2011 Special Program: Two-Phase Flow, Interface Flow and Related Phenomena

Immersed pendulum dynamics with the presence of a second or a third solid boundary

2011 - 10 - 12 (Wed.)
15:00 - 17:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

The unsteady motion of a solid sphere in an incompressible viscous liquid with the presence of a second solid boundary is a fundamental problem in fluid mechanics research. The knowledge is desired when modeling multiphase flow, particularly solid-liquid two-phase, since it provides the simplest framework to formulate particle-particle interactions with respect to particles configuration and flow condition. Such inter-particle interaction can be either non-contact coupling through the action of interstitial liquid (hydrodynamic coupling) or direct contact upon collisions (immersed collision).

Thus, this work will present recent experimental findings on how the dynamics of a fully immersed spherical pendulum may change with the presence of a pair of lateral walls or a downstream target. This pendulum collision with a downstream target with the presence of a third solid boundary will also be studied using systematic experiment data. Both hydrodynamic coupling and immersed collisions will be measured using relevant dimensionless parameters and examined with respect to dimensionless geometry size ratio, particle Reynolds and Stokes number. Some preliminary theoretical analysis will also be discussed to explain the experimental findings.