

A Moving Boundary Scheme of Space-Time Conservation Element and Solution Element Method for Two-Dimensional Hyperbolic Conservation Laws

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Space-time conservation element and solution element (CE/SE) method, which is a high resolution and genuinely multidimensional numerical method for solving conservation laws, was proposed by Chang and his working group (1995, 2002). It was built from ground zero with extensive physics considerations and designed to avoid the limitations of traditional numerical, i.e. finite difference method, finite volume method, finite element method et al. Nevertheless, its foundation is mathematically simple enough that one can build from it a coherent, robust, efficient, and accurate numerical framework.

In this paper, a moving boundary scheme for the space-time conservation element and solution element method has been developed. This scheme respectively reconstructed the conservation element and solution element in space-time domain, and calculated the flux conserved in the conservation elements to avoid the flow variables interpolation between the old and new time level. This scheme not only kept the characteristics of original space-time conservation element and solution element method, but also easily to extend the solver to multidimensional with structured/unstructured spatial grid. Results of several classic flow problems computed by this scheme show that the current scheme is more accurate, efficient, and robust for solving shock and contact discontinuities.

Keywords: CE/SE method, moving boundary, conservation law

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