A Three-dimensional Numerical Scheme on an Unstructured Grid System for MHD Simulation

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We present a three-dimensional numerical scheme on an unstructured grid system for MHD simulation. It is based on the finite volume method, called the Total Variation Diminishing (TVD) scheme, with the Roe-type upwinding numerical flux. It is aimed at the applications to the space and astrophysical problems with strong spatial non-uniformities. The treatment of an unstructured grid system is realized from the fact that the form of the MHD equations is unchanged for the rotation of the coordinate system. A Strang-type operator splitting is used to treat multiple spatial dimensions. The divergence-free constraint is enforced by calculating a correction via a gauge transformation. In order to show the efficiency of this scheme, some numerical examples are presented.