Fluid Structure Interaction with Application in Hemodynamics

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Abstract

In this talk we review a monolithic Newton-Krylov solver with exact Jacobian for the solution of fully incompressible Fluid-Structure Interaction problems. Unlike common approaches, the enforcement of the incompressibility conditions both for the fluid and for the solid parts is taken care of by using an inf-sup stable finite element pair, without stabilization terms. The Krylov solver is preconditioned using geometric multigrid with smoothers of Richardson type, in turn preconditioned by additive Schwarz algorithms. The separate solution of fluid or solid operators occurs only at the preconditioning stage of the smoother, thus guaranteeing at each level an accurate interface momentum balance. The above FSI formulation is tested in several hemodynamics applications, and it is proven to be both robust and accurate.

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