2D Linear Convection

$$\frac{\partial u}{\partial t} + c\frac{\partial u}{\partial x} + c\frac{\partial u}{\partial y} = 0$$

After Discretization

$$u_{i,j}^{n+1} = u_{i,j}^{n} - c\frac{\Delta t}{\Delta x}\left(u_{i,j}^{n} - u_{i-1,j}^{n}\right) - c\frac{\Delta t}{\Delta y}\left(u_{i,j}^{n} - u_{i,j-1}^{n}\right)$$

Solved with following Initial Conditions:

$$u(x, y) = 2\ (0.5 \leq x, y \leq 1)\ \&\ 1\ \text{elsewhere}$$

and Boundary condtions

$$u = 1 \text{ for } \{x,\ y\} = (0, 2)$$