An added mass partitioned algorithm for rigid bodies and incompressible flows

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ABSTRACT

This talk will discuss fluid-structure interaction (FSI) involving coupled rigid solids and incompressible fluids. The discrete formulation of the interface conditions has a strong influence on the stability of the approach, and FSI solvers often suffer when added-mass effects are large [5]. These difficulties arise because the reaction of an immersed body to an applied force depends not only on the mass of the body but also the mass of the fluid displaced by the body through its motion. Traditional approaches do not properly account for the added mass, with the consequence being numerical instabilities for light solids. I will present recent work concerning the development and analysis of new stable FSI solvers that avoid added-mass instabilities. The approach follows prior work in developing stable and accurate partitioned schemes for other FSI regimes [1, 4, 2, 3], and is based on embedding the evolutionary character of the fully coupled differential operator into the difference approximation. Overlapping grids are used to represent the complex moving geometries inherent to FSI problems.

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