

HYBRID LATTICE BOLTZMANN AND FINITE VOLUME METHOD
FOR FLUID FLOW AND HEAT TRANSFER SIMULATIONS

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ABSTRACT

The fluid flow and heat transfer problems encountered in industry applications span into different scales and multiscale methods are needed to solve problems involving multiple scales. Two strategies exist in combining these numerical methods. For the first one, the whole domain is divided into multiple subdomains and different domains use various numerical methods. For the second one, various parameters are solved with different numerical methods. These two types of multiscale methods are proposed and verified with natural convections in this dissertation.

Numerical investigation for melting problems are carried on in this dissertation. The key point in solving the melting problem is how to obtain the interface location, and interfacial tracking method is advanced in this dissertation. Various two-dimensional melting problems are solved with LBM, FVM and LBM-FVM hybrid method respectively. Double LBM-MRT model for three-dimensional fluid flow and heat transfer simulations are proposed, and various natural convection and melting problems are solved with it.