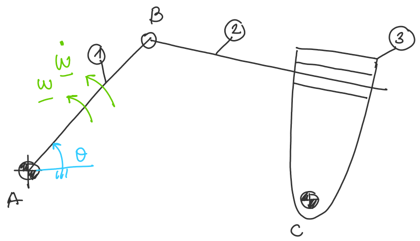
Esercitazione: Glifo oscllante

martedì 26 novembre 2024 10:35



Noto: moto manovella $\left\langle \begin{array}{l} \underline{\omega} = \dot{\theta}\underline{k} \\ \dot{\underline{\omega}} = \ddot{\theta}\underline{k} \end{array} \right.$

Trovare: moto ② e ③

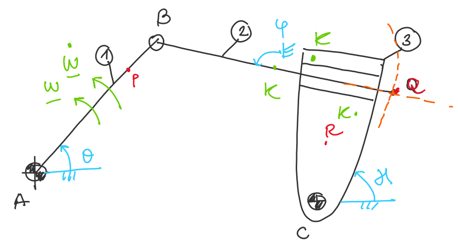
→ risolvere graf. $\left\langle \begin{array}{l} \underline{v} \\ \underline{a} \end{array} \right.$

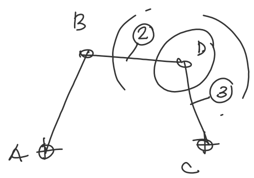
→ C_i ASSOLUTE

•) CALCOLO GDL: $n° gdl \geq 9 - 2\times 3 - 2\times 1 = 9 - 8 = 1$ ✓

3 CERNI. A, B, C (da 2×3)

COPPIA PRIS. ②–③ (da 2×1)





$$\boxed{\underline{v}_B = \underline{v}_A + \underline{\omega} \wedge \vec{AB}}$$

$$\boxed{\underline{a}_B = \underline{a}_A + \dot{\underline{\omega}} \wedge \vec{AB} - \omega^2 \vec{AB}}$$

•) $\underline{v}_{P①} = \cancel{\underline{v}_A} + \underline{\omega} \wedge \vec{AP} = \dot{\theta}\underline{k} \wedge \vec{AP}$ noto

($\underline{v}_A = 0$)

$$\underline{v}_{Q②} = \underline{v}_B + \underline{\omega}_2 \wedge \vec{BQ} = \dot{\theta}\underline{k} \wedge \vec{AB} + \dot{\varphi}\underline{k} \wedge \vec{BQ} \quad (1)$$

$\underline{v}_B = \underline{v}_{B①} = \dot{\theta}\underline{k} \wedge \vec{AB}$; $\underline{\omega}_2 \wedge \vec{BQ} = \dot{\varphi}\underline{k} \wedge \vec{BQ}$; $\dot{\varphi}$?

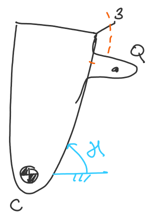
$\underline{v}_{R③} = \cancel{\underline{v}_C} + \underline{\omega}_3 \wedge \vec{CR} = \dot{\gamma}\underline{k} \wedge \vec{CR}$

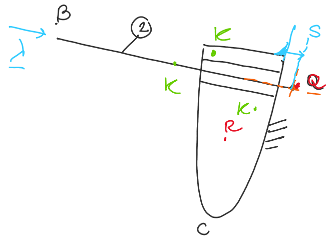
($\underline{v}_C = 0$); $\dot{\gamma}$?

$\Sigma_{③}$ T.C.V

$$\underset{ass}{\underline{v}_{Q②}} = \underset{tr}{\underline{v}_Q} + \underset{rel}{\underline{v}_Q} = \dot{\gamma}\underline{k} \wedge \vec{CQ} + \dot{s}\underline{\lambda} \quad (2)$$

$\underline{v}_Q^{tr} = \underline{v}_{Q③} = \dot{\gamma}\underline{k} \wedge \vec{CQ}$; $\underline{v}_Q^{rel} = \dot{s}\underline{\lambda}$; $\dot{\gamma}$? $\dot{s}$?





Eq^{ne} CHIUSURA (1) = (2)

$$\boxed{\underline{v}_{Q②} = \underline{v}_{Q②}}$$

FFC — TCV

$$\| \; \dot{\theta}\underline{k} \wedge \vec{AB} + \dot{\varphi}\underline{k} \wedge \vec{BQ} = \dot{\gamma}\underline{k} \wedge \vec{CQ} + \dot{s}\underline{\lambda} \; \|$$

$\dot{\varphi}$? $\dot{\gamma}$? $\dot{s}$?

⇒ 4 TERMINI

$\Rightarrow$ 3 INCOGNITE $\longrightarrow$ 2 INCOG. $\quad \dot\varphi = \dot\gamma, \ \dot s$

TCV A: $\quad \Sigma_{③} \quad \underline{\omega}_{②}^{ASS} = \underline{\omega}_{②}^{rel} + \underline{\omega}_2^{tr}$

$= \dot{\underline{\phi}} + \underline{\omega}_2^{tr} = \underline{\omega}_1$

$\Rightarrow \quad \underline{\omega}_2 = \underline{\omega}_1$

$\Downarrow$

$\dot\varphi = \dot\gamma$

$\ddot\varphi = \ddot\gamma$

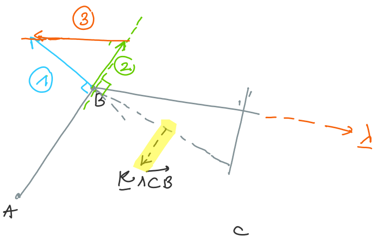
$$\| \ \dot\theta \underline{k} \wedge \vec{AB} + \dot\gamma \underline{k} \wedge \vec{BQ} = \dot\gamma \underline{k} \wedge \vec{CQ} + \dot s \underline{\lambda} \ \|$$

$$\dot\theta \underline{k} \wedge \vec{AB} = \underbrace{- \dot\gamma \underline{k} \wedge \vec{BQ}}_{\dot\gamma \underline{k} \wedge \vec{QB}} + \dot\gamma \underline{k} \wedge \vec{CQ} + \dot s \underline{\lambda}$$

$$= \dot\gamma \underline{k} \wedge (\vec{QB} + \vec{CQ}) + \dot s \underline{\lambda} \qquad \vec{CQ} + \vec{QB} = \vec{CB}$$

$\Downarrow$

$$\Rightarrow \| \ \underset{\text{noto } ①}{\dot\theta \underline{k} \wedge \vec{AB}} = \underset{\text{noto dir } ②}{\dot\gamma \underline{k} \wedge \vec{CB}} + \underset{\text{noto dir. } ③}{\dot s \underline{\lambda}} \ \|$$



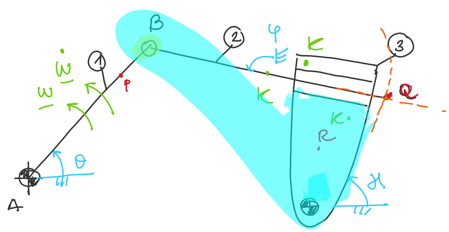
$$\begin{cases} \dot\gamma < 0 \\ \dot s < 0 \end{cases}$$

$\underset{FFC}{\underline{v}_{B①}} = \underset{\Sigma③}{\underline{v}_{B②}}$ TCV $\longmapsto$

$$\underset{FFC}{\underline{v}_{B①}} = \boxed{\underline{v}_{B②} = \underline{v}_{B②}}$$

$\underline{v}_{B②}$ (FFC) $= \dot\theta \underline{k} \wedge \vec{AB}$

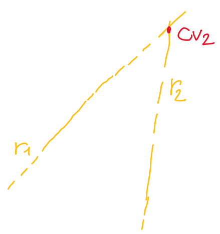
$\underline{v}_{B②}$ (TCV $\Sigma③$) $= \underline{v}_B^{rel} + \underline{v}_B^{tr} = \dot s \underline{\lambda} + \dot\gamma \underline{k} \wedge \vec{CB}$



$$\| \ \dot\theta \underline{k} \wedge \vec{AB} = \dot s \underline{\lambda} + \dot\gamma \underline{k} \wedge \vec{CB} \ \|$$

$\underset{FFC}{\underline{v}_{C③}} = \underline{0} = \underset{\substack{TCV \\ \Sigma②}}{\underline{v}_{C③}} \longrightarrow$

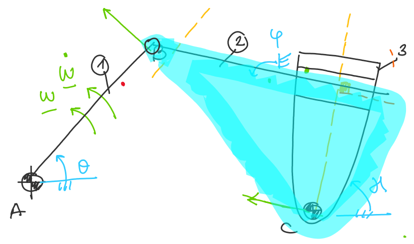
$$\left.\begin{aligned} \Sigma_{③} \quad & \underline{v}_B^{rel} = \dot s \underline{\lambda} \\ \Sigma_{②} \quad & \underline{v}_C^{rel} = - \dot s \underline{\lambda} \end{aligned}\right\}$$



$\Rightarrow \quad C_{V1} = A$

$C_{V2} \longrightarrow$ CHASLES

$\omega_3 = C$



$v_{B2} \Rightarrow r_1$

$$v_{C2}^{ASS} = v_C^{rel} + v_C^{tr}$$

$$v_C^{tr} = v_{C3}$$

$$\Sigma_3$$

$$v_{C2}^{ASS} = \dot s \lambda + \emptyset = \dot s \lambda \qquad r_2$$

ACCELERAZIONI

$$a_{P1} = \overset{0}{\cancel{a_A}} + \dot\omega \wedge \vec{AP} - \omega^2 \vec{AP}$$

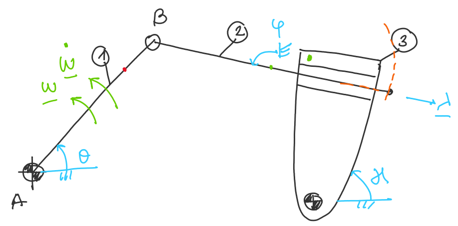
$$a_{Q2} = \underset{= a_{B1}}{a_B} + \ddot\gamma \underline{k} \wedge \vec{BQ} - \dot\gamma^2 \vec{BQ} = \ddot\theta \underline{k} \wedge \vec{AB} - \dot\theta^2 \vec{AB} + \underset{?}{\ddot\gamma} \underline{k} \wedge \vec{BQ} - \dot\gamma^2 \vec{BQ}$$

$$a_{R3} = \underset{0}{\cancel{a_C}} + \underset{?}{\ddot\gamma} \underline{k} \wedge \vec{CR} - \dot\gamma^2 \vec{CR}$$

$$\ddot\gamma = \ddot\varphi$$

$$\boxed{\underset{TR}{a_{B2}} = \underset{TCV\ \Sigma_3}{a_{B2}}}$$

$$a_{B2} = a_{B1}$$



$$\Sigma_3 \quad a_{B2} = a_B^{rel} + a_B^{tr} + a_B^{cor}$$

$$a_B^{rel} = \ddot s \lambda$$

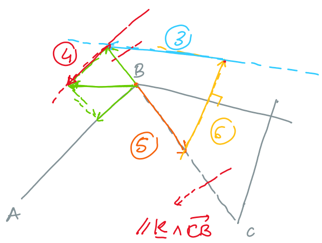
$$a_B^{tr} = a_{B3} = \ddot\gamma \underline{k} \wedge \vec{CB} - \dot\gamma^2 \vec{CB}$$

$$a_B^{cor} = 2\, \omega^{tr} \wedge v_B^{rel} = 2 \dot\gamma \underline{k} \wedge \dot s \lambda$$

$$\underbrace{\ddot\theta \underline{k} \wedge \vec{AB}}_{1} - \underbrace{\dot\theta^2 \vec{AB}}_{2} = \underbrace{\ddot s \lambda}_{?} + \underbrace{\ddot\gamma}_{?} \underline{k} \wedge \vec{CB} - \underbrace{\dot\gamma^2 \vec{CB}}_{5} + \underbrace{2 \dot\gamma \underline{k} \wedge \dot s \lambda}_{6}$$

noto in dir 3

noto in dir 4



$$\begin{cases} \ddot s < 0 \\ \ddot\gamma > 0 \end{cases}$$