Two-dimensional Riemann problem for a hyperbolic conservation laws

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ABSTRACT

We consider two-dimensional Riemann problem for a system of hyperbolic conservation laws. To simplify the problem, most studies have been conducted under the assumption that only one planar wave occurs at the initial discontinuity. However, for a $2 \times 2$ system it is reasonable to have up to two planar waves at the initial discontinuity. We construct the solution without this restriction. The solution is constructed analytically by applying generalized characteristic method. Constructed solution shows interesting structures including delta-shock wave. We also compute the numerical solution and compare with the analytic solution.

Introduction

We consider two-dimensional Riemann problem for a $2 \times 2$ system of hyperbolic conservation laws:

$$U_t + F(U)_x + G(U)_y = 0$$

with three constant initial data separated by $x$-positive, $y$-positive and $x$-negative axes. The analytic and the numerical solutions are computed and the results show the good coincident. Figure 1 shows one of the solution constructed.
Figure 1. $RJ$ (rarefaction, contact) + $SJ$ (shock, contact) + $JS$ (contact, shock)

REFERENCES


