

Vincolo: limita il moto di punti di un
corpo al quale è applicato



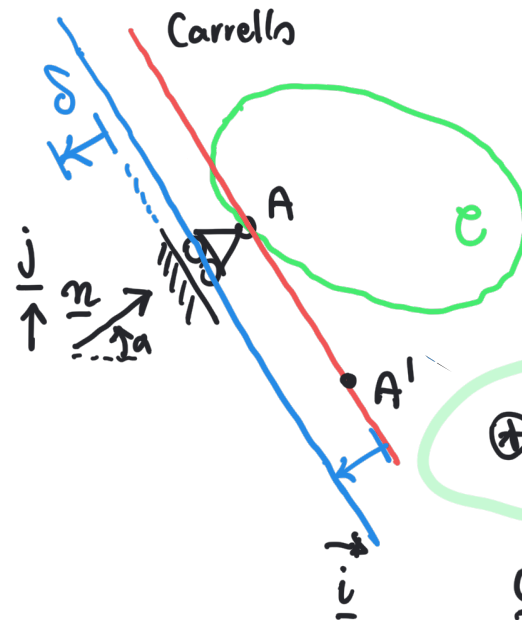
olonomi

fissi

bilateri

privi di
attrito

2 gradi di libertà



condizione di parallelismo

$$\underline{u}_A \cdot \underline{n} = -\delta \quad \oplus \quad \underline{\delta} > 0$$

non omogenea

$$\underline{n} = \cos \alpha \underline{i} + \sin \alpha \underline{j}$$

$$\underline{u}_A = u_A \underline{i} + v_A \underline{j}$$

$$\oplus \Leftrightarrow u_A \cos \alpha + v_A \sin \alpha = 0$$

CONDIZIONE VINCOLARE

rappresentazione analitica

$$\begin{aligned} u_A = u_0 - \delta y_A &\Rightarrow u_0 \cos \alpha - \delta y_A \cos \alpha + v_0 \sin \alpha \\ v_A = v_0 + \delta x_A &+ \delta x_A \sin \alpha = 0 \end{aligned}$$

Vett. param. leg.

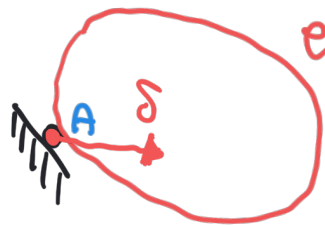
$$\underline{q} = [u_0, v_0, \delta]^T$$

$$\cos \alpha u_0 + \sin \alpha v_0 + (-y \cos \alpha + x \sin \alpha) \delta = 0$$

Prod. righe per colonna:

$$\begin{bmatrix} \cos \alpha & \sin \alpha & -y \cos \alpha + x \sin \alpha \end{bmatrix} \begin{bmatrix} u_0 \\ v_0 \\ \delta \end{bmatrix}$$

Cerniera esterna



cedimento $\underline{\delta} = \delta_x \underline{i} + \delta_y \underline{j}$
(vettore)

$$\underline{u}_A = \underline{\delta}$$

$$u_A = \delta_x$$

$$v_A = \delta_y$$

2 condizioni scalari
↑
moltiplicati 2

$\underline{u} \neq \underline{0} \Rightarrow A$ è il centro

$$\left. \begin{array}{l} u_A = u_0 - \partial y_A \\ v_A = v_0 + \partial x_A \end{array} \right\} \Rightarrow \begin{array}{l} u_0 - \partial y_A = \delta_x \\ v_0 + \partial x_A = \delta_y \end{array}$$

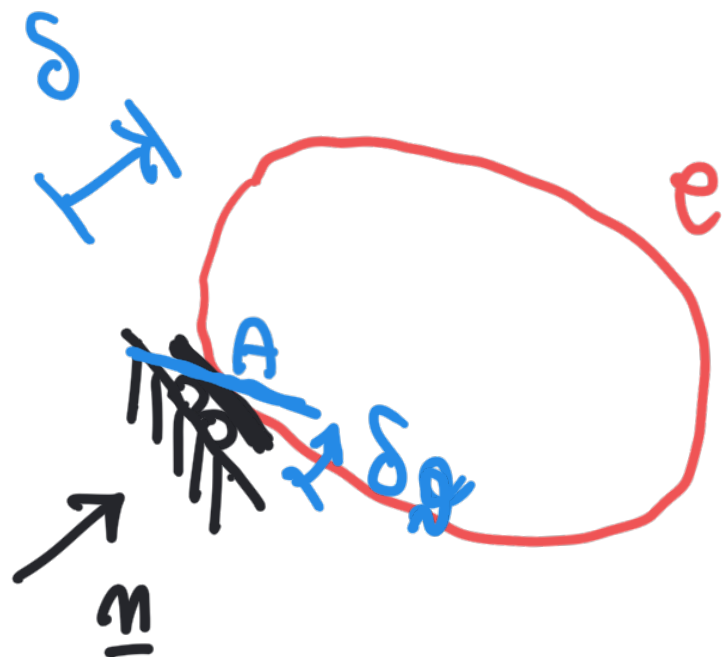
$$\begin{bmatrix} 1 & 0 & -y_A \\ 0 & 1 & x_A \end{bmatrix} \begin{bmatrix} u_0 \\ v_0 \\ \partial \end{bmatrix} = \begin{bmatrix} \delta_x \\ \delta_y \end{bmatrix} \Leftrightarrow \begin{cases} \begin{bmatrix} 1 & 0 & -y_A \end{bmatrix} \begin{bmatrix} u_0 \\ v_0 \\ \partial \end{bmatrix} = \delta_x \\ \begin{bmatrix} 0 & 1 & x_A \end{bmatrix} \begin{bmatrix} u_0 \\ v_0 \\ \partial \end{bmatrix} = \delta_y \end{cases}$$



$$\underline{A} \underline{q} = \underline{s}$$

→ Problema cinematico

Glifo



2 condizioni scalari



moltiplicità 2

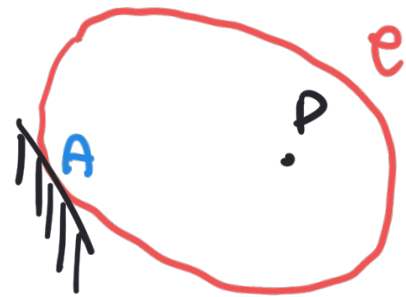
cedimento:

traslazione δ
rotazione δ_θ

$$\left\{ \begin{array}{l} \underline{u}_A \cdot \underline{n} = \delta \\ \vartheta = \delta_\theta \end{array} \right.$$



Incastro



$$\begin{cases} \underline{u}_A = \underline{0} \\ \vartheta = 0 \end{cases} \quad \begin{cases} u_A \Rightarrow \\ v_A \Rightarrow \end{cases}$$

③ equazioni
↑
molte p.l.c. tra!

$$\underline{u}_P = \underline{0}$$

Cedimento: $\underline{\delta}$ (spostamento)
 δ_ϑ (rotazione)

$$\underline{u}_A = \underline{\delta}$$

$$\vartheta = \delta_\vartheta$$