

Computational FSI: Methods Developed and Simulations Performed

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The presentation is focused on the computational framework that involves coupling of incompressible flow and structures undergoing large deformations [1]. The formulation of fluid mechanics on the moving domain is presented, and efficient solution strategies for the underlying linear equation systems are discussed. A framework for computational fluid-structure interaction (FSI) based on the Arbitrary Lagrangian-Eulerian formulation is presented. Basics of Isogeometric Analysis are also shown. The fluid-structure interface discretization is assumed to be nonmatching allowing for the coupling of standard finite-element and isogeometric discretizations for the fluid and structural mechanics parts of the FSI problem, respectively. FSI coupling strategies and their implementation in the high-performance parallel computing environment are also discussed, and computational challenges presented. Simulations ranging from cardiovascular fluid mechanics and FSI to full-scale wind-turbine FSI are presented.

REFERENCES

- [1] Y. Bazilevs, K. Takizawa, and T. E. Tezduyar. *Computational Fluid–Structure Interaction: Methods and Applications*. Wiley, 2013.