

Abstract

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Revisiting the lid-driven cavity flow problem: Review and new steady state benchmarking results using GPU accelerated code

This paper presents a broad account of the lid-driven cavity flow problem which is an important benchmark problem for the validation of CFD codes. A comprehensive review of the literature on the problem is presented and discussed, and available benchmarking results are compared in tabulated format to provide a comprehensive source of validation data. In addition, the problem was solved using a Graphical Processing Unit (GPU) accelerated in-house code developed by the authors (https://github.com/TamerAbdelmigid/DrivenCavity_FVM.git), which solves the steady Navier-Stokes equations, using the Finite Volume Method (FVM) in primitive variable formulation. Case studies of steady incompressible flow in a 2D lid-driven square cavity are investigated for $100 < \text{Re} < 5000$. Detailed second order spatially accurate results are verified and presented in a tabulated form for the sake of serving as benchmark dataset for future works on the same problem. In the present work, collocated grid arrangement along with a uniform structured Cartesian grid up to 1301×1301 was used.