A Discontinuous Galerkin Method for Compressible Flow on 3D Hybrid Grids

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Abstract

In this study, a high order discontinuous Galerkin method is developed for the steady state solutions to the compressible Euler and Navier-Stokes Equations on three dimensional hybrid grids. The discontinuous Galerkin method is developed for arbitrary 3D elements which form hybrid unstructured grids. The approximate solution within each element is expanded into a series of local polynomial functions. The inviscid and viscous numerical flux are calculated using van leer scheme and BR2 scheme respectively. An explicit third order Runge-Kutta method is employed to solve the discretized ODE systems. The shock waves and strong discontinuities in supersonic flow field are detected using KXRCF shock detector, and limited by slope limiters. A number of test cases are presented to demonstrate the accuracy of this method, the results show its superior performance for solving compressible flow problems with complex geometries.

Keywords: **discontinuous Galerkin method, compressible flow, hybrid grid.**