Solution to natural convection heat transfer by two different approaches: navier stokes and lattice Boltzmann

Abstract:

In this paper, a natural convection heat transfer from a differentially heated walls in a square cavity was solved using two different scale of numerical approaches; Navier-Stokes and lattice Boltzmann formulations. The vorticity-stream function method was replaced in the continuum Navier-Stokes formulation to reduce the number of unknown variables while lattice Boltzmann method reconstructs the evolution of fluid particles to predict the heat transfer and fluid flow behavior in the system. Both numerical methods are of second order accuracy in space and time. The results of both methods were evaluated and compared. Good agreement between the Navier-Stokes and lattice Boltzmann formulation was found.