The 18th International Conference on Finite Elements in Flow Problems (FEF2015)
16-18 March 2015, Taipei, Taiwan

AN IMMERSED BOUNDARY EXPLICIT GAS KINETIC SCHEME FOR SIMULATION OF INCOMPRESSIBLE FLOWS

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Key words: *immersed boundary method, explicit gas kinetic scheme, incompressible flow, stationary and moving objects.*

An immersed boundary-explicit gas kinetic scheme (IB-EGKS) is presented in this work for simulation of incompressible flows around stationary and moving objects. In the solver, the finite volume method is applied to solve the Navier-Stokes equation. The flux on the interface is evaluated by the new explicit gas kinetic scheme, which locally reconstructs the solution of the continuous Boltzmann equation. Due to the intrinsic advantage of gas kinetic scheme, the inviscid and viscous fluxes can be obtained simultaneously. On the other hand, the boundary condition-enforced immersed boundary method of Wu and Shu [1] is applied to deal with the complex boundaries. As compared to the work of Wu and Shu [1], the current IB-EGKS eliminates some drawbacks, such as the limitation on uniform grids and tie-up of the grid spacing and time step. Numerical simulations of flows over stationary and moving objects are considered for validation. The results demonstrate that the present IB-EGKS can provide accurate numerical results for the incompressible flows.

REFERENCES

[1] J Wu and Chang Shu. Implicit velocity correction-based immersed boundary-lattice boltzmann method and its applications. *Journal of Computational Physics*, 228(6):1963–1979, 2009.