Finite Element Method, Unit 5

Newton-Raphson in FEM

Time loop → increase Dirichlet & Neumann BC step by step

in each time step do one NR iteration

$$\omega(x, \vec{v}) \stackrel{!}{=} 0$$

FOR $k = 1 : \text{max\_newton\_steps}$

$$\omega(x_k, \vec{v}) + D\omega(x_k, \vec{v})[\Delta\vec{u}_{k+1}] \stackrel{!}{=} 0$$

linear in $\Delta\vec{u}_{k+1}$

$$D\omega(x_k, \vec{v})[\Delta\vec{u}_{k+1}] = -\omega(x_k, \vec{v})$$

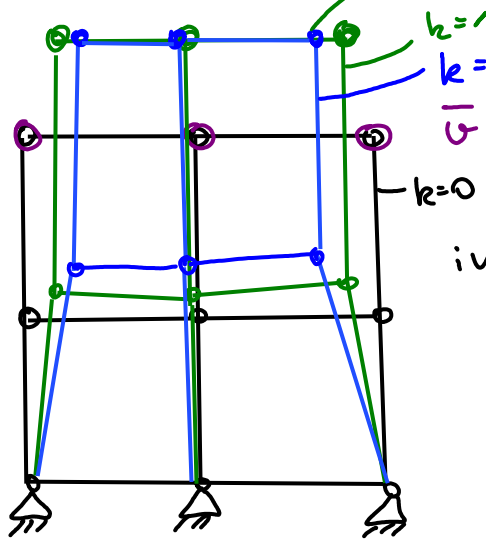
FEM →

$$A_{ijkl}\, \Delta u_{kl} = -F_{ij}$$

A_{ijkl}: Newton-Tangent; Δu_{kl}: increment; F_{ij}: Residuum

Dirichlet - bc

DRB fulfilled exactly!



$\bar{v}$ ... vertical displacement prescribed

in each time step:

- set BC $\bar{v}$ at beginning of time step
- perform first NR - step
- set DBC to zero after first NR-step