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ADVANTAGES OF SPLINE-BASED INTERFACES FOR FLUID-STRUCTURE INTERACTION IN BALLOON-TYPE PROBLEMS

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Abstract. Inflating Balloon-type problems are characterized by two numerical challenges: First, a deviation of the geometry, e.g., caused by discretization, can have a dramatic influence on the numerical result. Second, the composition of the boundary by an inflow and a moving but impermeable wall typically results in a problem with Dirichlet boundaries only. This leads to difficulties for partitioned fluid-structure interaction approaches , if incompressible fluids are involved. In the presented work, the first problem is handled by using a geometrically matching interface based on Non-Uniform Rational B-Spline (NURBS) interface [1]. On the solid side a shell model is solved with isogeometric analysis (IGA) [2]. Following the idea of the NURBS-enhanced finite element method [3], the spline-based interface is considered on the fluid side only at the boundary. The second problem is treated by enforcing the coupling condition at the interface through a Robin-Neumann-type coupling scheme. The accuracy of the partitioned FSI approach is demonstrated with two- and three-dimensional benchmark problems.

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