Lattice boltzmann method: fundamentals and engineering applications with computer codes

Mohamad, A. A., author

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Abstrak

This book introduces readers to the lattice Boltzmann method (LBM) for solving transport phenomena-flow, heat and mass transfer-in a systematic way. Providing explanatory computer codes throughout the book, the author guides readers through many practical examples, such as:

- flow in isothermal and non-isothermal lid-driven cavities;

- flow over obstacles;

- forced flow through a heated channel;

- conjugate forced convection; and

- natural convection.

Diffusion and advection-diffusion equations are discussed, together with applications and examples, and complete computer codes accompany the sections on single and multi-relaxation-time methods. The codes are written in MatLab. However, the codes are written in a way that can be easily converted to other languages, such as FORTRANm Python, Julia, etc. The codes can also be extended with little effort to multi-phase and multi-physics, provided the physics of the respective problem are known.