Abstract :

We present in this paper a method that simulates the motion of rigid particles in a Newtonian fluid. This method is based on a variational formulation throughout the fluid/solid domain, with constraints on the unknown and on the test functions. The rigid motion of the particle is enforced by penalizing the strain tensor on the rigid domain for canceling the deformation rate in the volume occupied by the particle. The time discretization is performed by using the characteristics method. We developed a code from *FreeFem++* that simulates Stokes flows or Navier–Stokes flows (low Reynolds number). A simulation of an elliptical rigid particle sedimentation in a Newtonian fluid has shown the importance of this approach.