

Positivity-Preserving High Order Finite Volume HWENO Schemes for Compressible Euler Equations

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Abstract In this paper, we present a positivity-preserving high order finite volume Hermite weighted essentially non-oscillatory (HWENO) scheme for compressible Euler equations based on the framework for constructing uniformly high order accurate positivity-preserving discontinuous Galerkin and finite volume schemes for Euler equations proposed in Zhang and Shu (J Comput Phys 230:1238–1248, 2011). The major advantages of the HWENO schemes is their compactness in the spacial field because the function and its first derivative are evolved in time and used in the reconstructions. On the other hand, the HWENO reconstruction tends to be more oscillatory than those of conventional WENO schemes. Thus positivity preserving techniques are more needed in HWENO schemes for the sake of stability. Numerical tests will be shown to demonstrate the robustness and high-resolution of the schemes.

Keywords Positivity preserving · High order accuracy · Hermite weighted essentially non-oscillatory scheme · Finite volume scheme · Compressible Euler equations

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