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**An improved coupled Immersed-Boundary-Lattice-Boltzmann solver for the simulation of particulate flows**[1] EMMANOUIL FALAGKARIS[2], PDRA, TIMM KRUEGER[3], Lecturer — Our present understanding of the fundamental physical mechanisms of particle-fluid interactions is far from complete. We focus on the accurate computation of the hydrodynamic forces and the no slip condition on the boundary using the lattice-Boltzmann method for the solution of the flow field and a multi-direct forcing (MDF) immersed-boundary method for the fluid-structure interaction. We found that certain MDF schemes can become unstable after a certain number of iterations. The source of the instability has been identified in the iterative computation of the boundary force. We propose an alternative iterative scheme that significantly enhances the numerical stability by allowing the boundary force computation to relax at a different rate. The numerical accuracy and stability of the proposed scheme is demonstrated by simulating flows laden with moving finite-size particles, including a particle in shear flow and the sedimentation of single spherical and non-spherical particles in a cavity, demonstrating the importance of the accurate boundary force computation on the particle motion and dynamics. Good agreement between the present results and other schemes is obtained.

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