

VERY HIGH-ORDER ACCURATE P-MULTIGRID DISCONTINUOUS FINITE ELEMENT SOLUTION OF THE EULER AND NAVIER-STOKES EQUATIONS

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ABSTRACT

Discontinuous Galerkin (DG) methods have proven to be very effective in the high-order accurate discretization of both advection and advection-diffusion problems on arbitrary and possibly non conforming grids. The drawback of these robust, accurate and flexible methods is their high computational cost both in terms of cpu and storage requirement. In order to improve the computational efficiency of this class of methods, a DG code based on the BR2 [1,2] space discretization scheme, tensor product nodal shape functions on quadrilateral and hexahedral elements with interpolation nodes coincident with quadrature points [3], and a p-multigrid solution strategy to accelerate convergence to steady state, see e.g. [4,5,6], has been developed. The resulting code shows a significantly improved performance with respect to a previously developed DG code based on the same space discretization method but using standard shape functions and an implicit time integration scheme.

In the full paper a detailed description of the type of interpolation/quadrature points employed as well as of the p-multigrid strategy employed will be provided. The effectiveness of the proposed methodology will be demonstrated by presenting the results obtained on several 2D and 3D test cases for both inviscid and viscous compressible flows.

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