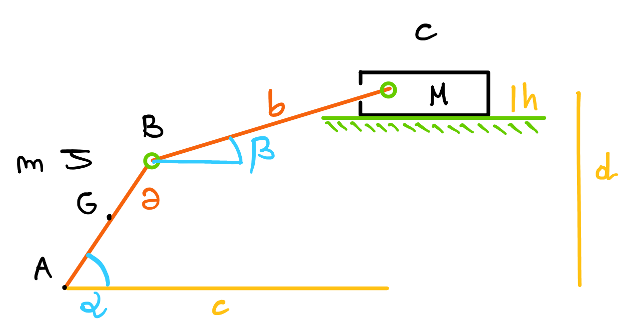
Es 4

Tuesday, 25 January 2022 00:44

MANOVELLISMO ORDINATO DEVIATO
SEMPLICE MA COMPLETO



CONOSCO $a, b, c, d, \alpha, \dot\alpha, \ddot\alpha, \beta, C_M, J, m, M, h$

CALCOLA V_G, a_G, V_C, a_C, M APPLICANDO PLV; V_{TRA} CORSOIO E TERRA

GRADI DI LIBERTA'

3 CORPI RIGIDI +9
3 CERNIERE −6
1 PATTINO −2

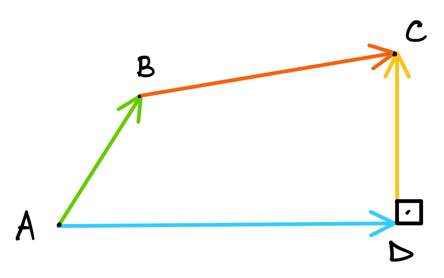
TOTALE 1 GDL 1 COORDINATA LIBERA

CONOSCENDO α (MOTORE) POSSO SAPERE TUTTE LE ALTRE

CHIUSURA

	$\lvert\cdot\rvert$	$\angle$
a	COST	$\alpha(t)$
b	COST	$\beta(\alpha)$
c	$c(\alpha)$	COST
d	COST	COST

← VETTORE DI CHIUSURA (CONOSCA)



CHIUSURA $(B-A)+(C-B) = (D-A)+(C-D)$

POSIZIONE

$$a(\cos\alpha\,\hat{i} + \sin\alpha\,\hat{j}) + b(\cos\beta\,\hat{i} + \sin\beta\,\hat{j}) = c\,\hat{i} + d\,\hat{j}$$

$$\begin{cases} a\cos\alpha + b\cos\beta = c \\ a\sin\alpha + b\sin\beta = d \end{cases} \qquad \beta = \arcsin\left(\frac{d - a\sin\alpha}{b}\right) \qquad c = \dots$$

VELOCITA'

$$a\dot\alpha(-\sin\alpha\,\hat{i} + \cos\alpha\,\hat{j}) + b\dot\beta(-\sin\beta\,\hat{i} + \cos\beta\,\hat{j}) = \dot c\,\hat{i} \qquad (\dot d = 0)$$

$$\begin{cases} -a\dot\alpha\sin\alpha - b\dot\beta\sin\beta = \dot c \\ +a\dot\alpha\cos\alpha + b\dot\beta\cos\beta = 0 \end{cases} \qquad \dot c = \dots \qquad \dot\beta = -\frac{a\dot\alpha\cos\alpha}{b\cos\beta} = J\dot\alpha$$ JACOBIANO

JACOBIANI

SAPENDO CHE $\beta = \beta(\alpha(t))$ $\quad \dot\beta = \frac{\partial\beta}{\partial\alpha}\frac{\partial\alpha}{\partial t}$ $\quad \frac{\partial\beta}{\partial\alpha} = \frac{\dot\beta}{\dot\alpha}$

SAPENDO CHE $c = c(\alpha(t))$ $\quad \dot c = \frac{\partial c}{\partial\alpha}\dot\alpha$ $\quad \frac{\partial c}{\partial\alpha} = \frac{\dot c}{\dot\alpha}$

PRINCIPI DEI LAVORI VIRTUALI

$\delta\beta = \frac{\dot\beta}{\dot\alpha}\delta\alpha$

$\delta c = \frac{\dot c}{\dot\alpha}\delta\alpha$

ACCELERAZIONI

$$\begin{cases} -a\ddot\alpha\sin\alpha - a\dot\alpha^2\cos\alpha - b\ddot\beta\sin\alpha - b\dot\beta^2\cos\beta = \ddot c \\ a\ddot\alpha\cos\alpha - a\dot\alpha^2\sin\alpha + b\ddot\beta\cos\beta - b\dot\beta^2\sin\beta = 0 \end{cases}$$

RICAVO $\ddot\beta$ DALLA SECONDA E POI $\ddot c$

VELOCITA' IN G

$|(G-A)| = a/2$ OMOGENEA

$V_G = \dot\alpha\hat{k} \times (G-A) =$

$= \dot\alpha\hat{k} \times \frac{a}{2}(\cos\alpha\,\hat{i} + \sin\alpha\,\hat{j})$

$= -\frac{a}{2}\dot\alpha\cos\alpha\,\hat{j} + \frac{a}{2}\dot\alpha\sin\alpha\,\hat{i}$

$= -\frac{a}{2}\dot\alpha(\sin\alpha\,\hat{i} - \cos\alpha\,\hat{j})$

$= -0{,}11\,\hat{i} + 0{,}06\,\hat{j}$

ACCELERAZIONE IN G

$a_G = \ddot\alpha\hat{k} \times (G-A) - \dot\alpha^2(G-A) =$

$= \ddot\alpha\hat{k} \times \frac{a}{2}(\cos\alpha\,\hat{i} + \sin\alpha\,\hat{j}) - \dot\alpha^2\frac{a}{2}(\cos\alpha\,\hat{i} + \sin\alpha\,\hat{j}) =$

$= -\ddot\alpha\frac{a}{2}\cos\alpha\,\hat{j} + \ddot\alpha\frac{a}{2}\sin\alpha\,\hat{i} - \dot\alpha^2\frac{a}{2}(\cos\alpha\,\hat{i} + \sin\alpha\,\hat{j})$

$= -0{,}68\,\hat{i} - 1{,}34\,\hat{j}$

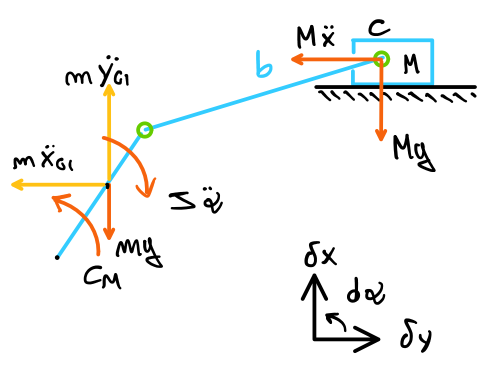
VELOCITA' IN C

$V_C = \dot c\,\hat{i} = -0{,}21$ m/s

ACCELERAZIONE IN C

$a_C = \ddot c\,\hat{i} = -1{,}93$ m/s

CALCOLA LA MASSA M



PER IL PLV:

$$C_M\delta\alpha + (-mg\,\delta y_G) + \cancel{(-Mg\,\delta y_C)} + (-m\ddot x_C\,\delta x) + (-m\ddot y_C\,\delta y) + (-J\ddot\alpha\,\delta\alpha) + (-M\ddot x_C\,\delta x_C) = 0$$

SOSTITUISCO I LEGAMI CINEMATICI

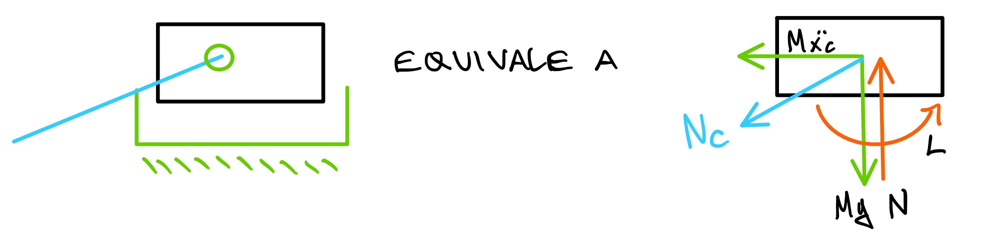
$\delta x_G = \frac{\partial x_G}{\partial\alpha}\delta\alpha$

$$\left[C_M - mg\left(\frac{\dot y_G}{\dot\alpha}\right) - m\ddot x_G\left(\frac{\dot x_G}{\dot\alpha}\right) - \delta\ddot\alpha - M\ddot c\left(\frac{\dot c}{\dot\alpha}\right)\right]\cancel{\delta\alpha} = 0$$

RISOLVO PER M ... M = 47,52 Kg

REAZIONI VINCOLARI TRA CORSOIO E TERRA

VINCOLO IMPEDISCE ROTAZIONE E TRASLAZIONE SU Y (PATTINO)



IN UNA CERNIERA f NORMALE SI ANNULLA SEMPRE
RESTA SOLO f LUNGO ASSE CERNIERA

$\sum M_C = 0$ POICHE' TUTTE LE F PASSANO PER IL POLO $L=0$

$\sum F_y = 0 \qquad N = N_C\sin\beta + Mg$

$\sum F_x = 0 \qquad N_C = M\ddot x_C \qquad \rightarrow \qquad N = M(\ddot x_C\sin\beta + g)$

NEL CASO POTREI RICAVARE N_C A RITROSO