Solution of 2D Euler Equations With the Moving-Grid Rotating-Invariance Method

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Abstract

A new rotating flux method based on moving grid is introduced to solve the two-dimensional Euler. We employ the adaptive moving grid method, which is based on the variational principle and uses the second-order accuracy of conservative-interpolation for physical quantities at the new grids, for the new grid distribution according to the solution property. Physically, the new rotating entropy stable numerical flux, which is obtained by Rotating Invariance and satisfies the second law of thermodynamics, is utilized as the numerical flux function at the new irregular quadrilaterial cell. The numerical results provides the remarkable evidence in stability and high-resolution.

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start

Give a logical region and a physical region, the initial value and the unit mean value are given on the control area.

Gauss-Seidel iteration is used to evolve the grid

no

The solution is updated used the conservation interpolation formula

$$\left\| \bar{z}^{[v+1]} - \bar{z}^{[v]} \right\| \leq \varepsilon$$

yes

The numerical solution of the next time layer is obtained by using the high resolution finite volume method

$$t_{n+1} \leq T$$

no

yes

end

$$u^{[0]}_{j+\frac{1}{2},k+\frac{1}{2}} := u^{n+1}_{j+\frac{1}{2},k+\frac{1}{2}}$$

$$\left(x^{[0]}_{j,k}, y^{[0]}_{j,k} \right) := \left(x^{[v+1]}_{j,k}, y^{[v+1]}_{j,k} \right)$$

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