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Simulating rigid body motion in incompressible two phase flow for applications in energy harvesting[1] CURTIS LEE, Texas Lutheran University, JESSICA SANDERS, JOHN DOLBOW, Duke University, PETER MUCHA, UNC, TOD LAURSEN, Duke University — Computational treatment of floating solids, in the presence of free surfaces and/or breaking waves, poses several modeling challenges. A motivating example where these systems are of interest is found in offshore wave energy harvesting systems, where a floating structure converts mechanical oscillations to electrical energy. In this work, we take the first steps in developing a robust computational strategy for treating rigid bodies with possible internal dynamics, such that they may be fully coupled to a fluid environment with free surfaces and arbitrarily large fluid motion. Our technique solves Lagrangian type rigid body equations coupled with the Eulerian formulation of the Navier Stokes equations for an immersed solid. This technique represents a subtle departure from standard methods, which solve the equations of motion completely on the Eulerian grid, and therefore facilitates the integration of internal components. To demonstrate this ability, simple rotational and translational components have been implemented with promising results.

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