

## **An Alternative Framework of Multi-Resolution Nested Weighted Essentially Non-Oscillatory Schemes for Solving Euler Equations with Adaptive Order**

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**Abstract :** In the present paper, an alternative framework is proposed to construct a class of finite difference multi-resolution nested weighted essentially non-oscillatory (WENO) schemes with an increasingly higher order of accuracy for solving inviscid Euler equations. These WENO schemes firstly obtain a set of reconstruction polynomials by a hierarchy of nested central spatial stencils, and then recursively achieve a higher order approximation through the lower-order precision WENO schemes. The linear weights of such WENO schemes can be set as any positive numbers with a requirement that their sum equals one and they will not pollute the optimal order of accuracy in smooth regions and could simultaneously suppress spurious oscillations near discontinuities. Numerical results obtained indicate that these alternative finite-difference multi-resolution nested WENO schemes with different accuracies are very robust with low dissipation and use as few reconstruction stencils as possible while maintaining the same efficiency, achieving the high-resolution property without any equivalent multi-resolution representation. Besides, its finite volume form is easier to implement in unstructured grids.

**Keywords :** finite-difference, WENO schemes, high order, inviscid Euler equations, multi-resolution

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