FINITE ELEMENT METHOD

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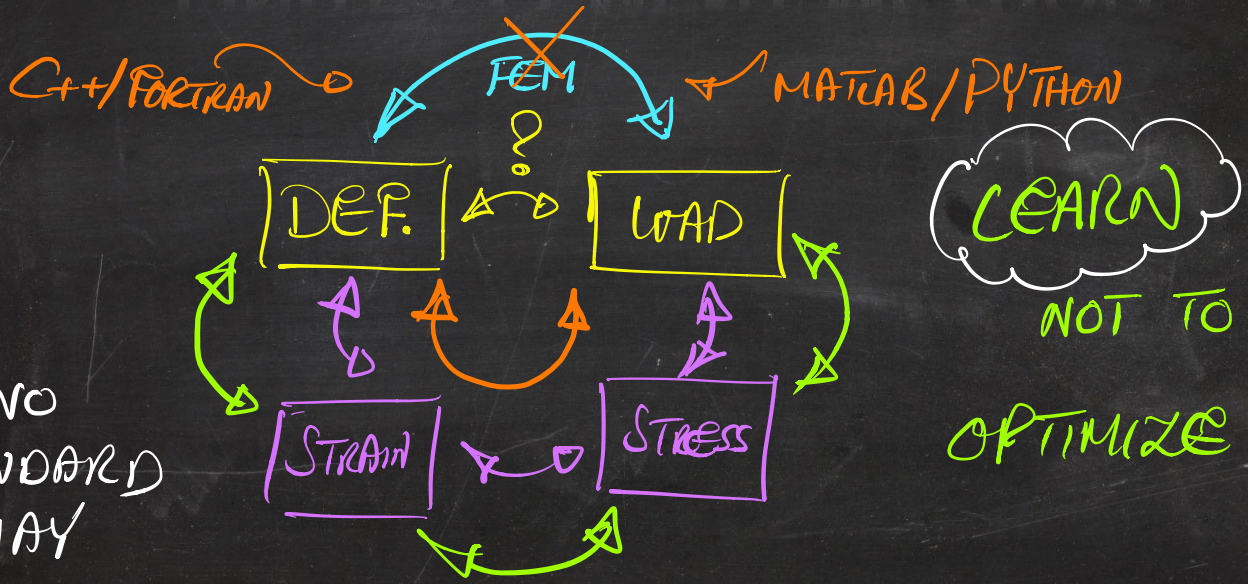
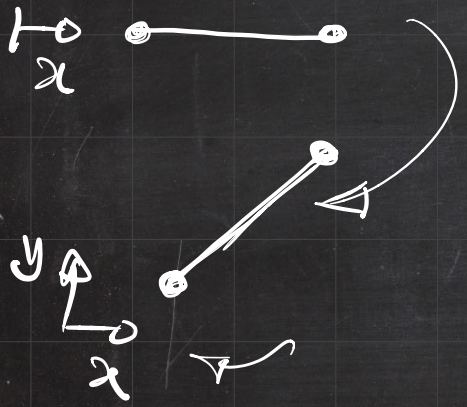
FINITE ELEMENT METHOD

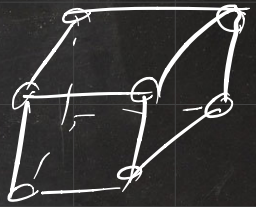


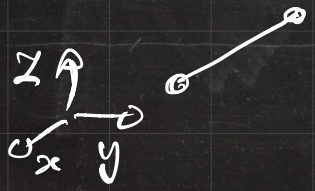
1D FEM:

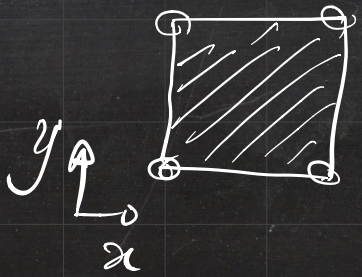
DIMENSION of ELEMENTS IT SPACE

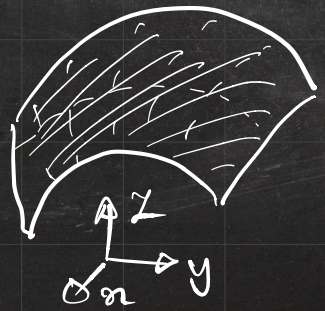
1D EL.











1D FEM:

$$\sigma = E\varepsilon \Rightarrow \frac{F}{A} = E\frac{u}{L}$$

STRESS σ : F/A

STRAIN ε : u/L, ΔL

$$\boxed{F = \frac{EA}{L}u}$$

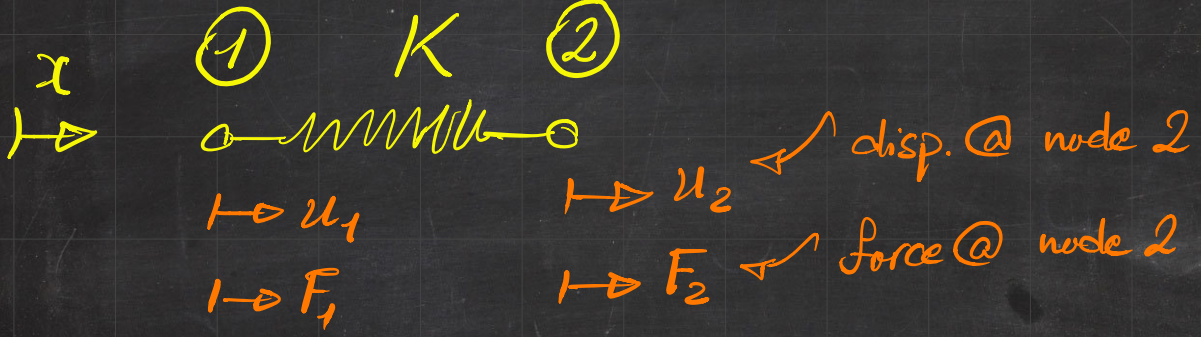
SPRING

$$\boxed{F = ku}$$

$$K_{eff} = \frac{EA}{L}$$

LEARN ASSEMBLY PROCEDURE USING SPRINGS

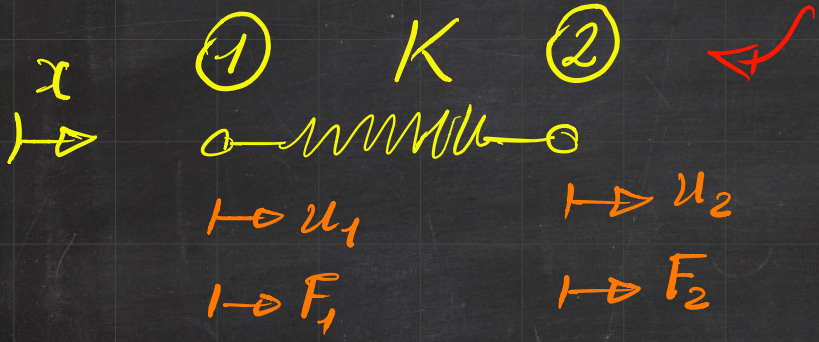
SPRING ≡ El.



$$\left.\begin{aligned} F_1 &= K[u_1 - u_2] \\ F_2 &= K[u_2 - u_1] \end{aligned}\right\} \Rightarrow \underbrace{\begin{bmatrix} F_1 \\ F_2 \end{bmatrix}}_{\text{FORCE VECTOR}} = \underbrace{\begin{bmatrix} K & -K \\ -K & K \end{bmatrix}}_{\text{STIFFNESS MATRIX}} \underbrace{\begin{bmatrix} u_1 \\ u_2 \end{bmatrix}}_{\text{DISPLACEMENT VECTOR}}$$

$0 = F_1 + F_2$ ← $\Sigma F = 0$

LEARN ASSEMBLY PROCEDURE USING SPRINGS



$\Phi = \frac{1}{2} k u^2$

SPRING ≡ El.

$\mathbb{F} = \mathbb{K} \cdot \mathcal{U}$

Det $\mathbb{K} = 0$

SYM.

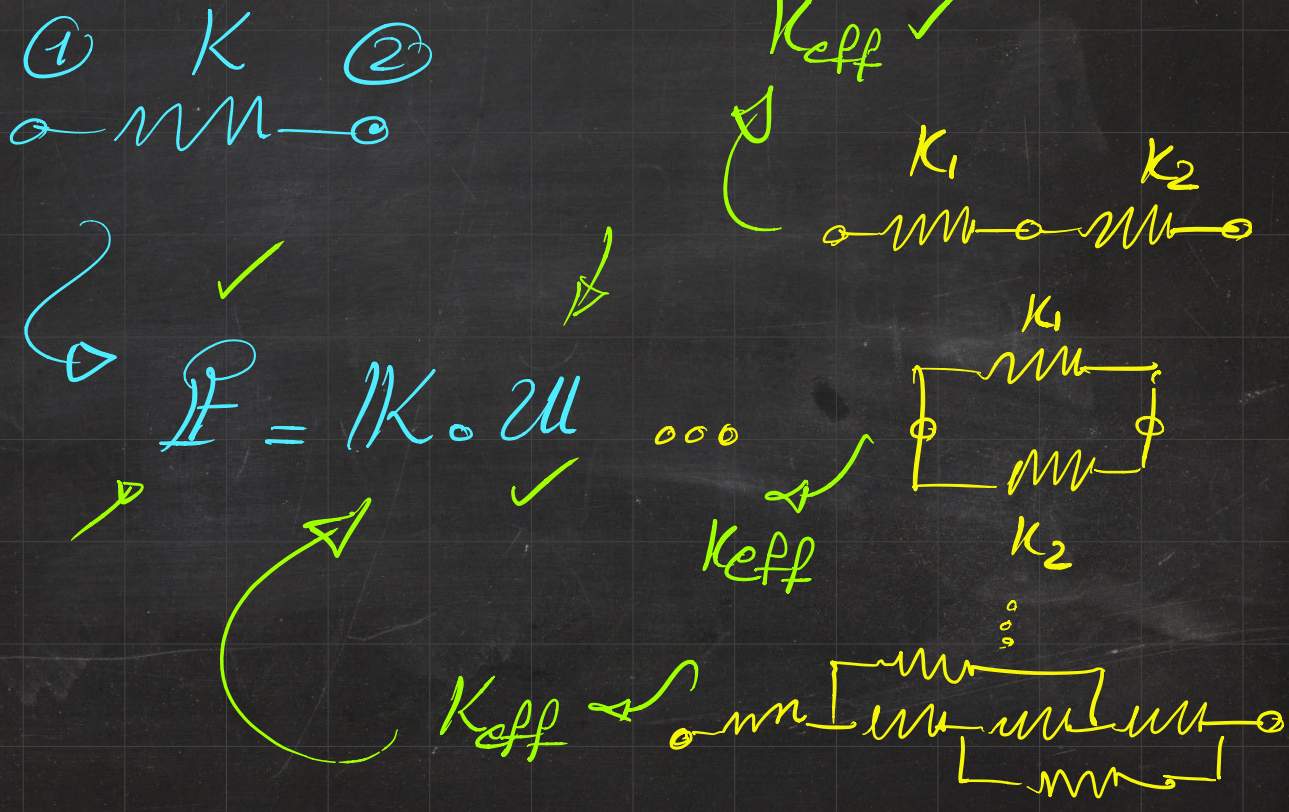
$$\left.\begin{aligned} F_1 &= K[u_1 - u_2] \\ F_2 &= K[u_2 - u_1] \end{aligned}\right\} \Rightarrow \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} K & -K \\ -K & K \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

$0 = F_1 + F_2$ ↷ $\Sigma F = 0$

FORCE VECTOR

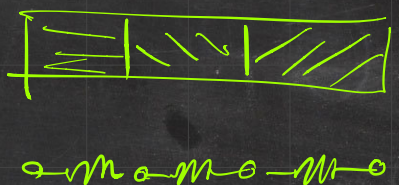
STIFFNESS MATRIX

DISPLACEMENT VECTOR


1
K
2
K_{eff}
K_1
K_2
$F = K \cdot u$
K_{eff}
K_1
K_2
K_{eff}

DISCRETIZATION

MATH.



FINITE ELEMENT METHOD

MATH.