6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

MESH ADAPTATION FOR FLUID-STRUCTURE INTERACTION PROBLEMS

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Keywords: *Fluid-Structure Interaction, Mesh Adaptation, Metric Gradation, Finite Volume Method, Finite Element Method.*

The fluid-structure interaction (FSI) problems deal with the interaction between structures and fluid flow. They are present in many domains among aeroelastics, flutter and bioengineering. Since the last decades, the computational resources had significantly increased allowing the computation of challenging FSI problems. However, the computational restitution time is still a key point for the industry, specially when dealing with multi-physics simulations. In this work, we proposed to demonstrate the efficiency of mesh adaptation to solve unsteady fluid-structure interaction problems. The Navier-Stokes equations are solved by an edge-based Finite Volume solver whereas the linear elasticity equation is solved by the Finite Element Method using the Lagrange $\mathbb{P}^1$ elements. The coupling between both solvers is realized with boundary conditions. The assumption of small displacement is made in this work leading to small strain. Therefore, the mesh is not deformed and an Arbitrary Lagrangian Eulerian (ALE) formulation for the Navier-Stokes equations is not needed. For the unsteady mesh adaptation, the algorithm developed in [1] is used to adapt the flow mesh. The flow metric is then propagated to structure mesh to adapt it by metric gradation [2]. FSI problems are very complex to solve due to nonlinearities and its multi-physic aspect. Few analytical solutions are available. It is why, in this work, we decided to treat a well-documented problem, namely the elastic panel in a shock tube developed by Giordano *et al.* [3]. Finally, we also plan to carry out simulations of three-dimensional complex cases.

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