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A finite element method for particulate flow

Particulate flows, i.e. flow of a (Newtonian) carrier liquid loaded with rigid particles, plays an important role in many technical applications. From a mathematical point of view, particulate flows give rise to an interesting and involved free boundary problem, where the flow field and the motion of the particles are coupled through the forces exerted by the flow.

In this talk a one-domain finite element method to solve this problem in 2d and 3d is presented. The main ingredients consist of a splitting scheme in time, a subspace projection method to account for the restriction of the flow field to a rigid body motion in those parts of the domain occupied by the particles and adaptivity to resolve the geometric problems.