Fluid-Structure Interaction with H(div)-Conforming HDG and a new H(curl)-Conforming Method for Non-Linear Elasticity

Michael Neunteufel[1] Joachim Schöberl[2]

Fluid-structure-interaction problems arise in a variety of engineering applications and finding appropriate discretization is still challenging. Often Taylor-Hood elements for the fluid and H1-conforming elements for the solid are used, as they are easy to implement, however they entail some disadvantages.

In this talk we present a new kind of coupling of the Navier-Stokes equations with the elastic wave equation using mixed methods.

The H(div)-conforming Hybrid Discontinuous Galerkin method is used for the discretization of the Navier-Stokes equations, which brings a new term in the Arbitrary Lagrangian Eulerian description besides the appearing mesh velocity.

For the elasticity part we introduce a new method, which is based on the idea to use H(curl)-conforming elements for the velocity instead of standard H1-elements. Therefore an additional variable is needed: the impulse, for which we use the dual space of H(curl).

The method is implemented in NGS-Py, which is based on the finite element library Netgen/NGSolve (www.ngsolve.org). Finally, we present first numerical results.

[1] Vienna University of Technology, Institute for Analysis and Scientific Computing, Vienna, Austria, e1241601@student.tuwien.ac.at

[2] Vienna University of Technology, Institute for Analysis and Scientific Computing, joachim.schoeberl@tuwien.ac.at