

A Flexible Fluid-Structure Interaction Framework with Applications

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ABSTRACT

In this presentation some recent advances in fundamental developments and applications of Isogeometric Analysis (IGA) are presented. In the applications involving solids and structures, the use of a novel IGA thin-shell formulation enables the development of accurate and efficient techniques for damage prediction in composite laminates due to low-velocity impacts. In the applications involving fluids and turbulence, the use of divergence-conforming B-Splines, in combination with an appropriately formulated Variational Multiscale Large-Eddy Simulation (LES) turbulence models, gives an excellent combination of accuracy and computational efficiency for such simulations. In the regime of compressible flow, appropriately stabilized smooth IGA discretizations also deliver very good results. A novel immersed framework for air-blast-structure interaction (ABSI) involving IGA-based compressible flow is presented and verified on a set of challenging examples. The presentation concludes with examples that highlight effective uses of IGA in advanced applications.