
Sonic lines arising from 2-D Riemann problems of the compressible Euler system

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Abstract

We study the sonic lines to a Riemann problem for the two-dimensional Euler system in the self-similar plane. In the plane, the governing equation becomes quasilinear and changes its type. The type of the flow in the far-field is hyperbolic and the type of the flow near the origin is mixed. The semi-hyperbolic patches and sonic lines are located inside the mixed area. We are specially interested in the property of the sonic line where the degeneracy of hyperbolicity occurs. This type of solution patch and the sonic line appear in the transonic flow over an airfoil and the Guderley reflection, and is common in the numerical configurations of Riemann problems. The exact behavior of solutions in the semi-hyperbolic patches near the sonic lines are studied and the C^1 regularity of the sonic line is obtained.

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