HFVS: High Order Flux Vector Splitting Scheme For Multi-Materials Flows

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Abstract

In this article, we extend HFVS[1], a flux vector splitting scheme with high order accuracy in both space and time, to solve the so-called extended Euler equations of multi-materials flows. The main contribution of this article is extend HFVS to solve quasi-conservative hyperbolic systems. Firstly, we separate the numerical flux into two parts: conservative and non-conservative. Secondly, we use HFVS to solve the conservative part directly. Thirdly, following the idea of [2], we use a necessary condition of avoiding numerical oscillation near the material interfaces to determine the numerical scheme of non-oscillation part. Numerous numerical results demonstrate the new scheme not only can achieve high order accuracy in both space and time, but also can solve multi-materials flows without introducing non-oscillation near the materials interfaces.

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[2] Chen Y., Jiang S.A non-oscillatory kinetic scheme for multi-component flows with the equation of state for a stiffened gas, Journal of Computational Mathematics, Volume 29, 2011