عنوان مقاله:

A Framework for Curved Boundary Representation in ۲D Discontinuous Galerkin Euler Solvers

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی, دوره 7, شماره 4 (سال: 1393)

تعداد صفحات اصل مقاله: 10

نویسندگان:

B. Baghapour - *School of Mechanical Engineering, College of Engineering, University of Tehran, North Kargar Ave., P. O. Box ۱۴۳۹۵-۱۳۳۵, Tehran, Iran*

V. Esfahanian - *School of Mechanical Engineering, College of Engineering, University of Tehran, North Kargar Ave., P. O. Box ۱۴۳۹۵-۱۳۳۵, Tehran, Iran*

A. Nejat - *School of Mechanical Engineering, College of Engineering, University of Tehran, North Kargar Ave., P. O. Box ۱۴۳۹۵-۱۳۳۵, Tehran, Iran*

خلاصه مقاله:

Finite-element based CFD solvers like the family of Discontinuous Galerkin (DG) solvers suffer severely from inaccurate boundary reconstruction. In this matter, developing an accurate and flexible strategy is highly demanded to provide high-order curved boundary representation in DG simulations. In this paper, a general framework is introduced to design the curved elements in discontinuous Galerkin finite-element (DGFEM) simulations. The aim is to connect the boundary to the surrounding mesh by defining an appropriate set of basis functions which deliver the curvature information inside the mesh region adjacent to the boundary. This information is then used in flux integral calculations. The proposed framework is applied in Lagragian and Hermitian boundary representations. The efficiency of the method is analyzed for compressible inviscid flow test cases using the discontinuous Galerkin scheme. It is illustrated that using the curved-side elements in the present approach, is adequate to reduce the artificial entropy generation near the boundaries. This leads to the simulations with the desired order of accuracy. The results show a well consistency in h/p-refinement which advocates the use of the proposed approach in high-order CFD simulations.

کلمات کلیدی:

Curvature distribution, Geometric transformation, Euler equations, Discontinuous Galerkin