PDE

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad u = u(x, t)$$

space, time

Boundary conditions:

e.g. $u(0,t) = u(1,t) = 0$ (Dirichlet)

Initial conditions:

$u(x,0)$, $\frac{\partial u}{\partial t}(x,0)$ given

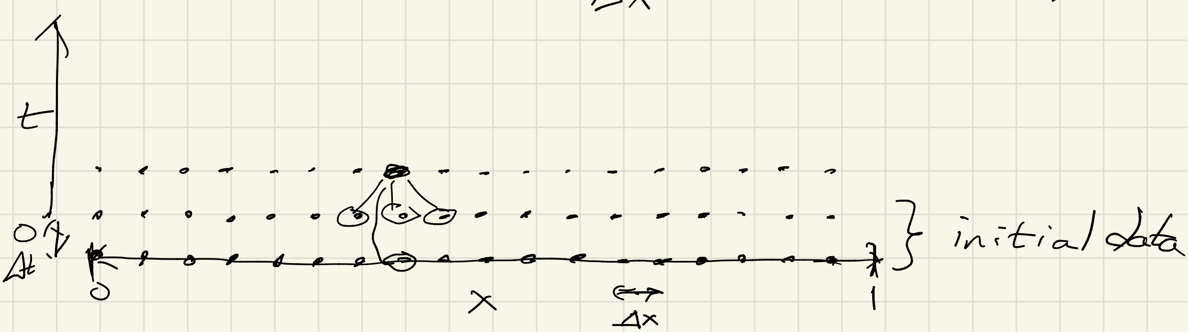
Numerics

Second order second derivative approx:

$$f''(x) \approx \frac{f(x-h) - 2f(x) + f(x+h)}{h^2}$$

$$\frac{u(x, t+\Delta t) - 2u(x,t) + u(x, t-\Delta t)}{\Delta t^2}$$

$$= c^2 \left(\frac{u(x+\Delta x, t) - 2u(x,t) + u(x-\Delta x, t)}{\Delta x^2} \right)$$



$\frac{\Delta x}{\Delta t}$ = max speed in mesh $>$ c = max speed in physics