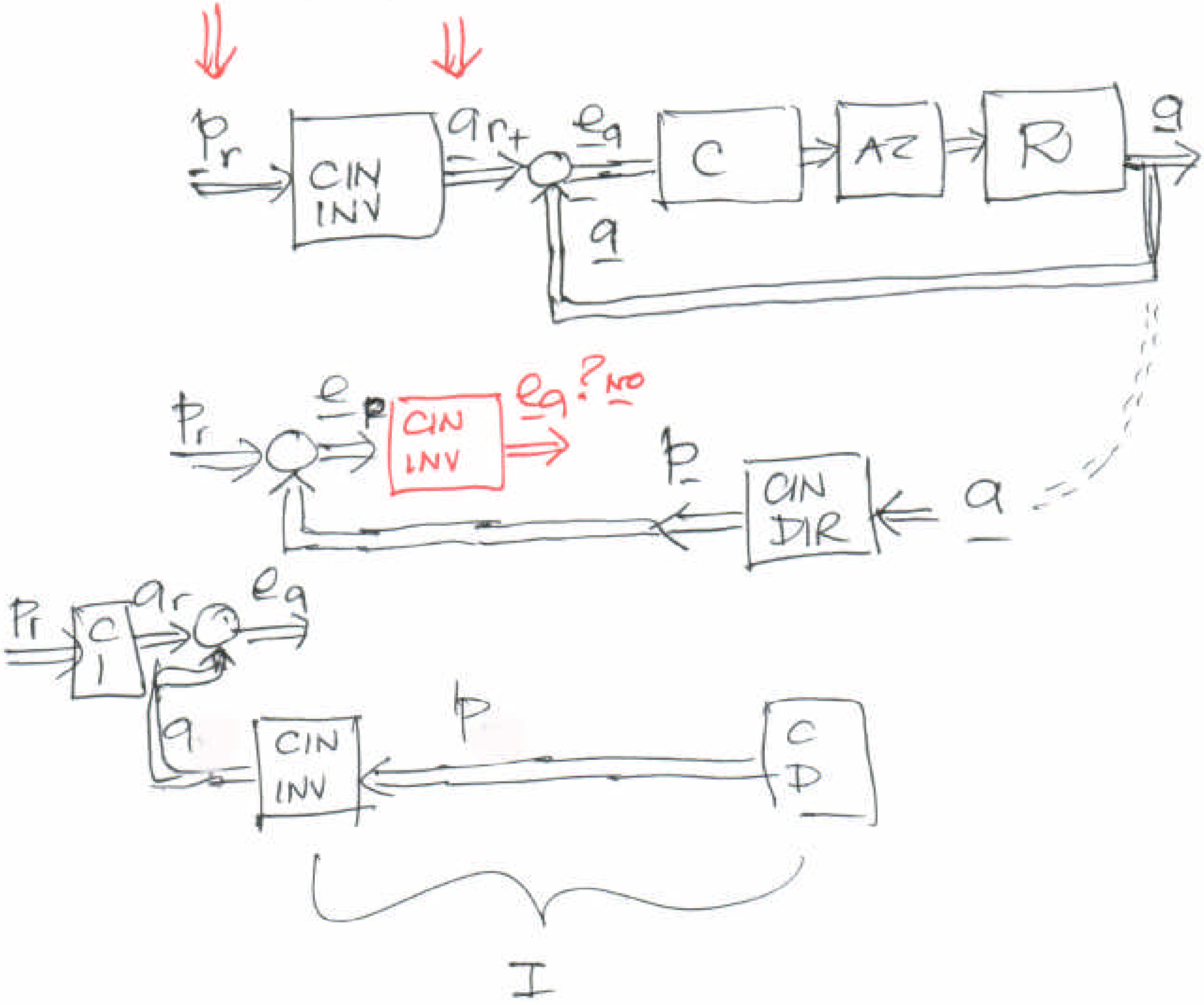
Lezione 18/03/2004

a) Pianificazione della traiettoria e del riferimento: testo pagg. 133-seguenti

PIANIFICAZIONE

- COORDINATE GIUNTO
- COORDINATE CARTESIANE



$$\dot{p} = J\dot{q} \qquad \dot{q} = J^{-1}\dot{p}$$

$$\Delta p \simeq J\Delta q \qquad \Delta q \simeq J^{-1}\Delta p$$

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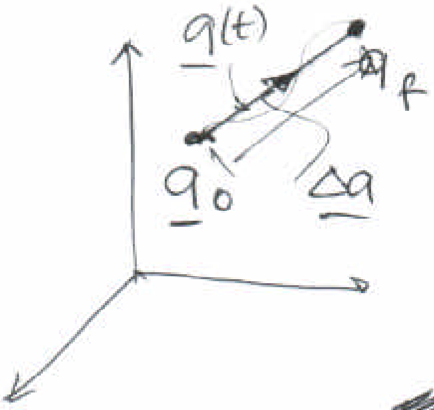
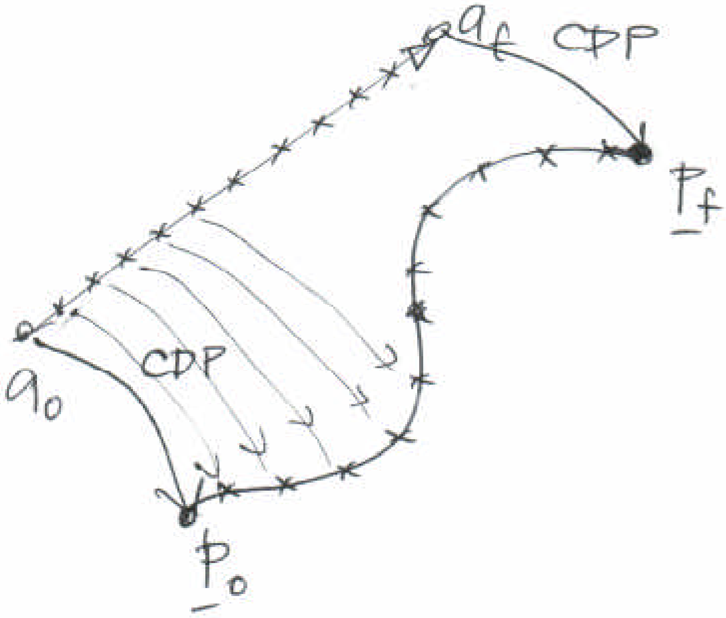
COORDINATE GIUNTO



DI SOLITO
NON SI PIANIFICA
LUNGO UNA TRAIETTORIA
(DIRETTAMENTE)

$$\underline{q}(t) = \underline{q}_0 + s(t)\,\underline{\Delta q}$$



COORDINATE CARTESIANE

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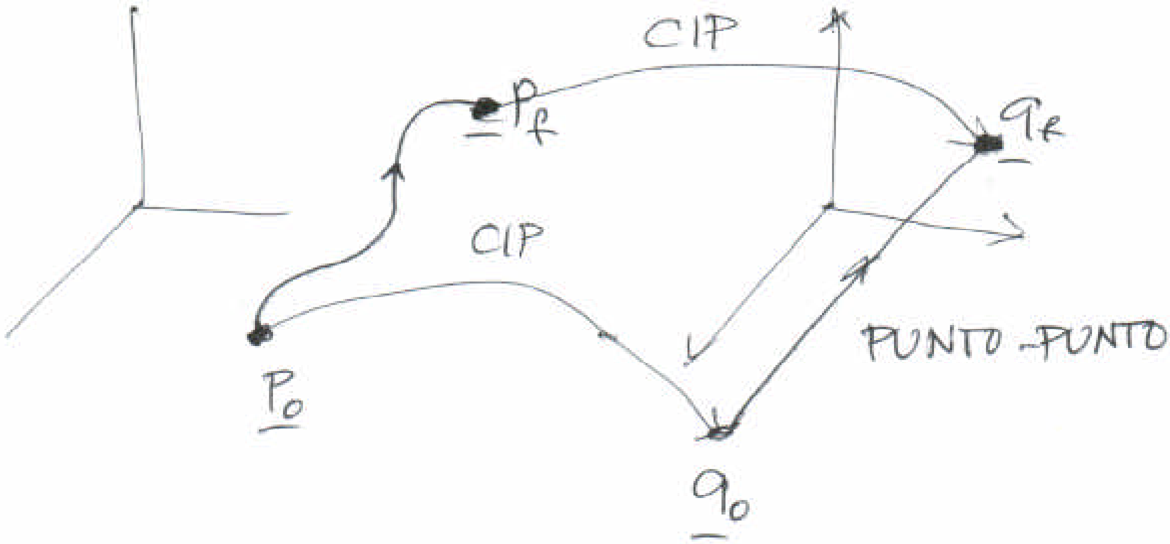
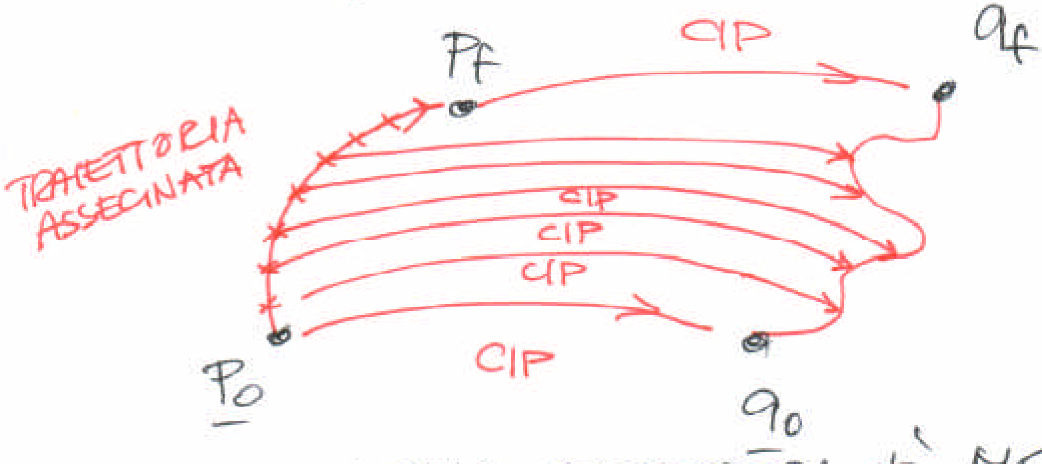
3



PUNTO-PUNTO CARTESIANO
TRAIETTORIA CARTESIANA



CON GLI ATTUALI PROCESSORI È MOLTO PESANTE

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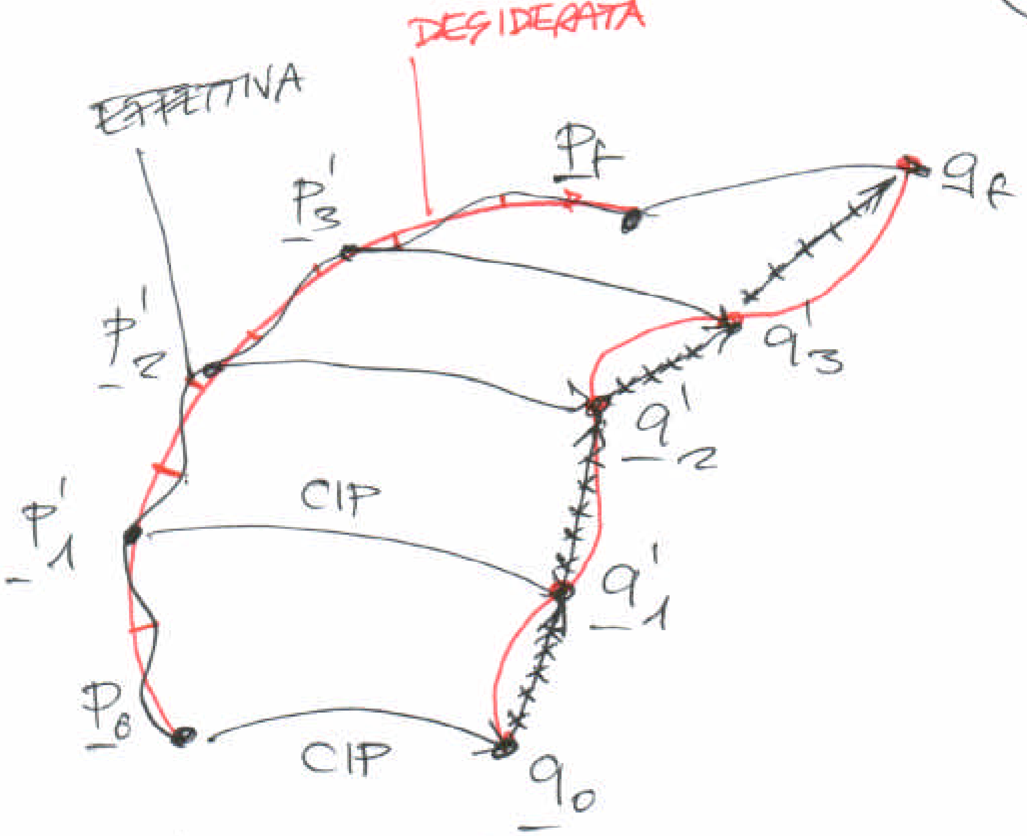

MACRO - MICRO
INTERPOLAZIONE

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5

$\underline{p}(t) = ?$ partendo da $\underline{p}_0$ e andando in $\underline{p}_f$

$$\underline{p}(t) = \begin{bmatrix} x(t) \\ \alpha(t) \end{bmatrix}$$

DUE PROBLEMI DISTINTI

$$\underline{x}(t) = x_0 + s(t)\left[x_f - x_0\right]$$

SE VOGLIO SEGMENTO DI RETTA

QUASI "UGUALE" PER ALTRE TRAIETTORIE

$$\dot{x}(t) = \dot{s}(t)\,\Delta x$$
$$\ddot{x}(t) = \ddot{s}(t)\,\Delta x$$

ARCO DI CERCHIO

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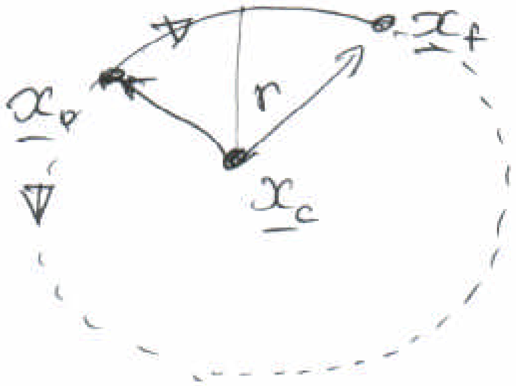

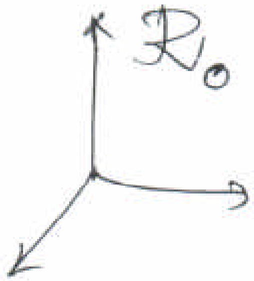

- •) PIANO $\underline{x}_0, \underline{x}_f, \underline{x}_c$
- •) FISSO UN RIFERIMENTO $\mathcal{R}_p$ tale che $\underline{i}_p$

RETTA NEL PIANO

$$ax + by = c$$

$$ax + by - c1 = 0$$

$$\begin{bmatrix} a & b & -c \end{bmatrix} \begin{bmatrix} x \\ y \\ +1 \end{bmatrix} = 0$$

$$\Downarrow$$

$$\begin{bmatrix} \frac{a}{-c} & \frac{b}{-c} & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} = 0$$

COORDINATE OMOGENEE !

TOMMASO CALVELLI

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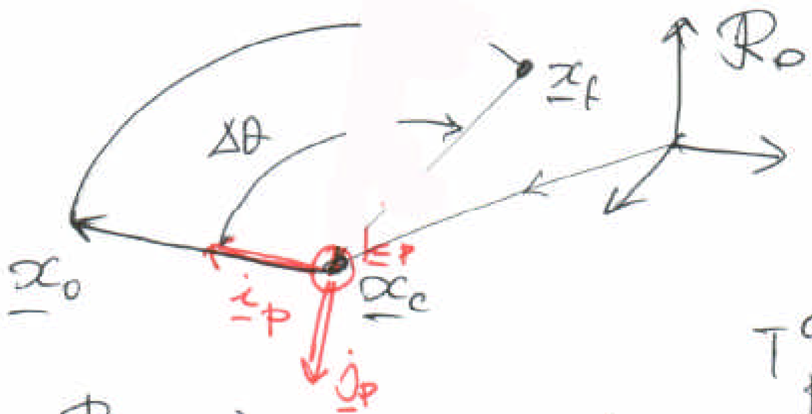


$$T^0_p = \text{data}$$

$$\mathcal{R}_p : \underline{i}_p \equiv \underline{x}_0 - \underline{x}_c / \|\cdot\| \qquad \begin{bmatrix} R^0_p & \underline{x}_c \\ 0^T & 1 \end{bmatrix}$$

$$\underline{k}_p \equiv$$

$$\Downarrow$$

$$\frac{(x_0 - x_c) \times (\underline{x}_f - \underline{x}_c)}{\|\cdot\|}$$

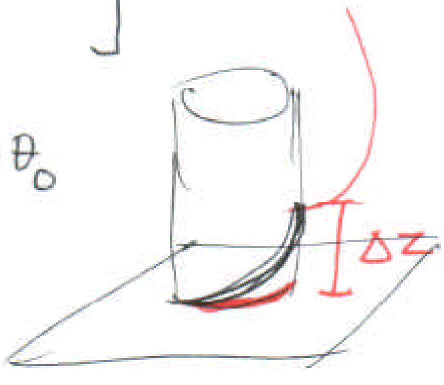
$$\sin\Delta\theta = \frac{\|(x_0 - x_c) \times (x_f - x_c)\|}{r^2}$$

$$\underline{\tilde{x}}(t) = T^0_p\, \underline{\tilde{x}}_p = \begin{bmatrix} R^0_p & x_c \\ 0^T & 1 \end{bmatrix} \begin{bmatrix} r\cos\theta(t) \\ r\sin\theta(t) \\ 0 \\ 1 \end{bmatrix}$$

$$\begin{matrix} r\cos\theta(t) \\ r\sin\theta(t) \\ z(t) \end{matrix}$$

$$\theta(t) = s(t)\,\theta_f + (1 - s(t))\,\theta_0$$

$$\theta_f = \theta_0 + \Delta\theta$$



$$z(t) = Z_0 + s(t)\,\Delta z$$

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PIANIFICAZIONE ASSETTO

NON FARE

R_0 assetto iniziale

R_f assetto finale

$$R(t) = s(t) R_f + (1 - s(t)) R_0$$

NO !!

TRE METODI

(1) PIANIFICO GLI ANGOLI (DI EULERO)

$$\left.\begin{array}{l} R_0 \rightarrow \phi_0 \ \theta_0 \ \psi_0 \\ R_f \rightarrow \phi_f \ \theta_f \ \psi_f \end{array}\right\} \begin{array}{l} \phi(t) = \phi_0 + s(t) \Delta\phi \\ \theta(t) = \theta_0 + s(t) \Delta\theta \\ \psi(t) = \psi_0 + s(t) \Delta\psi \end{array}$$

$$R(t) = Rot_{EULERO}(\phi(t), \theta(t), \psi(t))$$

VETTORE DI ROTAZIONE

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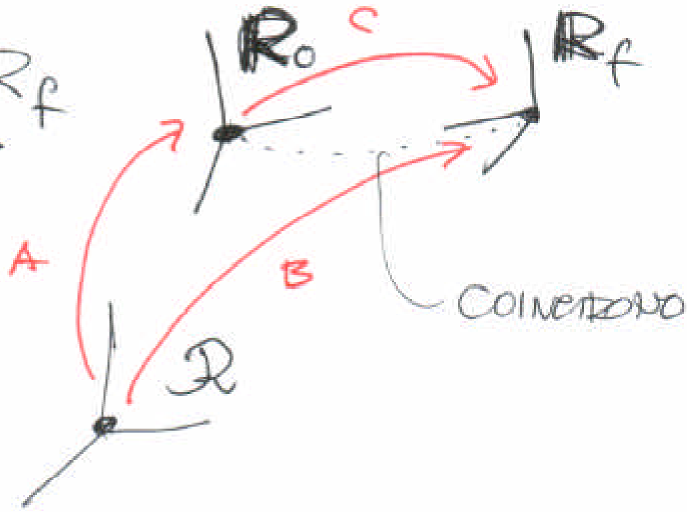
R_0

R_f

$C = R_0^T R_f$



$$R_0^T R_f \equiv R_L \Longrightarrow \underline{u}, \Delta\theta$$

$$\Delta\theta = \pm \arccos\left(\frac{\mathrm{tr}\, R_L - 1}{2}\right)$$

$\underline{u} \Rightarrow$ creando la matrice S

$$S(\underline{u}) = \frac{1}{2\sin\Delta\theta}\left(R_L - R_L^T\right)$$

OTTENETE: $\underline{u}, \Delta\theta$

$$\theta(t) = s(t)\,\Delta\theta \qquad R(t) = Rot(\underline{u}, \theta(t))$$