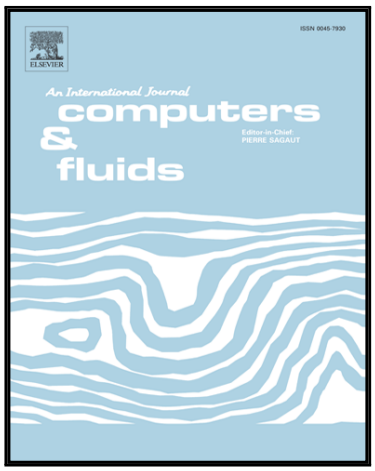

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Shock-conforming Mesh Generation for Aerodynamic Analyses at Supersonic Regimes

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Abstract

A shock estimation approach is proposed in the context of the generation of shock-conforming meshes for the numerical analysis of inviscid, steady, supersonic and hypersonic flows. For given flow conditions and vehicle's geometry, the method provides a fast estimation of the shock waves pattern such that grid points can be clustered along the shock waves in a judicious manner. In this way, the uncertainty on mesh generation for shock-dominated flows is reduced and the use of adaptive mesh refinement could be made more efficient or, in some cases, even considered not necessary. The approach is verified against two- and three-dimensional supersonic flows for conceptual exemplary geometries like wedges and revolution bodies and more real-world vehicles configurations like rockets and hypersonic aircraft. Qualitative and quantitative assessment of the solution-mesh pair quality is proposed to evaluate the quality of the resulting shock-conforming meshes.

Keywords: Supersonic aerodynamics, Shock estimation, Mesh generation.

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