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Flowfield-Dependent Variation Method for Moving-Boundary Problems

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Abstract

A novel numerical scheme using the combination of flowfield-dependent variation method and arbitrary Lagrangian-Eulerian method is developed. This method is a mixed explicit-implicit numerical scheme, and its implicitness is dependent on the physical properties of the flowfield. The scheme is discretized using the finite-volume method to give flexibility in dealing with complicated geometries. The formulation itself yields a sparse matrix, which can be solved by using any iterative algorithm. Several benchmark problems in two-dimensional inviscid and viscous flow have been selected to validate the method. Good agreement with available experimental and numerical data in the literature has been obtained, thus showing its promising application in complex fluid-structure interaction problems.

Keywords

KeyWords Plus: GEOMETRIC CONSERVATION LAW; UNSTRUCTURED GRIDS; FLOW COMPUTATIONS; UNSTEADY FLOWS; FORMULATION; FLUID; DOMAINS; SYSTEMS; MESHES; SPEED

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