FM6S_11485

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Development and Paractical Application of WENO Schemes for Compressible Fluid Flow Computations

Alexey N. Kudryavtsev, Dmitry V. Khotyanovsky

ITAM, Novosibirsk, Russia

Application of high-order shock-capturing schemes to numerical simulation of problems in supersonic aerodynamics is considered. Euler and Navier–Stokes solvers based on employing modern weighted essentially non-oscillatory (WENO) schemes are described. A new WENO scheme, which has an advantage when applied in general curvilinear coordinates, is constructed. A number of examples of numerical simulations of 2D and 3D shock-dominated flows with high-order schemes are given. They include shock wave propagation and diffraction, shock/shock and shock/boundary layer interaction, development of hydrodynamic instability waves in high-speed free shear flows, and the structure of imperfectly expanded supersonic jets. For some problems, high-quality numerical schlieren visualizations and interferograms are compared with experimental patterns. We demonstrate that high-order WENO schemes is a powerful tool for simulation of compressible fluid flow. They can be considered as a very promising candidate for DNS and LES of turbulent supersonic flows.

View the extended summary