

EFFICIENT THIRD ORDER WENO SCHEME WITH UNCONDITIONALLY OPTIMAL ACCURACY NEAR CRITICAL POINTS

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ABSTRACT. A novel third order Weighted Essentially Non-Oscillatory (WENO) scheme [3, 4], attaining unconditionally third order accuracy when the data is smooth enough, even in presence of critical points, and second order accuracy if a discontinuity crosses the data, is presented. The key to attribute these properties to this scheme is the inclusion of an additional node in the data stencil, which is only used in the computation of the weights measuring the smoothness. The accuracy properties of this scheme are proven in detail and several numerical experiments through finite-difference schemes on hyperbolic conservation laws [1, 2] are shown, which show that this scheme is more efficient in terms of the CPU cost/error ratio than its traditional third order counterparts as well as several higher order WENO schemes that are found in the literature.

Keywords: Finite-difference schemes, third order WENO reconstructions, optimal accuracy, efficiency

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