Programming Assignment 3: Incompressible Flow

Given the domain \((x, y) \in [0, 1] \times [0, 1]\) (see figure below) and the equations for incompressible flow with the conditions that that two boxes have velocities of \(u=1\) for the box at the left and \(u=-1\) for the box at the right, solve for the fluid velocity using the pressure correction technique with MAC grid etc. presented in class with a semi-Lagrangian update for the \(V^*\) updates. Use Dirichlet BC’s for the pressure around the boundary (with \(p = 0\)) and Neumann conditions for pressure (\(p_x = 0\)) on cells that intersect the two boxes with velocity constraints. The boxes have edge length .2 and are centered at (.2,.5) and (.8,.5) respectively.

I. HINT

If the semi-Lagrangian velocity causes you to look off the grid, simply set the velocity to zero.

Fig. 1.