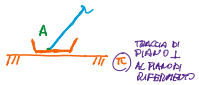
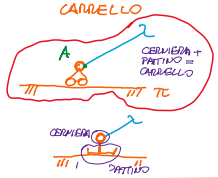
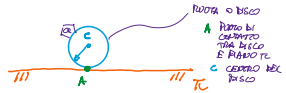
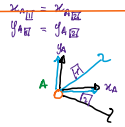
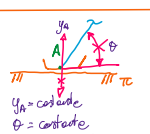
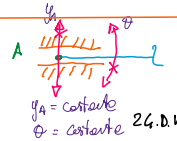
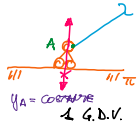
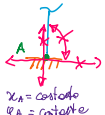
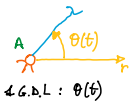
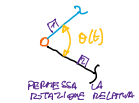
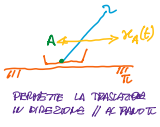
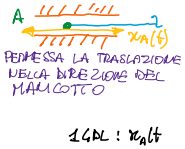
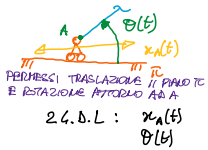
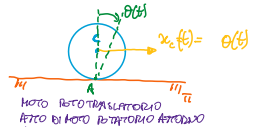
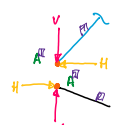
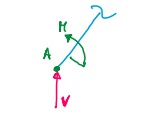
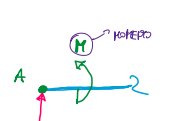
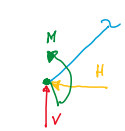
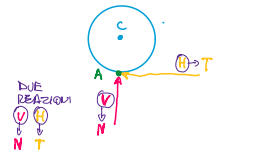
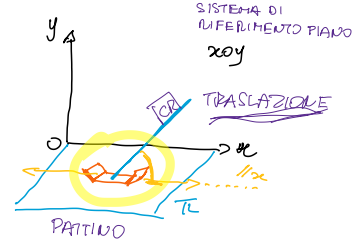
Lezione martedì 28 settembre 2020

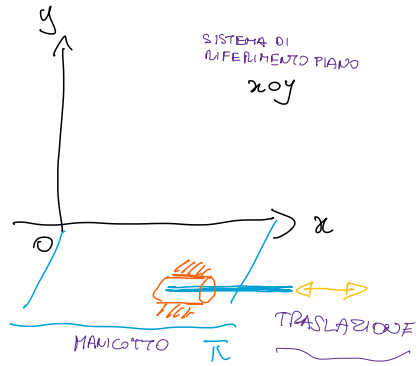
lunedì 28 settembre 2020 10:25

- VINCOLI PER C.R. DEL PIANO
- TEOREMA DEI MOTI RELATIVI

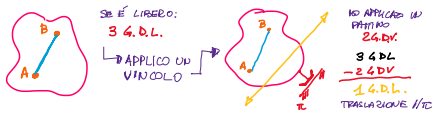
VINCOLI

SIMBOLO	CERNIERA A TERRA	CERNIERA TRA 2 C.R.	PATTINO	MANICOTTO	CARRELLO	INCASTRO	PUNTO ROTOLAMENTO
							
GRADI DI VINCOLO	 INIBITI GLI SPOSTAMENTI DI A ⇒ 2 G.D.V.	 2 G.D.V.	 y_A = costante θ = costante 2 G.D.V.	 y_A = costante θ = costante 2 G.D.V.	 y_A = costante 1 G.D.V.	 x_A = costante y_A = costante θ = costante 3 G.D.V.	 1) IL DISCO NON SI DISTACCA DAL PIANO 2) LA ORDINATA x_c (opportuno centro del disco//π) NON È INDIPENDENTE DALLA ROTAZIONE DEL DISCO θ 2 G.D.V.
GRADI DI LIBERTÀ RESTANTI	 1 G.D.L : $\theta(t)$	 PERMESSA LA ROTAZIONE RELATIVA 1 G.D.L. : $\theta(t)$	 PERMESSE LA TRASLAZIONE IN DIREZIONE // AL PIANO π 1 G.D.L : $x_A(t)$	 PERMESSA LA TRASLAZIONE NELLA DIREZIONE DEL MANICOTTO 1 GDL : $x_A(t)$	 PERMESSI TRASLAZIONE // PIANO π E ROTAZIONE ATTORNO AD A 2 G.D.L : $x_A(t)$ $\theta(t)$	 UNICO MOVIMENTO PERMESSO 0 G.D.L.	 MOTO ROTOTRASLATORIO ATTO DI MOTO ROTATORIO ATTORNO AD A ≡ C.I.R. 1 G.D.L.
REAZIONI VINCOLARI	 DAL PTO DI VISTA CINEMATICO HO IL "VINCOLO" DAL PTO DI VISTA DINAMICO SOSTITUISCO IL "VINCOLO" CON LE SUE REAZIONI VINCOLARI EQUIVALENTI DUE REAZIONI: V H	 DUE REAZIONI V H	 DUE REAZIONI: V H	 DUE REAZIONI: V M	 UNA REAZIONE: V	 TRE REAZIONI: V H M	 TRADIZIONALMENTE LA REAZIONE VERTICALE SI INDICA CON N E QUELLA ORIZZONTALE CON T

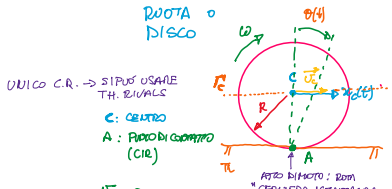




CALCOLO DEI GRADI DI LIBERTÀ (SISTEMI DI CORPI RIGIDI)



↳ CINEMATICA DELLA RUOTA (DISCO)



VINCOLO DI PURO ROTOLAMENTO → RUOTA RISTOLI SENZA STRISCIARE

$x_c = R\theta \rightarrow \left(\frac{d}{dt}\right) \rightarrow \dot{x}_c = v_c = R\dot{\theta} = R\omega$

VALE ANCHE

$\vec{v}_c = \vec{\omega} \wedge (C-A)$

SEMPRE // π

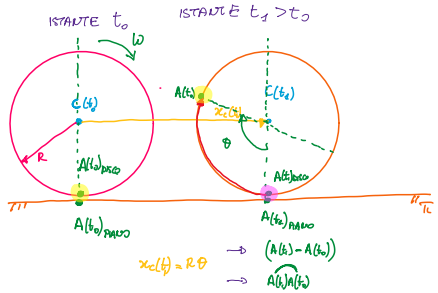
$\frac{d}{dt}$ TRAIETTORIA DI C E' // π

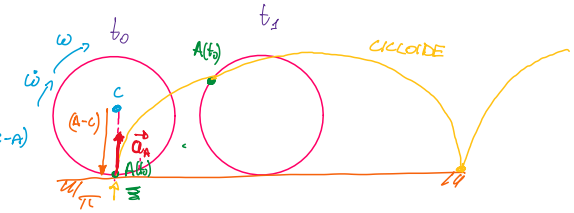
$v_A = 0$

$a_c = \ddot{x}_c = R\ddot{\theta} = R\dot{\omega}$

$\vec{a}_c = \vec{\dot{\omega}} \wedge (C-A)$

SOLO COMPONENTE TANGENTE





A: CIR.

$\vec{v}_A = 0$

$\vec{v}_C = \vec{v}_A + \vec{v}_{CA} = 0 + \vec{\omega} \wedge (C-A)$

$\vec{v}_C =$

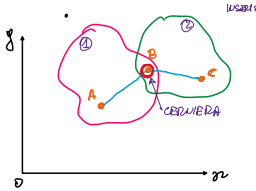
$\vec{a}_C = \vec{\dot{\omega}} \wedge (C-A)$

$\vec{a}_A = \vec{a}_C + \vec{a}_{AC} = \vec{\dot{\omega}} \wedge (C-A) + \vec{\omega} \wedge \vec{\omega} \wedge (A-C) + \vec{\dot{\omega}} \wedge (A-C) =$

$= \vec{\omega} \wedge \vec{\omega} \wedge (A-C) = -\omega^2 (A-C)$

$a_A = -\omega^2 R$

qua c'è il "-" per ricordare che è componente normale o abbiveti della centripeta



INSERISCO UNA CERNIERA TRA 2 C.R.

CALCOLO DEI GRADI DI LIBERTÀ DEL SISTEMA

2 C.R. × 3 G.D.L = 6 G.D.L. possibili

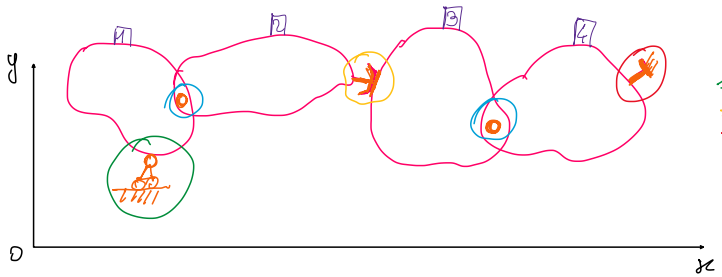
1 CERNIERA × 2 G.D.V. = −2 G.D.V.

4 G.D.L residui

$x_B^{(1)} = x_B^{(2)}$

$y_B^{(1)} = y_B^{(2)}$

x_A, y_A, x_C, y_C



4 C.R. × 3 G.D.L. = 12 G.D.L possibili

2 CERNIERE × 2 G.D.V = 4

1 CARRELLO × 1 G.D.V = 1

1 PATTINO × 2 G.D.V = 2

1 INCASTRO × 3 G.D.V = 3 −10 G.D.V

2 G.D.L residui

TEOREMA DEI MOTI RELATIVI

↳ FORMULE DI POISSON

> Formule di Poisson

$S(xOy)$ SISTEMA FISSO

$S_1(x_1Oy_1)$ CENTRO IN O CON

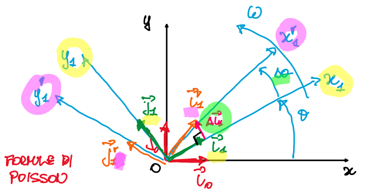
$S_1'(x_1'Oy_1')$ S_1 DOPO dt

$$\frac{d\vec{i}_1}{dt} = \lim_{\Delta t \to 0} \frac{\Delta \vec{i}_1}{\Delta t} =$$

$$\frac{d\vec{i}_1}{dt} = \vec{\omega} \wedge \vec{i}_1$$

$$\frac{d\vec{j}_1}{dt} = \vec{\omega} \wedge \vec{j}_1$$

FORMULE DI POISSON



$$\vec{i}_1 = e^{i\theta}$$

$$\vec{j}_1 = i e^{i\theta} = e^{i(\theta + \frac{\pi}{2})}$$

$\xrightarrow{\frac{d}{dt}}$

$$\frac{d\vec{i}_1}{dt} = i\dot{\theta} e^{i\theta} =$$

$$\frac{d\vec{j}_1}{dt} = -\dot{\theta} e^{i\theta}$$