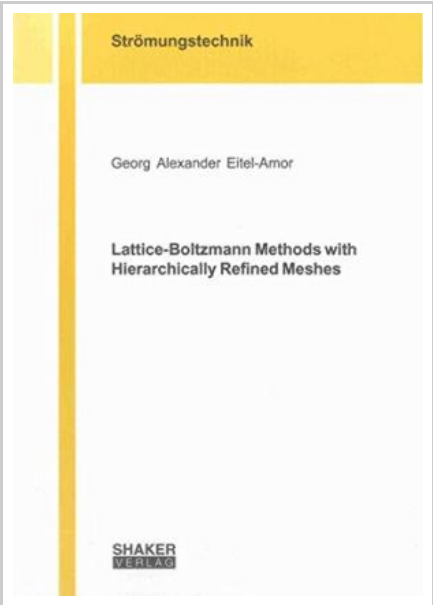

Lattice-Boltzmann Methods with Hierarchically Refined Meshes

By Georg Alexander Eitel-Amor

Shaker Verlag Nov 2012, 2012. Buch. Book Condition: Neu. 214x149x17 mm. Neuware - Since its initiation in the late 1980s, the lattice-Boltzmann method (LBM) has emerged as an eminent tool for numerical investigations of fluid flows involving complex physics and highly intricate geometries. Compared to conventional approaches, which utilize a discretization of the Navier-Stokes equations, the LB method offers a simple algorithmic structure, very good parallel scale-up, and an efficient boundary treatment for fixed walls. However, the method is still subject to ongoing research and development concerning its complex stability behavior and the use of non-uniform meshes. The purpose of this work is to explore possible improvements and new applications for LBM by developing a highly productive parallel LB flow solver based on hierarchically refined Cartesian meshes. The numerical method and the developed techniques for local grid refinement, solution-adaptation, and large-eddy simulations (LES) are described in detail. To validate the implemented methods, two-dimensional and threedimensional laminar and turbulent flows over blunt bodies at Reynolds numbers up to ReD = 3700 are simulated and adaptive mesh refinement is successfully applied in simulations of steady and unsteady cylinder flow. The results evidence a very good agreement with reference values from the literature...

Reviews

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