Simplex-Space-Time FEM for Fluid-Structure-Interaction

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ABSTRACT

Wings of aircraft or turbines and arteries deforming by enclosed flow are exemplary for the many applications involving Fluid-Structure-Interaction. The Simplex Space-Time Finite Element Method offers the potential for adaptive meshing in space and time, and handling moving domains and time-dependant topology changes of the spatial domain well. It has been used successfully to discretise solid [1], and fluid [2] sub-problems respectively. This contribution aims at discretising the full FSI problem this way.

Partitioned approaches to find numerical solutions to these offers the benefit of reusing existing solvers for the fluid- and structure sub-problem, but pose challenges to maintaining a consistent description of conservation variables at the fluid-structure interface.

The Consistent Boundary Flux Method has been used to reconstruct consistent fluxes for heat equation problems and is extendible to fluid problems to reconstruct tractions on the fluid-solid interface. This, among a stable consistent space-time formulation for elasto-dynamic solids and mesh generation for partitioned surface-coupled multi-physics problems is one of the remaining challenges for solving aero-elasticity problems computationally.

REFERENCES
