

# A strategy applied on weighted ENO interpolation to improve the accuracy near discontinuities

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## Abstract

A strategy is devised to make the WENO interpolation in the point values achieve optimal accuracy near the discontinuities. The classical WENO interpolation ensures the optimal accuracy when all stencils are smooth and ENO property when the discontinuity appears. When there exist more than two successive smooth stencils, the maximum theoretical accuracy near discontinuity is also preferred to be obtained. To achieve it, we divide the classical WENO algorithm into several sub-WENO procedures. In each sub-WENO procedure, only two stencils are used and the order of accuracy grows one at most. If both stencils are smooth, then sub-WENO procedure increases the order of accuracy by one. If there is a stencil is smooth and the left one is non-smooth, then algorithm conserves the order of interpolation by corresponding smooth stencil and keeps the ENO property. If both stencils are non-smooth, then the value constructed by sub-WENO procedure will be ignored in the latter procedures. The whole of new WENO algorithm can be expressed as a tree structure. The indicator of smoothness of every medium stencil in the tree structure is defined by the indicators of smoothness of corresponding stencils on the top of tree. Such definition is proved to be capable of obtaining the optimal accuracy and keep the ENO property. And the new WENO algorithm has almost the same computational cost as the classical WENO algorithm.

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