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A New Reconstructed Discontinuous Galerkin Method for Compressible Flows on Unstructured Grids JIAN CHENG, North Carolina State University, TIEGANG LIU, Beihang University, HONG LUO, North Carolina State University — A reconstructed discontinuous Galerkin method (rDG) has been developed for solving the compressible Euler equations on unstructured grids. The rDG method is designed not only to enhance the accuracy of the discontinuous Galerkin method, but also to avoid non-physical oscillations in the vicinity of discontinuities. In this work, a new hybrid least-squares reconstruction scheme is developed for the reconstructed discontinuous Galerkin method rDG(P1P2) for compressible flows on unstructured grids. The new hybrid least-squares reconstruction can be regards a combination of least-squares recovery method and least-square reconstruction method. Compared to Green-Gauss reconstruction and original least-squares reconstruction, the new hybrid least-squares reconstruction method can strictly satisfy 2-exact property when obtain a quadratic polynomial representation of the underlying discontinuous Galerkin linear polynomial solution on each cell. The numerical experiments for a variety of flow problems demonstrate that this new hybrid reconstruction method is more accurate than the Green-Gauss and the original least-squares reconstruction method, and is able to achieve the designed third-order of accuracy for both inviscid and viscous flow problems.

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