

Titel: Phase-Field Modeling of Fluid-Structure Interaction and Elastic Membranes

Abstract:

We consider the coupling of a fluid domain with an elastic solid body. As opposed to traditional approaches to such Fluid-Structure Interaction, we do not describe these domains by a moving grid. Instead, an implicit description by a phase-field function is employed to characterize the evolving domains, which offers some interesting advantages from a modeling point of view. We discuss a simple approach leading to a fully Eulerian two-phase flow problem with an additional elastic stress in the solid bulk. The approach is validated by asymptotic analysis and numerical comparison to ALE simulations and experiments.

In the second part of the talk, the framework is extended to viscoelastic membranes. An ALE model is derived and then extended and compared to a first phase field approach. Finally, the model is used to numerically explore biological cells in flow and novel artificial microswimmers.