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Phase-field modelling of Fluid-Structure-Interaction

We consider the coupling of a fluid domain with elastic solid bodies. As opposed to traditional approaches to Fluid-Structure-Interaction we will not describe these domains by a moving grid. Instead, an implicit description by a phase-field function will be employed to characterize the (conceivably evolving) domains, which offers some interesting advantages from a modelling point of view. We will discuss a simple approach leading to a fully Eulerian two-phase flow problem with an additional elastic stress in the solid bulk. The approach will be validated in an axisymmetric setting by comparison to an ALE method. Extensions to viscoelastic fluids and elastic membranes will be presented along with a recent application to biological cells in flow.