عنوان مقاله:

A new convergence acceleration technique for solving unsteady incompressible Navier-Stokes equations

محل انتشار:

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خلاصه مقاله:

A highly efficient method for solving unsteady incompressible flow simulation is introduced for the first time to reduce the computational cost, which is called cell-elimination method. The cell-elimination method is based on spares matrix solvers concept and it reduces useless cells in the computational domain. This scheme is combined with the progressive power-law preconditioning method in which the two-dimensional Navier-Stokes equations are modified by changing the terms of time derivative of the governing equations. The governing equations are integrated by means of Jameson s cell-centered finite volume numerical method. To achieve the steady state solution, the equations are integrated in pseudo-time using an explicit four-stage Runge-Kutta scheme with a local time step. For unsteady problems a dual-time implicit algorithm is applied to obtain time-accurate solutions. Results show that despite simplicity, for unsteady flows, accuracy and remarkable reduction in computational cost (about 33-83 times faster than the base scheme) are obtained.

کلمات کلیدی:

Unsteady incompressible flow, Cell-elimination method, Progressive power-law preconditioning method, Explicit four-stage Runge-Kutta scheme

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