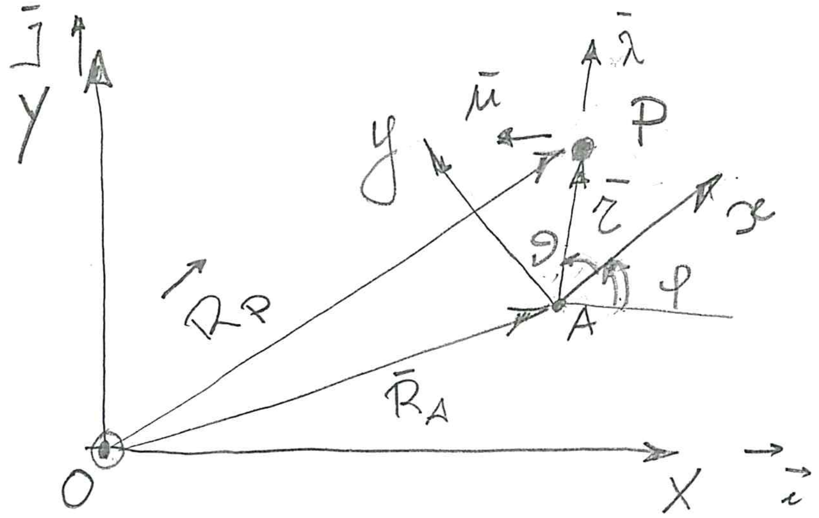
05.10.2010

1

$\bar{k} = \bar{i} \wedge \bar{j}$



$$\circ)\ \vec{R}_P = \vec{R}_A + \vec{r} = x_A \vec{i} + y_A \vec{j} + r \bar{\lambda}$$

$$\circ)\ \vec{V}_P = \dot{\vec{R}}_P = \dot{x}_A \vec{i} + \dot{y}_A \vec{j} + \dot{r} \bar{\lambda} + r \dot{\bar{\lambda}}$$

$$\circ\circ)\ \vec{a}_P = \ddot{\vec{R}}_P = \ddot{x}_A \vec{i} + \ddot{y}_A \vec{j} + \ddot{r} \bar{\lambda} + \dot{r} \dot{\bar{\lambda}} + \dot{r} \dot{\bar{\lambda}} + r \ddot{\bar{\lambda}}$$

$$\dot{\lambda}_{Ass} = (\dot{\varphi} + \dot{\vartheta}) \bar{k} \wedge \bar{\lambda} = (\dot{\varphi} + \dot{\vartheta}) \bar{\mu}$$

$$\ddot{\lambda}_{Ass} = (\ddot{\varphi} + \ddot{\vartheta}) \bar{\mu} + (\dot{\varphi} + \dot{\vartheta}) \dot{\bar{\mu}} = (\ddot{\varphi} + \ddot{\vartheta}) \bar{\mu} + (\dot{\varphi} + \dot{\vartheta})(\dot{\varphi} + \dot{\vartheta}) \vec{k} \wedge \bar{\mu}$$

$$\ddot{\lambda}_{Ass} = (\ddot{\varphi} + \ddot{\vartheta}) \bar{\mu} + (\dot{\varphi} + \dot{\vartheta})^2 (-\bar{\lambda})$$

$$\circ\ \bar{V}_P = \dot{x}_A \vec{i} + \dot{y}_A \vec{j} + \dot{r} \bar{\lambda} + r (\dot{\varphi} + \dot{\vartheta}) \bar{\mu}$$

$$\circ\circ\ a_P = \ddot{x}_A \vec{i} + \ddot{y}_A \vec{j} + \ddot{r} \bar{\lambda} + 2 \dot{r} (\dot{\varphi} + \dot{\vartheta}) \bar{\mu} +$$

$$+ r \left[(\ddot{\varphi} + \ddot{\vartheta}) \bar{\mu} + (\dot{\varphi} + \dot{\vartheta})^2 (-\lambda) \right]$$

P VISTO DA Axy

$$\vec{r} = r\vec{\lambda}$$

$$\dot{\lambda}_{REL} = \dot{\vartheta}\bar{k} \wedge \bar{\lambda} = \dot{\vartheta}\bar{\mu}$$

$$\dot{\mu}_{REL} = \dot{\vartheta}\bar{k} \wedge \bar{\mu} = \dot{\vartheta}(-\bar{\lambda})$$

$$\bar{V}_{rP} = \dot{r}\vec{\lambda} + r\vec{\dot{\lambda}} =$$

$$= \dot{r}\bar{\lambda} + r\dot{\vartheta}\bar{\mu}$$

$$\bar{a}_{rP} = \ddot{r}\bar{\lambda} + \dot{r}\bar{\dot{\lambda}} + \dot{r}\dot{\vartheta}\bar{\mu} + r\ddot{\vartheta}\bar{\mu} + r\dot{\vartheta}\bar{\dot{\mu}} =$$

$$= \ddot{r}\bar{\lambda} + \dot{r}\dot{\vartheta}\bar{\mu} + \dot{r}\dot{\vartheta}\bar{\mu} + r\ddot{\vartheta}\bar{\mu} + r\dot{\vartheta}^2(-\bar{\lambda}) =$$

$$= \bar{\lambda}\left(\ddot{r} - r\dot{\vartheta}^2\right) + \bar{\mu}\left(2\dot{r}\dot{\vartheta} + r\ddot{\vartheta}\right)$$

P VISTO DA OXY MA CON P BLOCCATO SU Axy ($\dot{r} = cost$

$$\bar{R}^*_P = \bar{R}_A + \bar{r}^* = x_A\vec{i} + y_A\vec{j} + r^*\bar{\lambda}^*$$

$$\bar{V}_{P_t} = \dot{x}_A\vec{i} + \dot{y}_A\vec{j} + r^*\dot{\lambda}^* =$$

$$= \dot{x}_A\vec{i} + \dot{y}_A\vec{j} + r^*\dot{\varphi}\vec{\mu}$$

$$\bar{a}_{P_t} = \ddot{x}_A\vec{i} + \ddot{y}_A\vec{j} + r^*\ddot{\varphi}\vec{\mu} + r^*\dot{\varphi}^2(-\bar{\lambda})$$

$$\bar{V}_P = \dot{x}_A \bar{i} + \dot{y}_A \bar{j} + r\dot{\varphi}\bar{\mu} + \dot{r}\bar{\lambda} + r\dot{\vartheta}\bar{\mu}$$

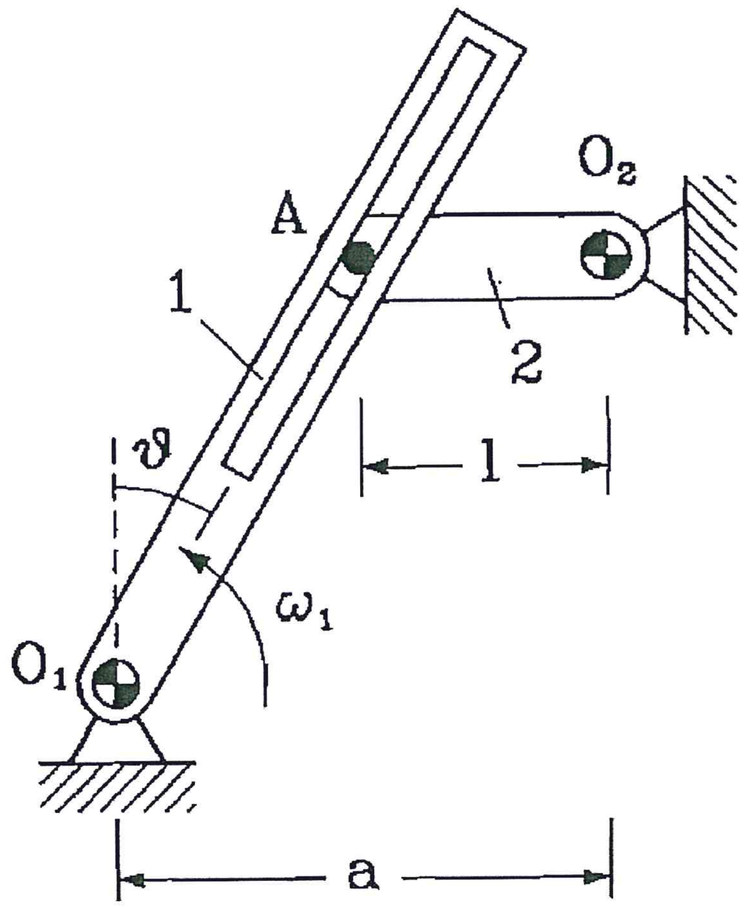
$$\vec{V}_P = \vec{V}_{Pt} + \vec{V}_{Pr}$$

$$\bar{a}_P = \ddot{x}_A \vec{i} + \ddot{y}_A \vec{j} + r\ddot{\varphi}\bar{\mu} + r\dot{\varphi}^2(-\bar{\lambda}) +$$
$$+ \lambda(\ddot{r} - r\dot{\vartheta}^2) + \mu(2\dot{r}\dot{\vartheta} + r\ddot{\vartheta})$$
$$+ (2\dot{r}\dot{\varphi}\bar{\mu} + 2r\dot{\varphi}\dot{\vartheta}(-\bar{\lambda}))$$

$$\bar{a}_P = \bar{a}_{Pt} + \bar{a}_{Pr} + \bar{a}_c$$

$$\bar{a}_c = 2\,\bar{\omega}_t \wedge \bar{V}_{Pr}$$
$$= 2\,\dot{\varphi}\,k \wedge (\dot{r}\bar{\lambda} + r\dot{\vartheta}\bar{\mu}) =$$
$$= 2\dot{\varphi}\dot{r}\bar{\mu} + 2\dot{\varphi}r\dot{\vartheta}(-\bar{\lambda})$$

Nel meccanismo raffigurato, il perno A è solidale col membro 2 ed è costretto a scorrere lungo una scanalatura longitudinale presente sul membro 1.
Sono note le dimensioni *a=500 mm, l=250 mm.*
Nell'istante in cui il meccanismo ha la configurazione rappresentata ($\vartheta = 30°$, membro 2 orizzontale), il membro 1 ha una velocità angolare di verso antiorario e di valore costante $\omega_1 = 5\ rad/s$. Determinare in tale condizione: la velocità del perno A relativa al membro 1, la velocità angolare del membro 2, l'accelerazione di A relativa al membro 1, l'accelerazione angolare del membro 2.



$a = 500\,mm$

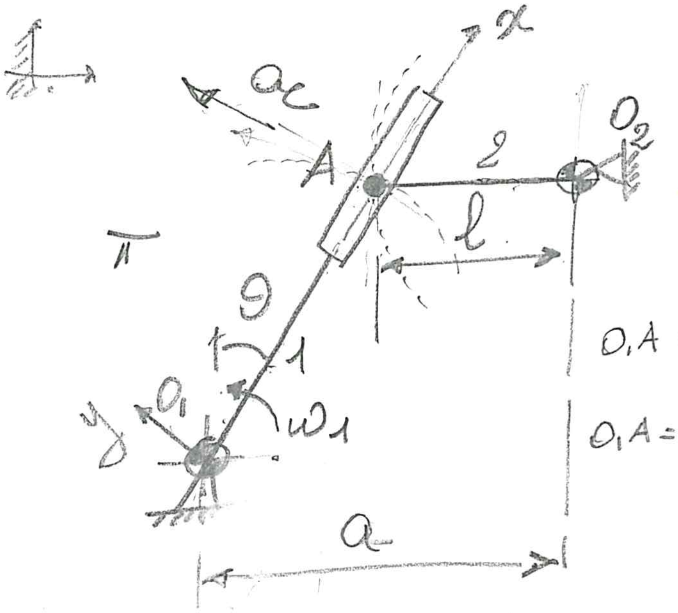
$l = 250\,mm$

$\theta = 30°$

2 ORIZZONTALE

$\omega_1 = 5\,rad/s$ COST

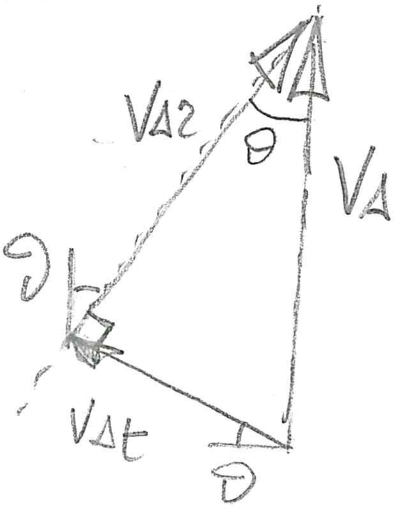
$V_{Ar}, \omega_2, a_{Ar}, \dot{\omega}_2$?



$O_1A = \frac{a-l}{\sin\theta}$

$O_1A = 0{,}5\,m$

	$\vec{V}_A$	$= \bar{V}_{Ar}$	$+ \bar{V}_{At}$
M	$\omega_2 l$?	?	$\omega_1 O_1A$ 2,5 m/s
D	$\perp O_2A$	$// O_1A$	$\perp O_1A$
V	?	?	↖



$$V_A = \frac{V_{At}}{\sin\theta} = \frac{2{,}5}{\sin 30°} = 5{,}0\,m/s$$

$$V_{Ar} = \frac{V_{At}}{tg\theta} = \frac{2{,}5}{tg 30°} = 4{,}33\,m/s$$

$$\omega_2 = V_A / l = 20\,rad/s$$

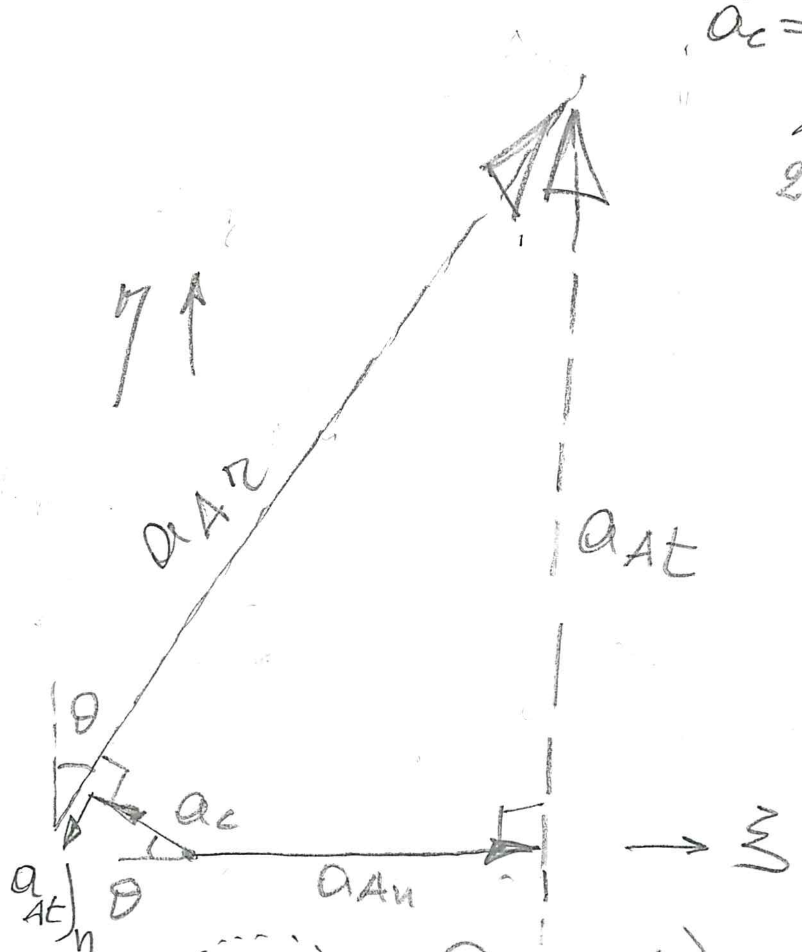
$$\bar{a}_A = \vec{a}_{Ar} + \vec{a}_{At})_n + \bar{a}_{At})_\tau + \bar{a}_c = a_A^n + a_{At}$$

	?	$\omega_1^2 O_1A$ 12,5 m/s²	$\dot{\omega}_1 O_1A = 0$	$2\omega_1 V_2$ 43,3 m/s²	$\omega_2^2 l$ 100 m/s²	$\dot{\omega}_2 l$?	M
	$//O_1A$	$//O_1A$	$\forall$	$\perp O_1A$ $\in \pi$	$//AO_2$	$\perp AO_2$	D
	?	$A \to O_1$	$\forall$	$\nwarrow$	$A \to O_2$	?	V

$$\bar{a}_c = 2\bar{\omega}_t \wedge \bar{V}_r$$

$$2\bar{\omega}_1 \wedge \bar{V}_2$$

$$2 \cdot 5 \cdot 4{,}33 = 43{,}3 \text{ m/s}^2$$



$$\xi)\ + a_{An} - a_{Ar} \sin\vartheta + a_{At})_n \sin\vartheta + a_c \cos\vartheta = 0$$

$$\eta)\ + a_{At} - a_{Ar} \cos\vartheta + a_{At})_n \cos\vartheta - a_c \sin\vartheta = 0$$

$$a_{Ar} = 287{,}5 \text{ m/s}^2$$

$$a_{At} = 259{,}75 \text{ m/s}^2$$

$$\dot{\omega}_2 = \frac{a_{At}}{l} = 1039{,}2 \text{ rad/s}^2$$

$$\bar{\dot{\omega}}_2 = \dot{\omega}_2(-\bar{k})$$