

Abstract Submitted
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An Implicit Immersed Method for Compressible Solid Interacting with Slightly Compressible Viscous Fluid¹ X. SHELDON WANG, New Jersey Institute of Technology — In this paper, an implicit immersed method is employed for compressible solids interacting with slightly compressible viscous fluid. Mixed finite element formulations are implemented for both fluid and solid domains. The velocity unknowns for fluid domain are attached to a fixed Eulerian mesh or an arbitrary Eulerian-Lagrangian (ALE) mesh. In the implicit formulation, at each Newton-Krylov iteration, the nodal velocity unknowns of immersed solids are mapped/interpolated from the surrounding background fluid mesh. Both fluid and solid pressure unknowns are directly calculated. Although the immersed solid has the same displacement/velocity as the fictitious fluid occupying the same domain (kinematic matching), in general the bulk moduli and the pressures are different. In order to satisfy the inf-sup conditions, for both fluid and solid domains, high-order mixed elements, namely, 9-4c elements, satisfying the inf-sup conditions are used. Numerical examples are used to compare with traditional fluid-structure interaction approaches. Pros and cons of explicit vs implicit and incompressible vs compressible immersed methods are also discussed in this paper.

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