

Improving the efficiency of monolithic fluid-structure interaction solvers

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ABSTRACT

Monolithic solvers for fluid-structure interaction (FSI) problems have been shown to be very robust in a wide range of problems. Depending on the scenario at hand, they might even outperform partitioned schemes. However, solving the solid, the fluid and the mesh motion problem simultaneously requires a careful design of the overall solution algorithm to still be competitive in terms of computational cost and wall clock time. Various algorithmic building blocks have to be tweaked to apply these types of algorithms to large scale sophisticated examples. Some of them are parallel hardware and software architecture, freedom of choice of time integration scheme [1], adaptive time stepping [2], FSI-specific linear block preconditioners [3] and special nonlinear solution techniques to name a few.

In this presentation, we will outline various measures that increase efficiency of monolithic solvers for fluid-structure interaction problems. In particular, aspects of time integration and preconditioning will be discussed. Numerical examples will demonstrate their effect on overall simulation cost and timings.

REFERENCES

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