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Computing Particle Collisions in Fluids by Incorporating the Lubrication Theory in the Immersed Interface Method ACMAE EL YACOUBI, Cornell University, SHENG XU, Southern Methodist University, Z. JANE WANG, Cornell University — The interactions of particles in fluids are key to understanding collective behavior of particle suspensions. To compute the dynamics of these systems in the high particle-density limit, one has to treat the collision of particles. There has been experimental and theoretical studies to understand the dynamics of particle collisions in fluids. However, direct numerical simulation remains a challenge. The small gap introduces difficulties in spatial resolution, as it would require successive local refinements of the grid. A scheme with a fixed grid resolution would break down when the gap falls below a threshold. There have been various *ad hoc* methods using a repulsive force or modified dry collision equations. However, they can lead to unrealistic dynamics such as the rebound of particles. In this talk, we will present a computational method which applies the lubrication theory in the interstitial region between particles. We will describe the numerical implementation in the immersed interface method framework. The fluid velocity and pressure gradient in the gap are solved for analytically, and are used in the expression of the singular forces. We test our computational scheme by checking against analytical solutions of interactions between a falling cylinder and a wall.

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