A numerical study of secondary flow and large eddies in a driven cavity

Y. H. Yapi, A. Badarudin, and P. A. Rubini

1Department of Mechanical Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia
2Department of Engineering, University of Hull, East Yorkshire, United Kingdom

(Manuscript Received March 30, 2011; Revised September 7, 2011; Accepted September 21, 2011)

Abstract

This paper reports on the application of a newly developed LES flow solver to compute a true three-dimensional flow. The research also investigates the behavior of turbulence statistics by comparing transient simulation results to available data based on experiments and simulations. An extensive discussion on the results such as energy spectrum, velocity profiles and time trace of velocities is carried out in the research as well. Based on the results obtained, the application of the flow solver for a turbulent three-dimensional driven cavity flow by using three grids with varying densities is proven. In addition, the research successfully verifies that in many instances computational results agreed reasonably well with the reference data, and the changes in the statistical properties of turbulence with respect to time are closely related to the changes in the flow structure and strength of vortices. The focus of this study is on the prediction of a sub- and sub-scale Reynolds shear stress profiles, and the results show that the standard model is able to reproduce general trends measured from