1. Record Nr. UNINA9910462815103321

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| Titolo | Lattice Boltzmann method [[electronic resource] ] : and its applications in engineering / / Zhaoli Guo, Chang Shu |
| Pubbl/distr/stampa | Singapore ; ; Hackensack, NJ, : World Scientific, c2013 |
| ISBN | 981-4508-30-6 |
| Descrizione fisica | 1 online resource (420 p.) |
| Collana | Advances in computational fluid dynamics ; ; vol. 3 |
| Disciplina | 530.138 |
| Soggetti | Lattice dynamics<br>Lattice field theory<br>Electronic books. |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Description based upon print version of record. |
| Nota di bibliografia | Includes bibliographical references (p. 373-396) and index. |
| Nota di contenuto | Dedication; Preface; Contents; Chapter 1 Introduction; 1.1 Description of Fluid System at Different Scales; 1.1.1 Microscopic description: molecular dynamics; 1.1.2 Mesoscopic description: kinetic theory; 1.1.3 Macroscopic description: hydrodynamic equations; 1.2 Numerical Methods for Fluid Flows; 1.3 History of LBE; 1.3.1 Lattice gas automata; 1.3.2 From LGA to LBE; 1.3.3 From continuous Boltzmann equation to LBE; 1.4 Basic Models of LBE; 1.4.1 LBGK models; 1.4.2 From LBE to the Navier-Stokes equations: Chapman-Enskog expansion; 1.4.3 LBE models with multiple relaxation times; 1.5 Summary<br>Chapter 2 Initial and Boundary Conditions for Lattice Boltzmann Method2.1 Initial Conditions; 2.1.1 Equilibrium scheme; 2.1.2 Non-equilibrium scheme; 2.1.3 Iterative method; 2.2 Boundary Conditions for Flat Walls; 2.2.1 Heuristic schemes; 2.2.2 Hydrodynamic schemes; 2.2.3 Extrapolation schemes; 2.3 Boundary Conditions for Curved Walls; 2.3.1 Bounce-back schemes; 2.3.2 Fictitious equilibrium schemes; 2.3.3 Interpolation schemes; 2.3.4 Non-equilibrium extrapolation scheme; 2.4 Pressure Boundary Conditions; 2.4.1 Periodic boundary conditions; 2.4.2 Hydrodynamic schemes<br>2.4.3 Extrapolation schemes2.5 Summary; Chapter 3 Improved Lattice Boltzmann Models; 3.1 Incompressible Models; 3.2 Forcing Schemes with Reduced Discrete Lattice Effects; 3.2.1 Scheme with modified equilibrium distribution function; 3.2.2 Schemes with a forcing term; |

Sommario/riassunto

Lattice Boltzmann method (LBM) is a relatively new simulation technique for the modeling of complex fluid systems and has attracted interest from researchers in computational physics. Unlike the traditional CFD methods, which solve the conservation equations of macroscopic properties (i.e., mass, momentum, and energy) numerically, LBM models the fluid consisting of fictive particles, and such particles perform consecutive propagation and collision processes over a discrete lattice mesh.This book will cover the fundamental and practical application of LBM. The first part of the book consists of