AE 601 - Computational Fluid Mechanics
Department of Aerospace Engineering & Engineering Mechanics
San Diego State University

FINAL PROJECT

Time Developing Flow in a Driven Cavity

Project report due on **December 6, 2007**
(No late sumbissions accepted, hardcopies only)

Solve the incompressible Navier-Stokes equations in primitive variable form for the two-dimensional cavity problem.

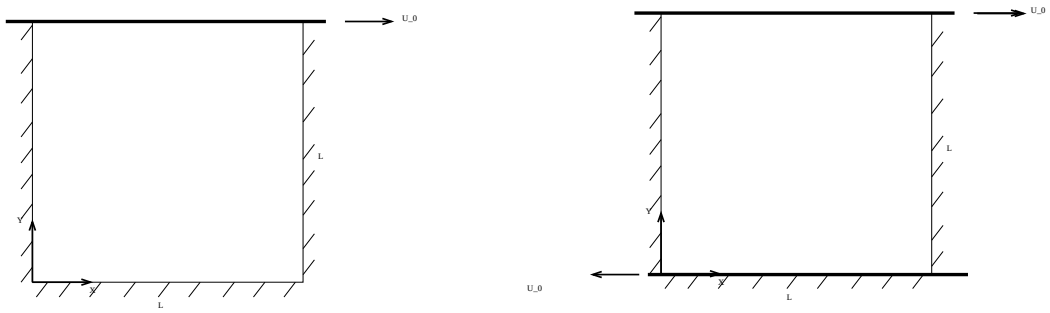

Figure 1: Schematic of the computational model for a lid-driven and a two-sided lid-driven cavity

1. Choose either the one-sided or two-sided driven cavity.

2. Non-dimensionalize all the variables and governing equations (including initial and boundary conditons) using the length of the cavity (L) and the velocity of the plate (U_0) as scales for the length and velocity, respectively.

3. Find the numerical solution using the unsteady explicit MAC method.

Choose:

4a. Investigate the effect of Reynolds number in the range Re=1 to Re=400.

4b. At Re=400 investigate the square cavity and a cavity with different size in x- and y-direction.

5. Compare your results to results in literature: find at least three papers on lid-driven cavity. (good sources include:the science citation index (online library), www.scirus.com).

6. Investigate accuracy, and stability by considering the effect of the time step, Δt, and the grid spacing, $\Delta x = \Delta y$. (At higher Reynolds number, the "boundary layer" near the top wall will be thinner, and more resolution is required to resolve this boundary layer).

In the presentation of the results at least include plots of

- Velocity vectors
- Streamlines

This is the base problem. You are strongly encouraged to independently pick a flow problem in a square or rectangular domain of relevance to your current activities.