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Elimination of Parasitic Currents in the Simulation of Contact Line Motion TAEHUN LEE, LIN LIU, Department of Mechanical Engineering, City University of New York — Parasitic currents are caused by discretization errors in the computation of the intermolecular forces, in particular, a slight imbalance between the pressure gradient and the surface tension force due to truncation error. They increase as the surface tension force and density gradient of the participating fluids. It was shown that these currents could be eliminated to round-off, if the potential form of the intermolecular forces for non-ideal gases was used with the compact isotropic discretization in the periodic computational domain (Lee and Fischer, Phys. Rev. E v.74, 046709). We propose a formulation of the intermolecular forces for immiscible incompressible fluids in contact with solid in the framework of the lattice Boltzmann equation (LBE) method. The forces between solid and fluids are assumed to be of short range and described by adding linear wall energy (de Gennes, Rev. Mod. Phys. v.57, p.827). The present LBE method eliminates the parasitic currents in the simulation of immiscible fluids even in contact with solid and is able to deal with large density/viscosity difference as a result. The equilibrium contact angle and surface concentration are accurately predicted by prescribing non-dimensional wetting potential. The LBE simulations of spreading and impact of a droplet on a dry solid surface are compared with the previous theoretical and experimental results.

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