1 Problem considered

For some function $u : \Omega \to \mathbb{R}$, consider the following differential equation:

$$\frac{\partial u(x,y,t)}{\partial t} = \alpha \left(\frac{\partial^2 u(x,y,t)}{\partial x^2} + \frac{\partial^2 u(x,y,t)}{\partial y^2} \right). \tag{1}$$

Equation (1) is a special case of the diffusion problem considered in the statement, with $D(x,y) = \alpha$ and $f(x,y) = 0$ for all x, y. We consider the following values for the problem:

- $\Omega = [0, 300] \times [0, 50] \times [0, 50]$,
- $\alpha = 2$.

Note that a physical way to interpret Equation (1) is to consider the diffusion of *heat* on a 2D plate of dimensions 50[m] × 50[m] during 300[s]. $u(t,x,y)$ is thus the temperature in [K] at time t[s] at the point at x[m] of the origin of the plate in one direction and y[m] of the origin in the other direction[1].

Consider that, with the same notations as in the statement, we choose somes values of Δx, Δy, then the explicit scheme is numerically stable if [1, Equations (3.5), (3.6)]:

$$yo \tag{2}$$

2 Results

TODO

References

[1] K. W. Morton and D. F. Mayers. *Numerical Solution of Partial Differential Equations: An Introduction.* Cambridge University Press, 2 edition, 2005.

[1] [m] stands for *meters*, [s] for *seconds* and [K] for *Kelvin*.