An ALE-Based Unstructured-Grid Solver for Fluid-Structure Interaction.[1] GUOHUA XIA, CHING-LONG LIN, Department of Mechanical and Industrial Engineering, IIHR-Hydroscience and Engineering, The University of Iowa — An implicit structural dynamics solver is coupled with a fluid dynamics solver through the Arbitrary Lagrangian-Eulerian (ALE) method on an unstructured mesh framework to study fluid-structure interaction (FSI) phenomena. The fluid and structure solutions are updated in an iterative manner with a dynamic mesh algorithm. This study aims to improve the efficiency and accuracy of the coupled FSI solver. With the adoption of the dynamic mesh algorithm, the efficiency of unsteady flow simulation is improved and large structural deformation can be handled without excessive distortion of the meshes near the moving structure. The FSI solver is applied to simulate the vortex induced vibrations of an elastic plate under different initial conditions. Both cases with a rigid plate and an elastic plate are investigated for comparison. The results agree well with existing numerical and experimental data. It is observed that the vortex shedding patterns and frequencies for both cases are different and the solution for an elastic plate varies with the initial deflection of the plate.

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