PDE Model Finite Difference Derivation for a plane

Let the diffusion be fixed by a scalar . The original model is then

Let the mass term be set with .

The geometry is assumed to be a plane with dimensions . Assume a discretization step size of . There are then grid points in the direction of each row and rows overall. Representing grid points by

the following finite differences approximation can be made:

This is a system of ordinary differential equations.