$$\rho C_p \frac{\partial T}{\partial t} = k\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}\right)$$

- control points $\rightarrow$ CP
- collocation pts. $\rightarrow \tau$

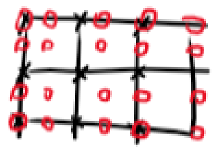
$N_i \ N_j$ on CP

$$T(\tau) = \sum_j \sum_i N_i(\tau) N_j(\tau) T_{ij}(CP)$$

$$\frac{\partial T}{\partial t} = \underbrace{\frac{k}{\rho C_p}}_{\alpha}\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}\right)$$

$\times$ CP

o τ



$$\frac{\partial T(\tau)}{\partial t} = \alpha\left(\frac{\partial^2 T(\tau)}{\partial x^2} + \frac{\partial^2 T(\tau)}{\partial y^2}\right)$$

$$\frac{T^{n+1}(\tau) - T^{n}(\tau)}{dt} = \alpha\left(\frac{\partial^2}{\partial x^2} T^{n+1}(\tau) + \frac{\partial^2}{\partial y^2} T^{n+1}(\tau)\right)$$

$$T^{n}(\tau) = T^{n+1}(\tau) - dt\,\alpha\left(\frac{\partial^2}{\partial x^2} T^{n+1}(\tau) + \frac{\partial^2}{\partial y^2} T^{n+1}(\tau)\right)$$

$$\sum_j \sum_i N_i(\tau) N_j(\tau) T^{n}(CP) = \sum_j \sum_i N_i(\tau) N_j(\tau) T^{n+1}(CP) - dt\,\alpha\left(\sum_j \sum_i N_i''(\tau) N_j(\tau) T^{n+1}(CP) + \sum_j \sum_i N_i(\tau) N_j''(\tau) T^{n+1}(CP)\right)$$

$$\underbrace{\sum_j \sum_i N_i(\tau) N_j(\tau)}_{C_0} T^{n}(CP) = \underbrace{\left[\sum_j \sum_i N_i(\tau) N_j(\tau) - dt\,\alpha\left(\sum_j \sum_i N_i''(\tau) N_j(\tau) + \sum_j \sum_i N_i(\tau) N_j''(\tau)\right)\right]}_{C_1} T^{n+1}(CP)$$

$$[C_0]\, T^{n}(CP) = [C_1]\, T^{n+1}(CP) \rightarrow T^{n+1}(CP) = [C_1] \backslash \left([C_0]\, T^{n}(CP)\right)$$