

Optimization of spatial and minimum storage RK schemes for computational acoustics.

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Abstract

In this paper, new finite difference schemes for the spatial discretization and time advancing RK schemes for the numerical simulation of Computational Aero-Acoustic problems are derived. The new schemes are designed taking into account not only the standard accuracy and stability properties but also the dissipation and dispersion properties for a given interval of wavenumbers that are essential for the simulation of these waves in long time intervals.

The schemes developed are composed by a fourth-order accurate space discretization and also in time with six explicit low-memory stages that minimize the total dispersion and dissipation errors arising in the spatial and temporal discretization process.

The numerical results obtained indicate an important improvement in accuracy and in efficiency when they are compared with other low dispersive and dissipative explicit schemes recently published in the last years.