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Luoding Zhu*, Department of Mathematical Sciences, 402 N. Blackford St., LD270, Indianapolis, IN 46202. *A lattice-Boltzmann based immersed boundary method in three dimensions with application.*

The immersed boundary (IB) method originated by Charles Peskin has been popular in modeling and simulating problems involving the interaction of a flexible solid structure and a viscous incompressible fluid. The Navier-Stokes equations in the IB method are usually solved by numerical methods such as FFT or projection methods. Here in our work the N-S equations are solved by an alternative approach, the lattice Boltzmann method (LBM). Compared to many conventional N-S solvers, the LBM is relatively easier to implement and more convenient to model additional physics in a problem. This alternative approach adds extra versatility to the immersed boundary method. In this talk we will briefly introduce the IB method and the lattice Boltzmann method, discuss the use of a 3D lattice Boltzmann model (D3Q19) in the IB method, implementation of the hybrid method (both explicit and implicit), and application of the method in simulation of a viscous flow past a flexible sheet tethered at its middle-line or upstream-edge in a three dimensional channel. (Received September 13, 2010)