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Efficient Numerical Simulation for LDC

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Abstract : In this poster, numerical solutions of two-dimensional and three-dimensional lid driven cavity are presented by solving the steady Navier-Stokes equations at high Reynolds numbers where it becomes difficult. Lid driven cavity is where the a fluid contained in a cube and the upper wall is moving. In two dimensions, we use the streamfunction-vorticity formulation to solve the problem in a square domain. A numerical method is employed to discretize the problem in the x and y directions with a spectral collocation method. The problem is coded in the MATLAB programming environment. Solutions at high Reynolds numbers are obtained up to Re=20000 on a fine grid of 131 * 131. Also in this presentation, the numerical solutions for the three-dimensional lid-driven cavity problem are obtained by solving the velocity-vorticity formulation of the Navier-Stokes equations (which is the first time that this has been simulated with special boundary conditions) for various Reynolds numbers. A spectral collocation method is employed to discretize the y and z directions and a finite difference method is used to discretize the x direction. Numerical solutions are obtained for Reynolds number up to 200. , The work prepared here is to show the efficiency of methods used to simulate the physical problem where accurate simulations of lid driven cavity are obtained at high Reynolds number as mentioned above. The result for the two dimensional problem is far from the previous researcher result.

Keywords : lid driven cavity, navier-stokes, simulation, Reynolds number
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