2D Douglas ADI

Consider the equation

Splitting this we have

In Douglas' paper, this was written as (in equation 2.5)

Multiplying by , we have

Attempting to solve for and , we have

Or, finally

Combining

From above to the second equation, we have

We finally have

This is exactly the same as the form we used in class.

This is written in the last equation (2.7) as

3D Douglas ADI

Consider the equation

Splitting this operator into several steps, we have

After rearranging, we have

This is the form of the 3D ADI.

Time step selection

In class, we prescribed a time step of

For the problem

There is an issue with this time step selection. Note that if and

But if and , we have exactly the same PDE, but

In order to rectify the same result. Let's choose the timestep

Where is the amplitude of . For the case previously stated, note that . Let's verify that this workaround will produce the same result. Suppose and . Then we have

Although crude, this seems to be a more appropriate choice for the time step.