Ayudantía 13 TY

Ecuación Euler-Bernoulli

$$\alpha \frac{\partial^4 f}{\partial x^4} + \beta \frac{\partial^2 f}{\partial t^2} = F_{(x)}$$

Podemos aproximar ambas

$$\frac{\partial f^2}{\partial t^2} = \frac{f_{(x,t+1)} - 2 f_{(x,t)} + f_{(x,t-1)}}{dt^2}$$

Por otro lado

$$\frac{d^4 f}{dx^4} = \frac{f_{x+2} - 4f_{x+1} + 6f_x - 4f_{x-1} + f_{x-2}}{dx^4}$$

La ecuación queda

$$\alpha \frac{f_{x+2} - 4f_{x+1} + 6f_{x} - 4f_{x-1} + f_{x-2}}{dx^4}$$

$$+ \beta \frac{f_{(x,t+1)} - 2f_{(x,t)} + f_{(x,t-1)}}{dt^2} = F_{(x)}$$

Despejando $f_{(x,t+1)}$

$$+\frac{f_{(x,t+1)} - 2f_{(x,t)} + f_{(x,t-1)}}{dt^2} =$$

$$-\frac{\alpha}{\beta}\frac{f_{x+2} - 4f_{x+1} + 6f_{x} - 4f_{x-1} + f_{x-2}}{dx^4} + \frac{1}{\beta}F_{(x)}$$

$$f_{(x,t+1)} = 2 f_{(x,t)} - f_{(x,t-1)} +$$

$$\left(-\frac{\alpha}{\beta} \frac{f_{x+2} - 4 f_{x+1} + 6 f_{x} - 4 f_{x-1} + f_{x-2}}{dx^4} + \frac{1}{\beta} F_{(x)} \right) dt^2$$