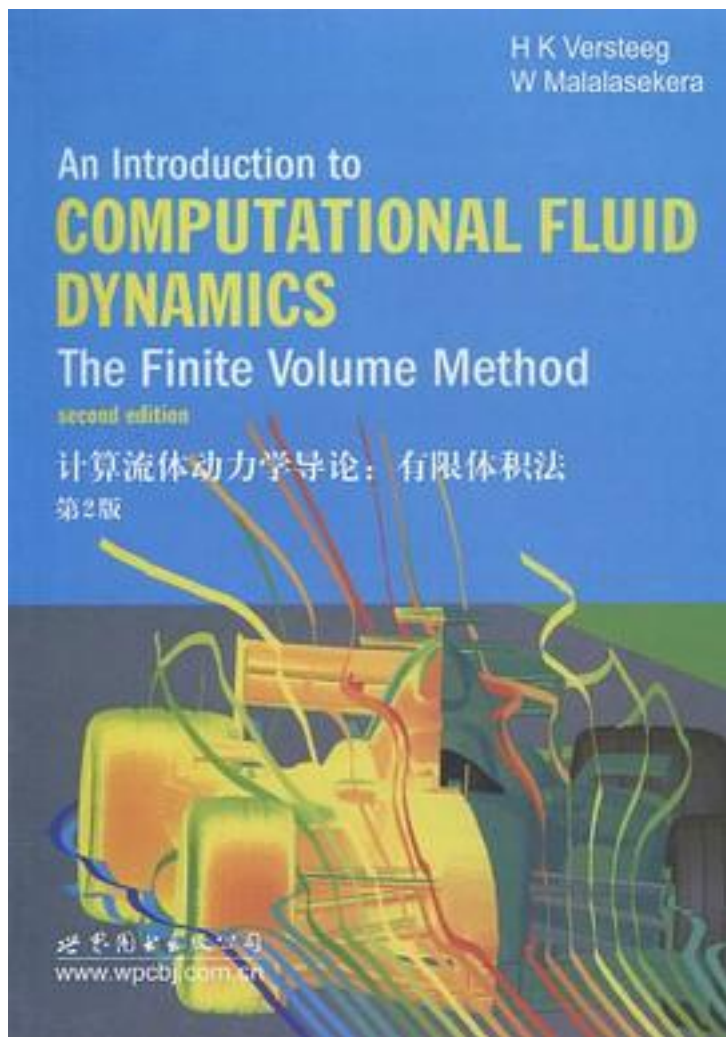


计算流体力学导论



[计算流体力学导论_下载链接1](#)

著者:H. Versteeg

出版者:世界图书出版公司

出版时间:2010-4

装帧:平装

isbn:9787510005572

《计算流体力学导论:有限体积法(第2版)(英文版)》 内容简介:We were pleasantly

surprised by the ready acceptance of the first edition of our book by the CFD community and by the amount of positive feedback received over a period of 10 years. To us this has provided justification of our original plan, which was to provide an accessible introduction to this fast-growing topic to support teaching at senior undergraduate level, post-graduate research and new industrial users of commercial CFD codes. Our second edition seeks to enhance and update. The structure and didactic approach of the first edition have been retained without change, but augmented by a selection of the most important developments in CFD.

作者介绍:

H K Versteeg and W Malalasekera are both senior lecturers in Thermo-Fluids, at Loughborough University

目录: Preface

Acknowledgements

1 Introduction

1.1 What is CFD?

1.2 How does a CFD code work?

1.3 Problem solving with CFD

1.4 Scope of this book

2 Conservation laws of fluid motion and boundary conditions

2.1 Governing equations of fluid flow and heat transfer

2.2 Equations of state

2.3 Navier-Stokes equations for a Newtonian fluid

2.4 Conservative form of the governing equations of fluid flow

2.5 Differential and integral forms of the general transport equations

2.6 Classification of physical behaviours

2.7 The role of characteristics in hyperbolic equations

2.8 Classification method for simple PDEs

2.9 Classification of fluid flow equations

2.10 Auxiliary conditions for viscous fluid flow equations

2.11 Problems in transonic and supersonic compressible flows

2.12 Summary

3 Turbulence and its modelling

3.1 What is turbulence?

3.2 Transition from laminar to turbulent flow

3.3 Descriptors of turbulent flow

3.4 Characteristics of simple turbulent flows

3.5 The effect of turbulent fluctuations on properties of the mean flow

3.6 Turbulent flow calculations

3.7 Reynolds-averaged Navier-Stokes equations and classical turbulence models

3.8 Large eddy simulation

3.9 Direct numerical simulation

3.10 Summary

4 The finite volume method for diffusion problems

4.1 Introduction

4.2 Finite volume method for one-dimensional steady state diffusion

4.3 Worked examples: one-dimensional steady state diffusion

4.4 Finite volume method for two-dimensional diffusion problems

4.5 Finite volume method for three-dimensional diffusion problems

4.6 Summary

- 5 The finite volume method for convection-diffusion problems
 - 5.1 Introduction
 - 5.2 Steady one-dimensional convection and diffusion
 - 5.3 The central differencing scheme
 - 5.4 Properties of discretisation schemes
 - 5.5 Assessment of the central differencing scheme for convection-diffusion problems
 - 5.6 The upwind differencing scheme
 - 5.7 The hybrid differencing scheme
 - 5.8 The power-law scheme
 - 5.9 Higher-order differencing schemes for convection-diffusion problems
 - 5.10 TVD schemes
 - 5.11 Summary
- 6 Solution algorithms for pressure-velocity
 - 6.1 Introduction
 - 6.2 The staggered grid
 - 6.3 The momentum equations
 - 6.4 The SIMPLE algorithm
 - 6.5 Assembly or a complete method
 - 6.6 The SIMPLER algorithm
 - 6.7 The SIMPLEC algorithm
 - 6.8 The PISO algorithm
 - 6.9 General comments on SIMPLE, SIMPLER, SIMPLEC and PISO
 - 6.10 Worked examples of the SIMPLE algorithm
 - 6.11 Summary
- 7 Solution of discretised equations
 - 7.1 Introduction
 - 7.2 The TDMA
 - 7.3 Application of the TDMA to two-dimensional problems
 - 7.4 Application of the TDMA to three-dimensional problems
 - 7.5 Examples
 - 7.6 Point iterative methods
 - 7.7 Multigrid techniques
 - 7.8 Summary
- 8 the finite volume method for unsteady flows
 - 8.1 Introduction
 - 8.2 One-dimensional unsteady heat conduction
 - 8.3 Illustrative examples
 - 8.4 Implicit method for two- and three-dimensional problems
 - 8.5 Discretisation of transient convection-diffusion equation
 - 8.6 Worked example of transient convection-diffusion using QUICK differencing
 - 8.7 Solution procedures for unsteady flow calculations
 - 8.8 Steady state calculations using the pseudo-transient approach
 - 8.9 A brief note on other transient schemes
 - 8.10 Summary
- 9 Implementation of boundary conditions
 - 9.1 Introduction
 - 9.2 Inlet boundary conditions
 - 9.3 Outlet boundary conditions
 - 9.4 Wall boundary conditions
 - 9.5 The constant pressure boundary condition
 - 9.6 Symmetry boundary condition
 - 9.7 Periodic or cyclic boundary condition
 - 9.8 Potential pitfalls and final remarks
- 10 Errors and uncertainty in CFD modelling

- 10.1 Errors and uncertainty in CFD
- 10.2 Numerical errors
- 10.3 Input uncertainty
- 10.4 Physical model uncertainty
- 10.5 Verification and validation
- 10.6 Guidelines for best practice in CFD
- 10.7 Reporting/documentation of CFD simulation inputs and results
- 10.8 Summary
- 11 Methods for dealing with complex geometries
 - 11.1 Introduction
 - 11.2 Body-fitted co.ordinate grids for complex geometries
 - 11.3 Cartesian vs. curvilinear grids - an example
 - 11.4 Curvilinear grids - difficulties
 - 11.5 Block-structured grids
 - 11.6 Unstructured grids
 - 11.7 Discretisation in unstructured grids
 - 11.8 Discretisation of the diffusion term
 - 11.9 Discretisation of the convective term
 - 11.10 Treatment of source terms
 - 11.11 Assembly of discretised equations
 - 11.12 Example calculations with unstructured grids
 - 11.13 Pressure-velocity coupling in unstructured meshes
 - 11.14 Staggered vs. co-located grid arrangements
 - 11.15 Extension of the face velocity interpolation method to unstructured meshes
 - 11.16 Summary
- 12 CFD modelling of combustion
 - 12.1 Introduction
 - 12.2 Application of the first law of thermodynamics to a combustion system
 - 12.3 Enthalpy of formation
 - 12.4 Some important relationships and properties of gaseous mixtures
 - 12.5 Stoichiometry
 - 12.6 Equivalence ratio
 - 12.7 Adiabatic flame temperature
 - 12.8 Equilibrium and dissociation
 - 12.9 Mechanisms of combustion and chemical kinetics
 - 12.10 Overall reactions and intermediate reactions
 - 12.11 Reaction rate
 - 12.12 Detailed mechanisms
 - 12.13 Reduced mechanisms
 - 12.14 Governing equations for combusting flows
 - 12.15 The simple chemical reacting system (SCRS)
 - 12.16 Modelling of a laminar diffusion flame - an example
 - 12.17 CFD calculation of turbulent non-premixed combustion
 - 12.18 SCRS model for turbulent combustion
 - 12.19 Probability density function approach
 - 12.20 Beta pdf
 - 12.21 The chemical equilibrium model
 - 12.22 Eddy break-up model of combustion
 - 12.23 Eddy dissipation concept
 - 12.24 Laminar flamelet model
 - 12.25 Generation of laminar, flamelet libraries
 - 12.26 Statistics of the non-equilibrium parameter
 - 12.27 Pollutant formation in combustion
 - 12.28 Modelling of thermal NO formation in combustion

12.29 Flamelet-based NO modelling
12.30 An example to illustrate laminar flamelet modelling and NO modelling of a turbulent flame
12.31 Other models for non-premixed combustion
12.32 Modelling of premixed combustion
12.33 Summary
13 Numerical calculation of radiative heat transfer
13.1 Introduction
13.2 Governing equations of radiative heat transfer
13.3 Solution methods
13.4 Four popular radiation calculation techniques suitable for CFD
13.5 Illustrative examples
13.6 Calculation of radiative properties in gaseous mixtures
13.7 Summary
Appendix A Accuracy of a flow simulation
Appendix B Non-uniform grids
Appendix C Calculation of source terms
Appendix D Limiter functions used in Chapter 5
Appendix E Derivation of one-dimensional governing equations for steady, incompressible flow through a planar nozzle
Appendix F Alternative derivation for the term $(\mathbf{n} \cdot \mathbf{grad} A_i)$ in Chapter 11
Appendix G Some examples
Bibliography
Index
• • • • • ([收起](#))

[计算流体力学导论_下载链接1](#)

标签

流体力学

CFD

学术

计算力学7

流体模拟

数学

cfD

FVM

评论

计流老师力荐

[计算流体力学导论_下载链接1](#)

书评

[计算流体力学导论_下载链接1](#)