The Efficiency of Gas-Kinetic BGK Scheme for Solving 2-D Compressible Inviscid Regular Shock Reflection Problem

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Abstract

In this paper, the gas-kinetic BGK scheme is developed and tested for its ability in solving the two-dimensional compressible inviscid regular shock reflection problem. The BGK (Bhatnagar-Gross-Krook) scheme uses the collisional Boltzmann equation as the governing equation for flow evolutions. Second-order BGK scheme is also developed for flow simulation. This is achieved by means of reconstructing the initial data via MUSCL (Monotone Upstream-Centered Schemes for Conservation Laws) method. In addition, a multisage TVD (Total Variation Diminishing) Runge-Kutta method is employed for the time integration of the finite volume gas-kinetic scheme. A typical two-dimensional regular reflection of an oblique shock wave from a solid surface is chosen for testing the accuracy and robustness of the BGK scheme. The computational results are validated against the numerical results of Roe’s scheme.