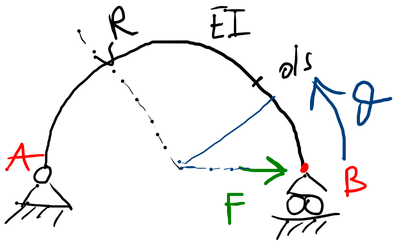
ES.

$\to \delta_B$? TRASCURANDO LA DEF. ASSIALE



STR REALE
(STR CINEM. AMM.)

LEG. COST.

$\bar{\varepsilon}(s) = N/EA$

$\chi(s) = M/EI$

$\bar{\varepsilon} \to 0$ SE TRASC. LA DEF. ASSIALE

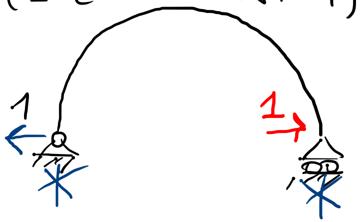
$L_{ve} = L_{vi}$

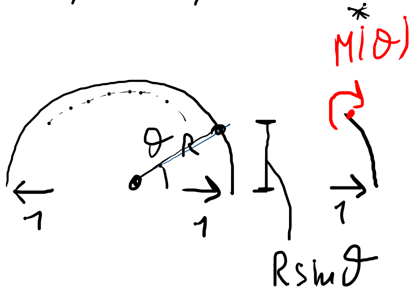
$$1\cdot\delta_B + \underbrace{\cancel{1\cdot 0}}_{\text{NO LAVORO REAZ. VINCOL.}} = \int_{STR} N^* \bar{\varepsilon} + M^* \chi \, ds$$

CDS STR REALE

$$1\,\delta_B = \int_{STR} \cancel{N^* \frac{N}{EA}} + M^* \frac{M}{EI}\, ds \Rightarrow \delta_B = \int_{STR} M^*(s)\, \frac{M(s)}{EI}\, ds = \int_{STR} M^*(\theta)\, \frac{M(\theta)}{EI}\, R\, d\theta$$

STR FITTIZIA (*) SDC, 6/12/23
(STR STAT. AMM.)

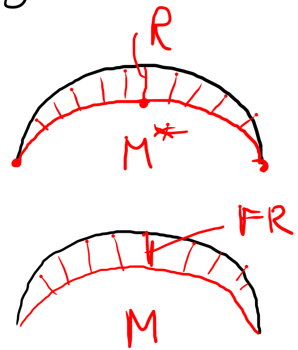




$M^*(\theta)$? ; $\overset{+}{\circlearrowleft}_K$: $1\cdot R\sin\theta - M^*(\theta) = 0$

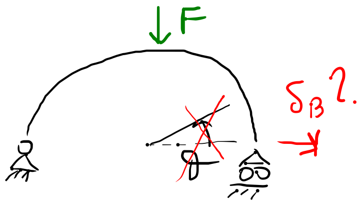
$M^*(\theta) = R\sin\theta$

$M(\theta)$? $= F\, M^*(\theta) = FR\sin\theta$

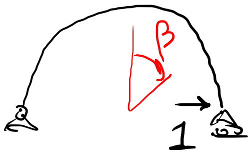


$$\delta_B = \frac{R}{EI}\int_0^{\pi} F\, M^{*2}(\theta)\, d\theta = \frac{FR}{EI}\int R^2 \sin^2(\theta)\, d\theta = \frac{FR^3}{EI}\left[\frac{\theta}{2} - \frac{\sin 2\theta}{4}\right]_0^{\pi}$$

$$= \frac{FR^3}{EI}\left(\frac{\pi}{2} - 0\right) = \overset{\oplus}{\frac{\pi}{2}}\,\frac{FR^3}{EI}$$

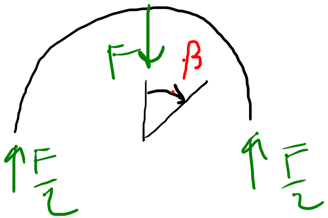


STR REALE



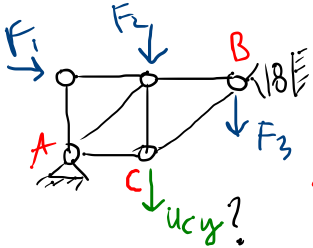
STR FITTIZIA

$$M(\theta) \neq M^*(\theta)$$

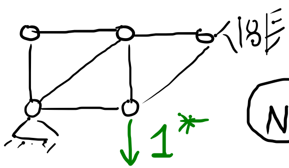


$$\delta_B = \int_{-\pi/2}^{\pi/2} M^*(\beta)\, \frac{M(\beta)}{EI}\, R\, d\beta$$

CALCOLO SPOST. NODALI IN STR. RETICOLARI ISOSTATICHE MEDIANTE T.L.V.



$\bar{\varepsilon}_i \ (N_i)$



N^* $M^* = 0$

SCH. CINEM. AMM.

SCH. STAT. AMM.

$L_{ve} = L_{vi}$

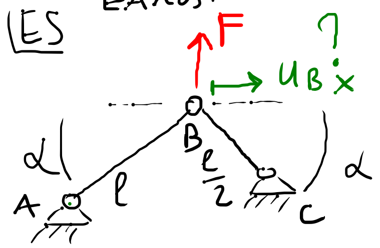
$1^* \cdot u_{cy}$ + LAVORO VIRTUALE DELLE REAZIONI VINCOLARI ESTERNE $= \displaystyle\int_{STR} N^* \bar{\varepsilon}\, ds = \sum_{i=1}^{m_A} N_i^* \bar{\varepsilon}_i \overbrace{\int_{aste\ i} ds}^{l_i}$

l_i : LUNGH. ASTA i-SIMA

$= \displaystyle\sum_{i=1}^{m_A} N_i^* \bar{\varepsilon}_i l_i \longrightarrow 1^* \cdot u_{cy}$ + LAVORO REAZ. VINCOLARI $= \displaystyle\sum_{i=1}^{m_A} N_i^* \frac{N_i}{EA} l_i$

VISTO CHE LE ASTE DELLA STR REALE SONO ELASTICHE LINEARI ALLORA $\bar{\varepsilon}_i = \dfrac{N_i}{EA}$

ES EA: cost



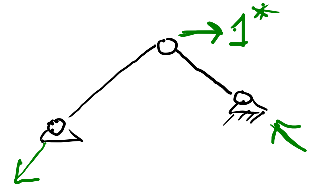
STR REALE

SCH. CINEM. AMM.

$\bar{\varepsilon}_i \,,\, u_{Bx}$

$$1 \cdot u_{Bx} = N^*_{BA} \underbrace{\frac{N_{BA}}{EA}}_{\bar{\varepsilon}_{BA}} \ell + N^*_{BC} \underbrace{\frac{N_{BC}}{EA}}_{\bar{\varepsilon}_{BC}} \frac{\ell}{2}$$

S: $\sin\alpha$
C: $\cos\alpha$



STR FITTIZIA

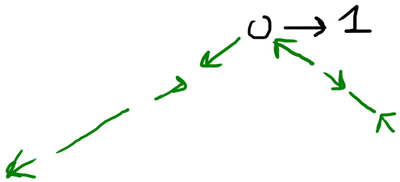
SCH. STAT. AMM

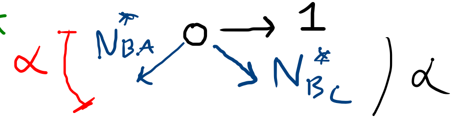
$N^*, 1^*$ (N^*_{BA}, N^*_{BC})

$$u_{Bx} = \frac{1}{2C}\frac{F}{2S}\frac{\ell}{EA} + \left(-\frac{1}{2C}\right)\frac{F}{2S}\frac{\ell}{2EA}$$

$$u_{Bx} = \frac{F\ell}{EA}\left(\frac{1}{4CS} - \frac{1}{8CS}\right) = +\frac{F\ell}{8EA\sin\alpha\cos\alpha}$$

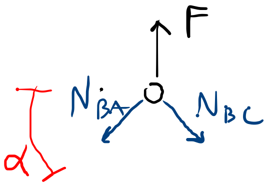
(NODO B SI SPOSTA A DESTRA)





N_{BA}, N_{BC}

Per simm. $N_{BC} = N_{BA}$



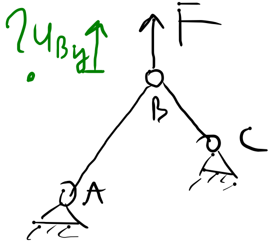
$$+\uparrow: \; F - N_{BA}\sin\alpha \cdot 2 = 0$$

$$N_{BA} = N_{BC} = \frac{F}{2\sin\alpha} \quad \text{(TIRANTI)}$$

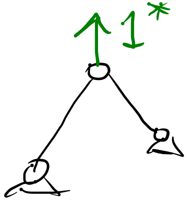
$$\overset{+}{\rightarrow}: \; -N^*_{BA}\cos\alpha + N^*_{BC}\cos\alpha + 1 = 0$$

$$+\downarrow: \; +N^*_{BA}\cancel{\sin\alpha} + N^*_{BC}\cancel{\sin\alpha} = 0$$

$$N^*_{BA} = +\frac{1}{2\cos\alpha} \;;\; N^*_{BC} = -\frac{1}{2\cos\alpha}$$



N_{BA}, N_{BC}



SCH. FITTIZIO

$N^*_{BA} = \frac{N_{BA}}{F}$ $\quad N^*_{BC} = \frac{N_{BC}}{F}$

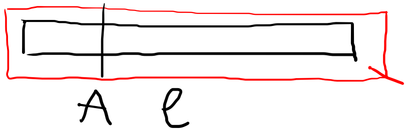
$\Delta l^{\Delta T}$?

$$\Delta l^{\Delta T} = \int_0^l \underbrace{\varepsilon^{\Delta T} dz}_{dw^{\Delta T}} = \varepsilon^{\Delta T} l = \alpha \Delta T l$$

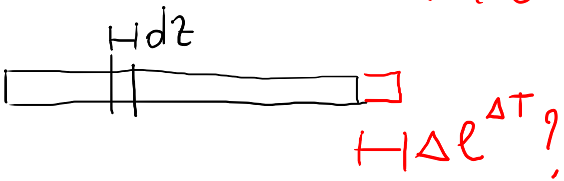
DILATAZIONE $\bar{\varepsilon}$ INDOTTA DA UNA DISTORSIONE TERMICA

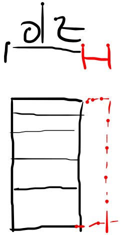
ΔT UNIFORME

$\Delta T > 0$: RISCALDAMENTO
$\Delta T < 0$: RAFFREDDAMENTO



ESPANSIONE CON $\Delta T > 0$





$dw^{\Delta T} = \underbrace{\alpha \Delta T}_{\varepsilon^{\Delta T}} dz$

$\varepsilon^{\Delta T}$ DILATAZ. TERMICA

VA SOMMA A QUELLA ELASTICA!

α: COEFF DI DILATAZ. LINEARE $\left[\frac{1}{T}\right] \sim {}^\circ C^{-1}$

$[\alpha \Delta T] = [-]$

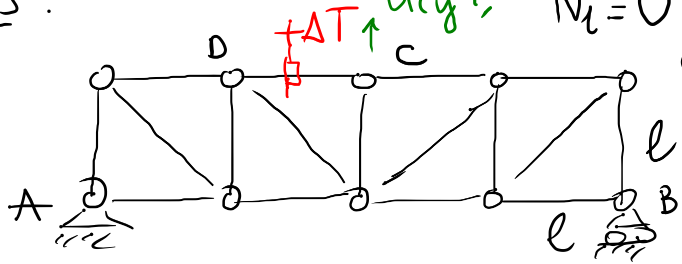
EQ. DEI LAVORI VIRT. PER CALCOLARE GLI SPOST. NELLE RETICOLARE QUANDO CI SONO EFFETTI TERMICI DIVENTA:

$$1 \cdot u_{By} + \begin{matrix}\text{LAVORO VIRT}\\ \text{REAZ. VINC.}\end{matrix} = \sum_{i=1}^{m_A} N_i^* \overbrace{\Big(\underbrace{\frac{N_i}{EA}}_{\bar{\varepsilon}_{el}} + \underbrace{\alpha \Delta T_i}_{\bar{\varepsilon} = \varepsilon^{\Delta T}} \Big)}^{\text{STR. REALE}} l_i$$

$\Delta T_i > 0$ RISC.

< 0 RAFFR.

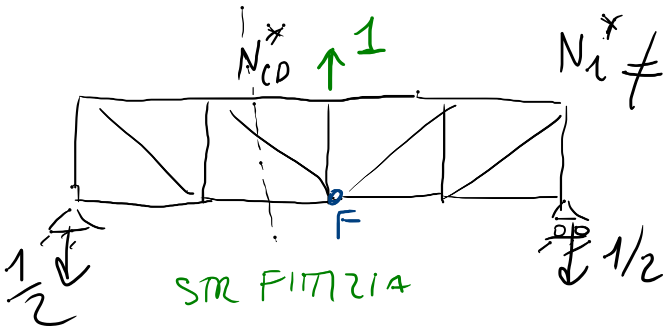
ES.



$N_i = 0$

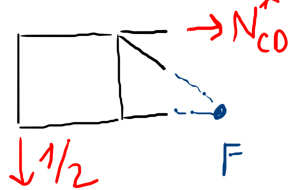
$\alpha \Delta T \neq 0$ SOLO PER ASTA CD

STR REALE



$N_i^* \neq 0$

STR FITTIZIA



$\circlearrowleft F): \frac{1}{2} 2l$

$- N^*_{CD}\, l = 0$

$N^*_{CD} = +1$

$$1 \cdot u_{cy} = N^*_{CD}\, \alpha \Delta T\, \overbrace{l_{CD}}^{=l} \Rightarrow u_{cy} = N^*_{CD}\, \alpha \Delta T\, l$$

$$\boxed{u_{cy} = +\alpha \Delta T l}$$