

## **High Order Shock Detectors for Hybrid WENO-Compact Finite Difference Scheme for Hyperbolic Conservation Laws**

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A high order/resolution hybrid scheme that conjugates a nonlinear WENO finite difference scheme and a linear compact finite difference scheme will be described. The hybrid scheme takes advantages of the sharp essentially non-oscillatory capturing of shocks and high gradients of the WENO reconstruction procedure and high resolution and non-dissipative nature of the compact scheme. The key component of the hybrid scheme is the determination of the smoothness of the solution at a given grid point and time. By treating the solution frozen in time as an image, several high order shock detection algorithms such as the polynomial based multi-resolution analysis, trigonometric based conjugate Fourier analysis and non-polynomial based radial basis function analysis will be presented. Their performances in terms of accuracy, efficiency and robustness will be illustrated via several benchmark shocked flows, such as the one-dimensional shock-density wave interaction, two-dimensional classical Riemann initial value problem, the Mach 10 double reflection problem, and the reactive flow over a backward facing step.