

A FEM/MULTIGRID SOLVER FOR MONOLITHIC ALE FORMULATION OF FLUID-STRUCTURE INTERACTION PROBLEM

Jaroslav Hron

*Mathematical Institute of Charles University
Sokolovska 83, 185 75 Praha, Czech Republic
e-mail: hron@karlin.mff.cuni.cz*

Keywords: fluid-structure interaction, monolithic ALE, mixed FEM, multigrid

Abstract

In this contribution we investigate a monolithic algorithm to solve the problem of time dependent interaction between an incompressible, possibly non-newtonian, viscous fluid and an elastic solid. The continuous formulation of the problem and its discretization is done in a monolithic way, treating the problem as one continuum and discretized by the Q2/P1 finite elements. The resulting set of nonlinear algebraic system of equations is solved by an approximate Newton method with coupled geometric multigrid linear solver for solving the linear subproblems. We discuss possible efficient strategies of setting up the resulting system and its solution. A 2-dimensional configuration is presented to test the developed method. It is based on the DFG benchmark *flow around cylinder* for incompressible laminar fluid flow and extended to fluid-structure interaction in [1].

Acknowledgement: This research was supported by NCMM, project LC06052, financed by MSMT CR.

References

- [1] S. TUREK AND J. HRON, *Proposal for numerical benchmarking of fluid-structure interaction between an elastic object and laminar incompressible flow*. In H.-J. Bungartz and M. Schafer, eds, Fluid-Structure Interaction: Modelling, Simulation, Optimisation, LNCSE, Springer, 2006.