$$\boxed{\begin{array}{lll} N' + p = 0 & N^{+} - N^{-} + P = 0 & N = N_0 \\ T' + q = 0 & T^{+} - T^{-} + Q = 0 & T = T_0 \\ M' + T = 0 & M^{+} - M^{-} + R = 0 & M = M_0 \end{array}}$$

OSS:

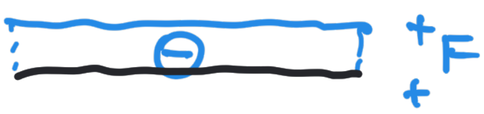
$N, T, M \Rightarrow$ Forze applicate ↗ attive & reatt.

Facile!

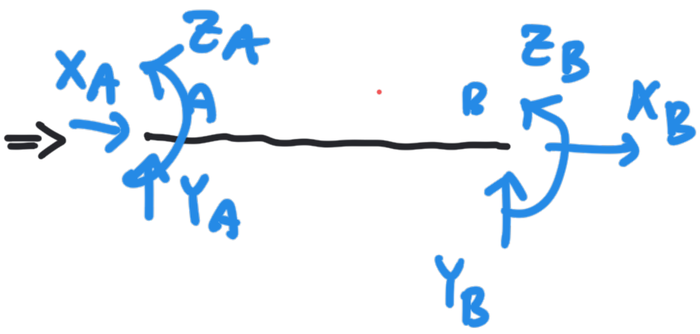
? FORZE APPL.

ES:

$\left.\begin{array}{l} T=0 \\ M=0 \end{array}\right)$



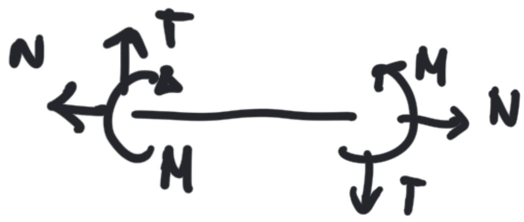
$\Rightarrow$



$p = -N' = 0$

N continuo $\Rightarrow$ no forze conc.!!

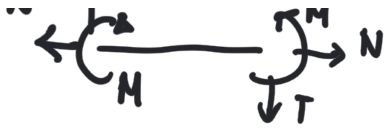
c. contorno $\rightarrow$ forze e coppie agli estremi.



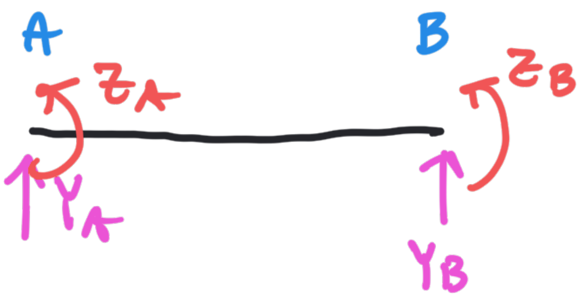
$X_B = N_B - F \qquad X_A = -N_A = F$

$Y_B = -T_B = 0 \qquad Y_A = T_A = 0$

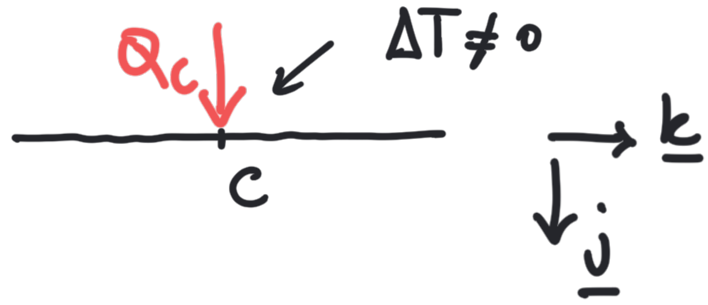
$Z_B = M_B = 0 \qquad Z_A = M_A = 0$

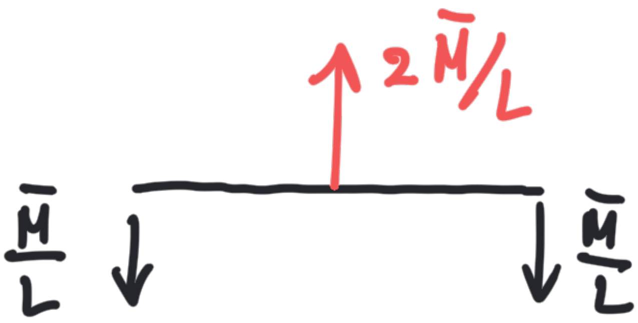


forze e coppie applicate $\boxed{\text{al bordo}}$



forze applicate $\boxed{\text{all'interno.}}$



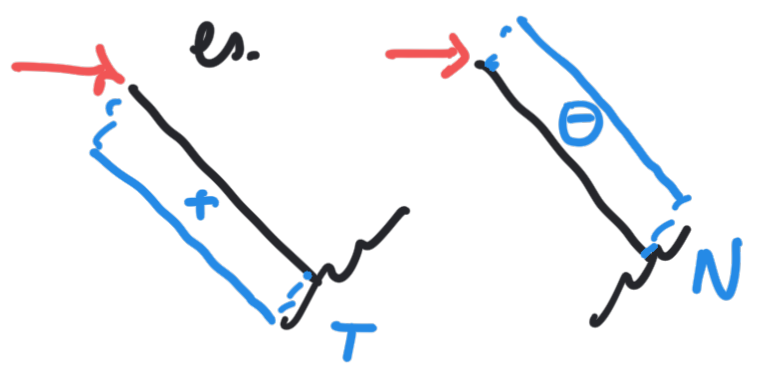


$$Y_A = T_A = -\bar{M}/L$$
$$Z_A = -M_A = 0$$

$$Y_B = -T_B = -\bar{M}/L$$
$$Z_B = M_B = 0$$

$$Q_C = T_C^- - T_C^+ = -\bar{M}/L - \bar{M}/L$$
$$= -2\bar{M}/L$$

$$\boxed{\begin{array}{lll} N' + p = 0 & N^{+} - N^{-} + P = 0 & N = N_0 \\ T' + q = 0 & T^{+} - T^{-} + Q = 0 & T = T_0 \\ M' + T = 0 & M^{+} - M^{-} + R = 0 & M = M_0 \end{array}}$$

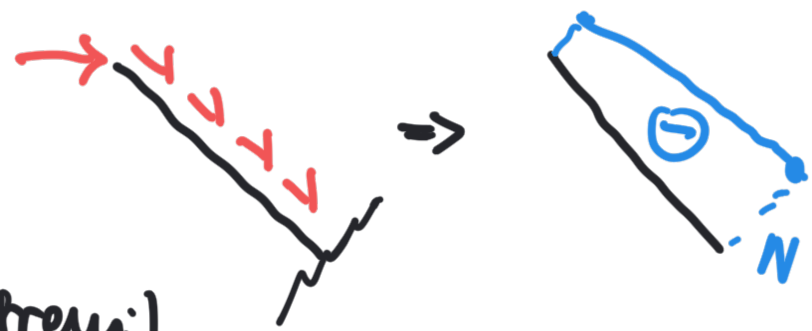


- $q = 0 \Rightarrow T$ cost.

  Basta conoscere N/T in un punto.

- $p =$ cost $\Rightarrow N$ pol. grad 1

  Basta determ. N in due punti (in genere, gli estremi).

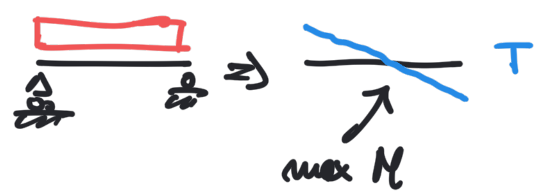


- $q =$ cost $\Rightarrow T$ .... (stessa cosa)

$\boxed{M' + T = 0 \qquad M^+ - M^- + R = 0 \qquad M = M_0}$

$T = 0 \Rightarrow$ punto estremale per M.

ES. trave app.

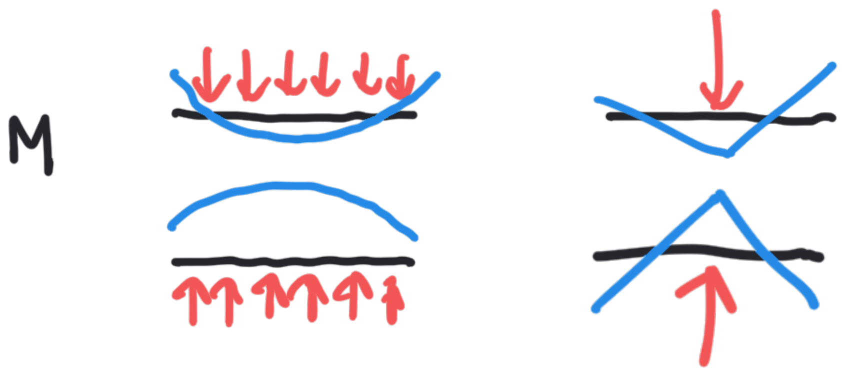


$T = \text{cost.}$ su un tratto $\Rightarrow$ M "lineare" su quel tratto.

• Concavità del diagramma di M:

$M'' = -q$

anche per forze concentrate.

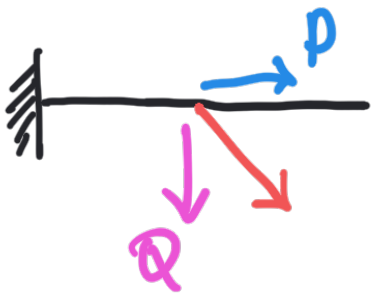


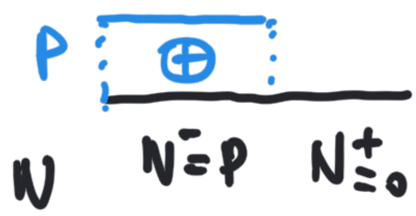
← analogia del "filo teso"!

Es:

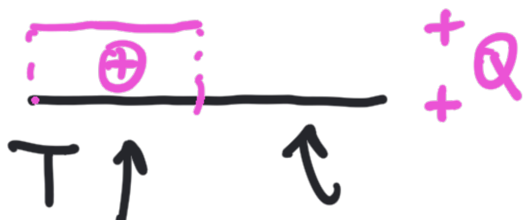
Condizioni di salto:

$$
\boxed{
\begin{array}{lll}
N' + p = 0 & N^+ - N^- + P = 0 & N = N_0 \\
T' + q = 0 & T^+ - T^- + Q = 0 & T = T_0 \\
M' + T = 0 & M^+ - M^- + R = 0 & M = M_0
\end{array}
}
$$



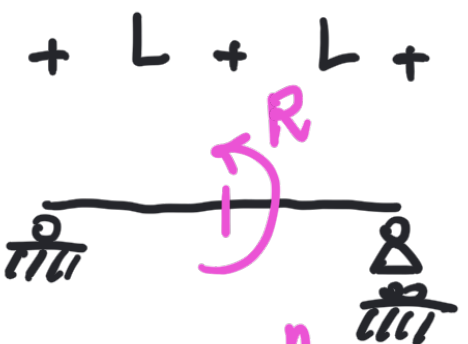


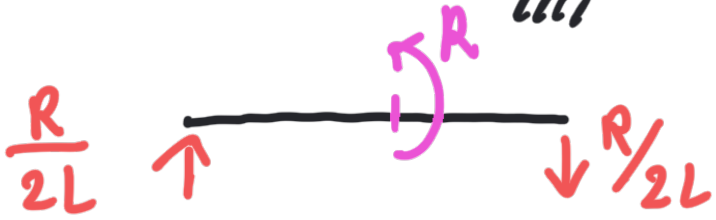
$N^+ - N^- = -P$

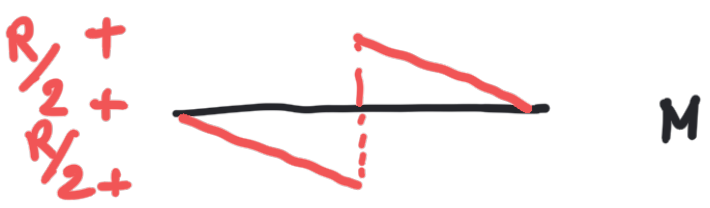


$T^- = Q$ $\quad$ $T^+ = 0$

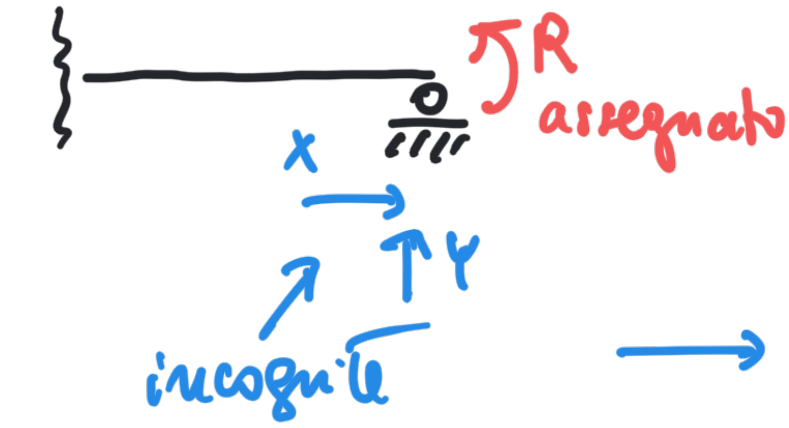
$T^+ - T^- = -Q$





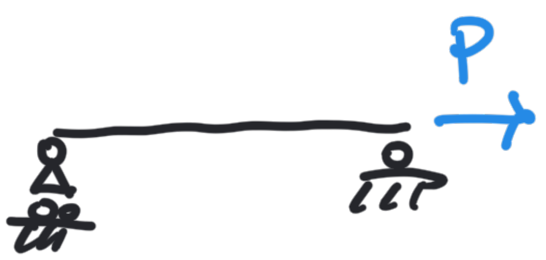


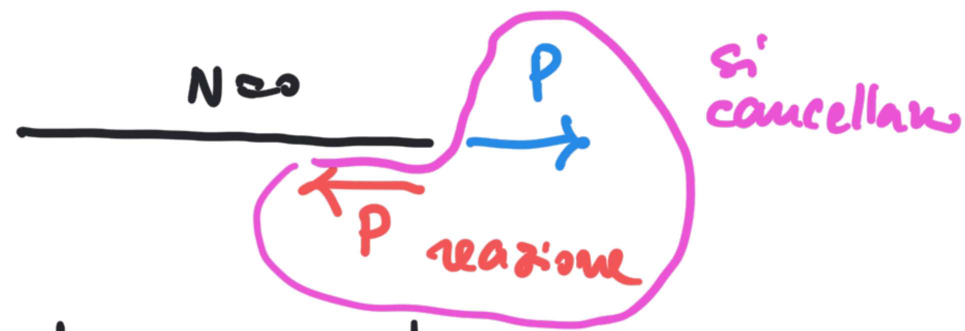
$M' + T = 0$ $\qquad$ $M^+ - M^- + R = 0$ $\qquad$ $M = M_0$



$\longrightarrow$ a priori non possiamo dire nulla su T e N

OSS:





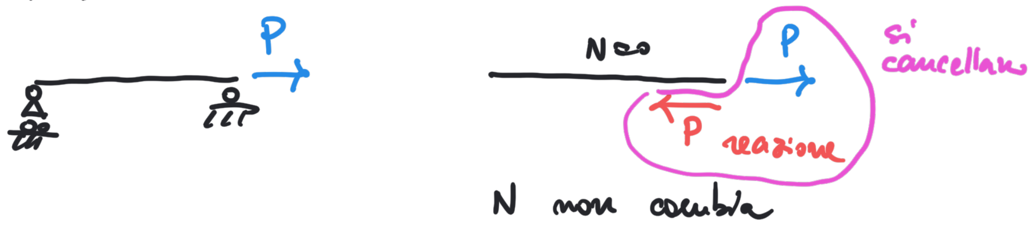
N non cambia

Applicando un carico che si sovrappone

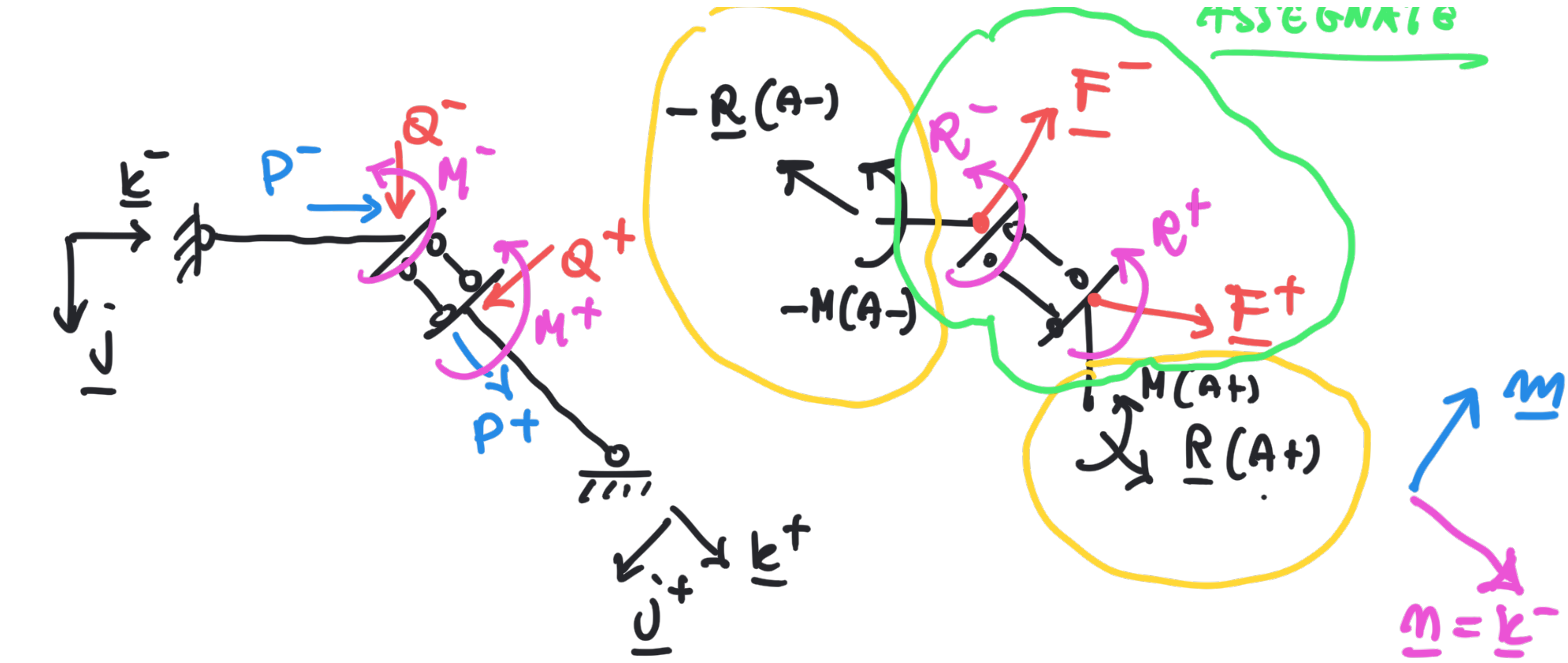
Condizioni agli estremi / sconnessioni

$$
\boxed{
\begin{array}{lll}
N' + p = 0 & N^{+} - N^{-} + P = 0 & N = N_0 \\
T' + q = 0 & T^{+} - T^{-} + Q = 0 & T = T_0 \\
M' + T = 0 & M^{+} - M^{-} + R = 0 & M = M_0
\end{array}
}
$$

OSS:



Applicando un carico che si "sovrappone" alle reazioni, le CdS non cambiano.



$$0 = L = \left(\underline{R}(A^+) + \underline{F}^+\right) \cdot \underline{u}_A^+ + \left(M(A+) + R^+\right) \vartheta_A^+$$

$$+ \left(-\underline{R}(A^-) + F^-\right) \cdot \underline{u}_A^- + \left(-M(A-) + R^-\right) \vartheta_A^-$$

$$\vartheta_A^+ - \vartheta_A^- = 0$$

1) Dai diagrammi delle CdS è possibile ricavare le forze applicate (reattive e non)

eq. diff.li ⟹ p, q

cond salto ⟹ P, Q, R

c. contorno ⟹ forze & coppie estremità

OSS: sebbene il segno di M dipende da come è orientata la trave

sx → dx

dx → sx

il diagramma di M non dipende dalla orientazione, grazie alla convenzione delle fibre tese !!!

SOMMARIO:

2) • Andamento di q, p = forma dei diagrammi
• Eventuali forze concentr. ⇒ salti
• Cond. vincolo ⇒ valori agli estremi o nelle sconnessioni

3) La parte di controllo è FONDAMENTALE.

4) Nella pratica comune, le eq.ni diff. e., cond. salto e c. contorno si adoperano per ottenere informazioni qualitative sui diagrammi, e solo raramente si usano per determinarli.