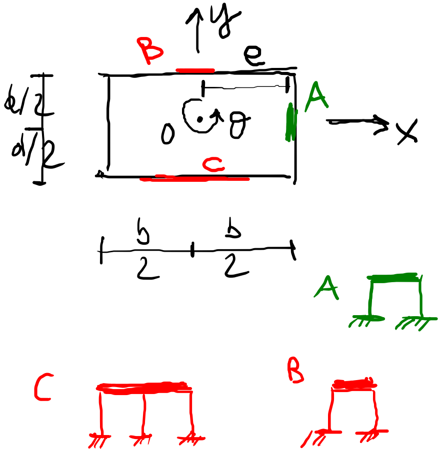
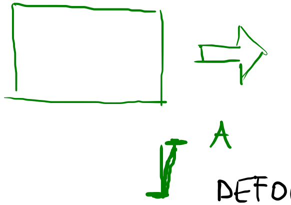
MATRICE DI RIGIDEZZA PER PROBLEMA 3D

14/04/2023





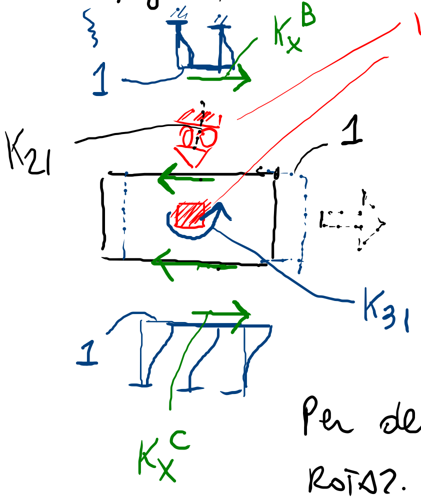
DEFORMAZIONE NELLA DIREZ "DEBOLE DI A"

TRASCURIAMO LA RIGIDEZZA DEI TELAI NELLE DIREZIONI "DEBOLI"

$K_{ij} \Rightarrow 1: x \,;\, 2: y \,;\, 3: \theta$

$x = 1,\ y = 0,\ \theta = 0$

VINCOLI AUSIL. BLOCCANO I GDL y, θ



K_x^B, K_x^C NOTI DALLE CARATTERISTICHE DEI TELAI

$K_{11} = K_x^B + K_x^C$

$K_{21} = 0$ (NO FORZE LUNGO y)

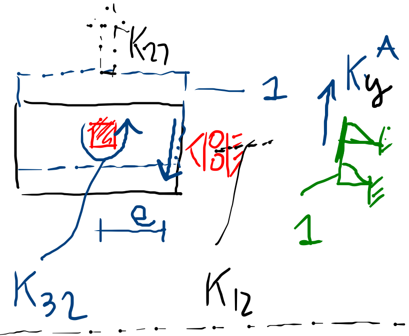
$K_{31} = (K_x^C - K_x^B)\,\frac{d}{2}$ (MOMENTO)

Per det. K_{31}: EQUIL. ALLA ROTAZ. RISPETTO A O.

$\circlearrowleft O^{+}:\ K_{31} - K_x^C \cdot \frac{d}{2} + K_x^B \frac{d}{2} = 0$

$K_{31} = (K_x^C - K_x^B)\,\frac{d}{2}$

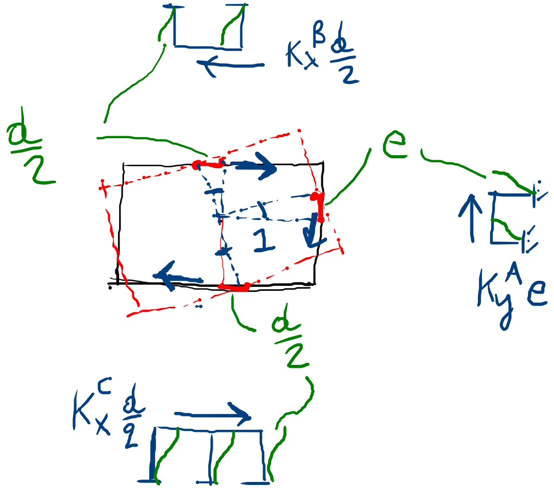
$x = \theta = 0; \quad y = 1$



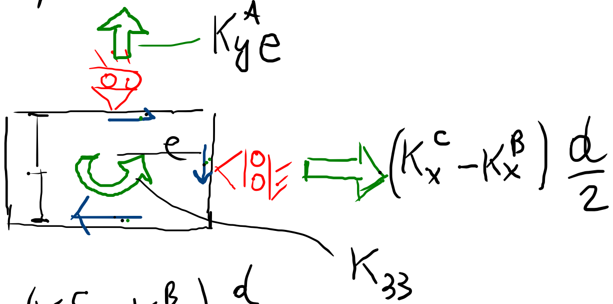
$K_{12} = 0$

$K_{22} = K_y^A$

$K_{32} = K_y^A e$



$x = y = 0; \quad \theta = 1$



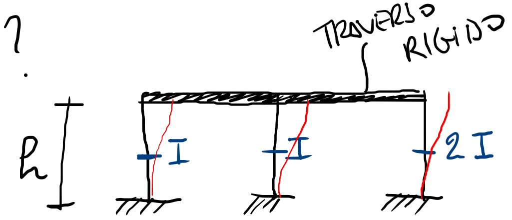
$K_{13} = (K_x^C - K_x^B)\frac{d}{2}$

$K_{23} = K_y^A e$

$K_{33} = K_x^C \frac{d}{2} \cdot \frac{d}{2} + K_x^B \frac{d}{2} \cdot \frac{d}{2} + K_y^A e \cdot e$

$$\underset{\sim}{K} = \begin{bmatrix} K_x^C + K_x^B & 0 & (K_x^C - K_x^B)\frac{d}{2} \\ 0 & K_y^A & K_y^A e \\ (K_x^C - K_x^B)\frac{d}{2} & K_y^A e & \end{bmatrix} \quad \text{SYM}$$

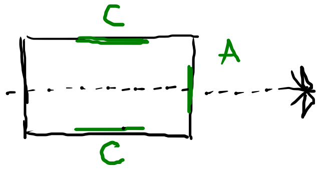
K_x^C ?



$$K_x^C = 12\,\frac{EI}{h^3} + 12\,\frac{EI}{h^3} + 12\,\frac{E(2I)}{h^3} = 48\,\frac{EI}{h^3}$$

OSSERVAZIONE:

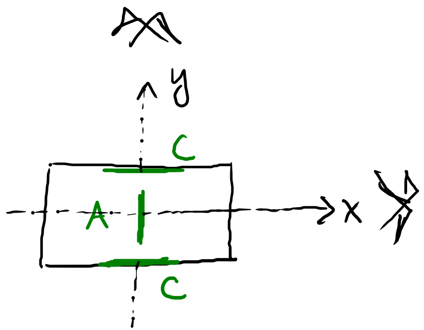
$K_x = K_x^C$



$\mapsto x = 1$

NO ROTAZ. θ
(NO MOMENTO K_{33})

$$\underset{\sim}{K} = \begin{bmatrix} 2K_x & 0 & 0 \\ 0 & \bullet & \bullet \\ 0 & \bullet & \bullet \end{bmatrix}$$

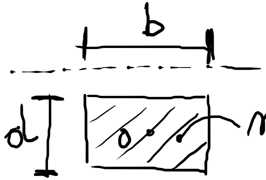


DOPPIO ASSE DI SIMMETRIA

$$\underset{\sim}{K} = \begin{bmatrix} \bullet & 0 & 0 \\ 0 & \bullet & 0 \\ 0 & 0 & \bullet \end{bmatrix}$$

MATRICE DIAGONALE
(DISACCOPPIAMENTO DEI GDL)

$$(-\omega^2 \underset{\sim}{M} + \underset{\sim}{K})\,\underline{q} = \underline{0}$$



m: massa totale

$$\underline{q} = \begin{bmatrix} x \\ y \\ \theta \end{bmatrix} \qquad \underset{\sim}{M} = \begin{bmatrix} m & & \\ & m & \\ & & I_0 \end{bmatrix}$$

$I_0 = m\,\dfrac{b^2+d^2}{12}$: MOM. D'INERZIA POLARE DELLA "LAMINA SOTTILE OMOGENEA"