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An Immersed Approach to Fluid–Structure Interaction for Geophysics and Biomedicine

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During the last decades, Fluid-Structure Interaction (FSI) has received considerable attention due to various applications where a fluid and a solid interact with each other (such as in aeronautics, turbomachinery, and biomedical applications).

Different approaches have been developed for simulating the coupling of fluid and solid dynamics, ranging from body-fitted to immersed grid methods.

We present a novel framework for fluid-structure interaction inspired by the Fictitous Domain Method [1, 2] where both the two physical models are discretized with the Finite–Element method.

The solid and the fluid problems are coupled by using L^2–projections for transferring the velocities and the forces between the fluid and the solid meshes [3].

We illustrate the approach through several numerical examples in the fields of biomedicine and geophysics, in particular applications to the haemodynamics of heart valves and the flow within rock fractures.

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