

Domain Decomposition Solvers for some Fluid-Structure Interaction Problems

Ulrich Langer* and Huidong Yang†

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Abstract

In this talk, we present some analysis and numerical studies of two partitioned fluid-structure interaction solvers: a preconditioned GMRES solver and a Newton based solver. The structure part in the fluid-structure interaction problems considered consists of a nearly incompressible elasticity model in a classical mixed displacement-pressure formulation. Both solvers are highly relying on robust and efficient solvers for the fluid and structure sub-problems obtained from an extended and stabilized finite element discretization on hybrid meshes. For solving the discretized sub-problems with incompressible and nearly incompressible models, a special algebraic multigrid method capable of handling such general saddle point systems is investigated.

In addition, a two-layer coupled fluid-structure-structure interaction model is considered, which incorporates an anisotropic structure model into the fluid-structure interaction problems. We propose two domain decomposition solvers for such a class of coupled problems: a Robin-Robin preconditioned GMRES solver combined with an inner Dirichlet-Neumann iterative solver, and a Robin-Robin preconditioned GMRES solver combined with an inner monolithic algebraic multigrid solver capable of handling an anisotropic compressible and nearly incompressible sub-problem.

*Johann Radon Institute for Computational and Applied Mathematics (RICAM) of the Austrian Academy of Sciences and Institute of Computational Mathematics at the Johannes Kepler University, Linz, Austria

†Johann Radon Institute for Computational and Applied Mathematics (RICAM) of the Austrian Academy of Sciences, Linz, Austria