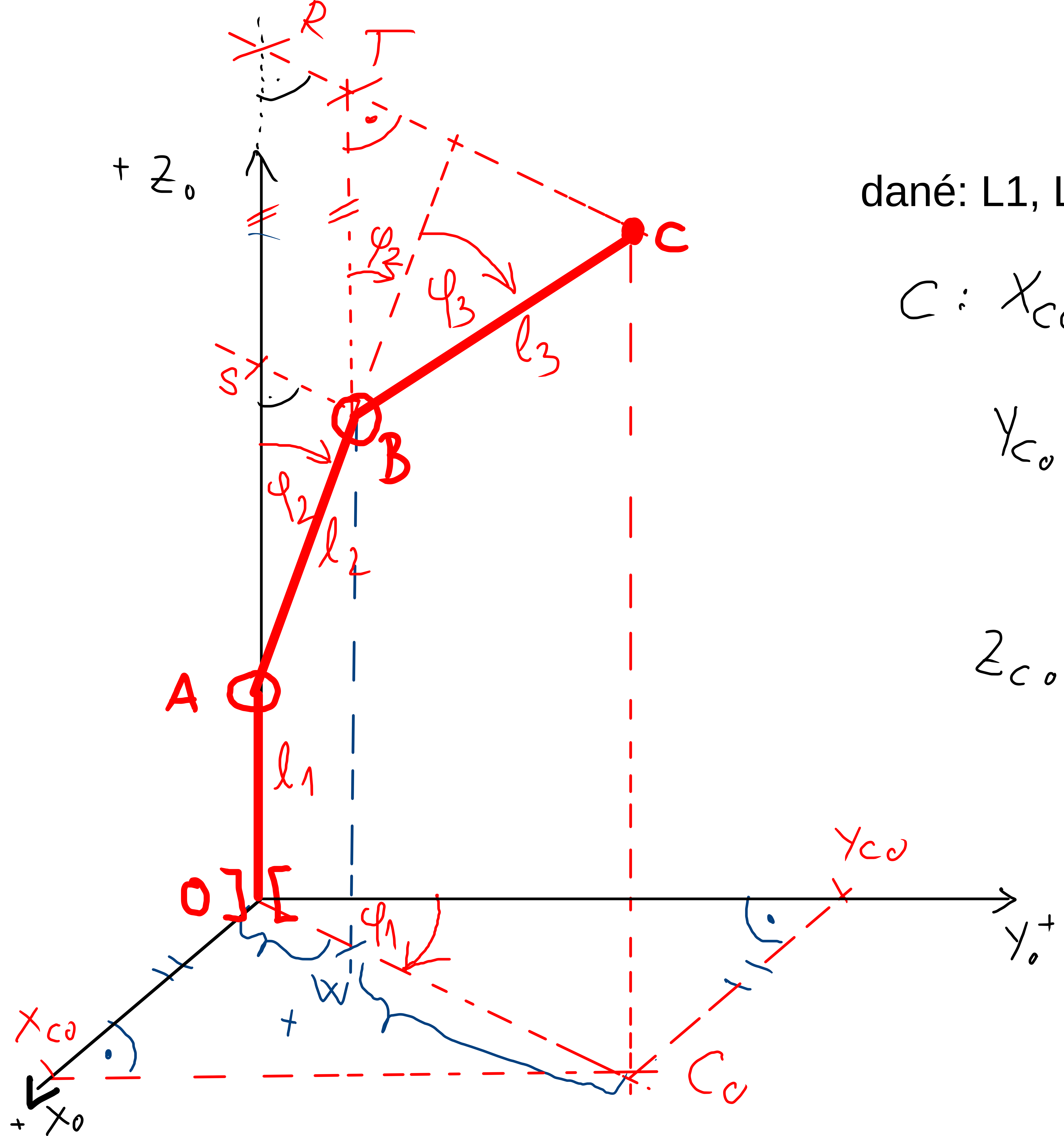


dané: L1, L2, L3, Phi1, Phi2, Phi3

$$C: X_{C0} = \sin\varphi_1 \left[l_2 \cdot \sin\varphi_2 + l_3 \cdot \sin(\varphi_2+\varphi_3)\right]$$

ΔOC_0Y_{C0} ΔABS ΔBCT

$$Y_{C0} = \cos\varphi_1 \left[l_2 \cdot \sin\varphi_2 + l_3 \cdot \sin(\varphi_2+\varphi_3)\right]$$

ΔOC_0Y_{C0} ΔABS ΔBCT

$$Z_{C0} = l_1 + l_2 \cdot \cos\varphi_2 + l_3 \cdot \cos(\varphi_2+\varphi_3)$$

ΔABS $|AS|$ ΔBCT $|BT|$

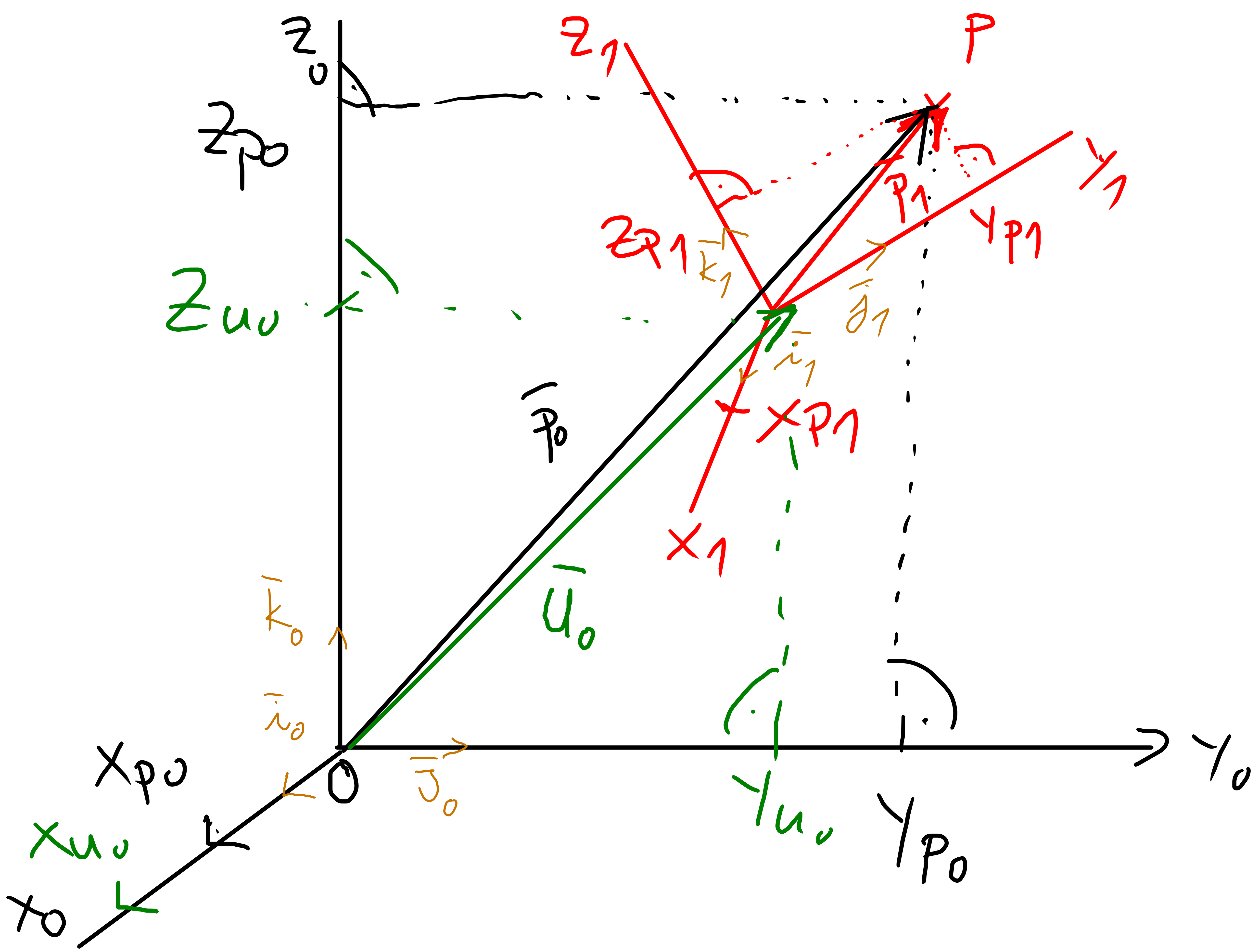
FB.com/mnemotechnickepomocky

Zvolal Sínus na kone: "Protiľahlá k prepone!"

Iné riešenie:

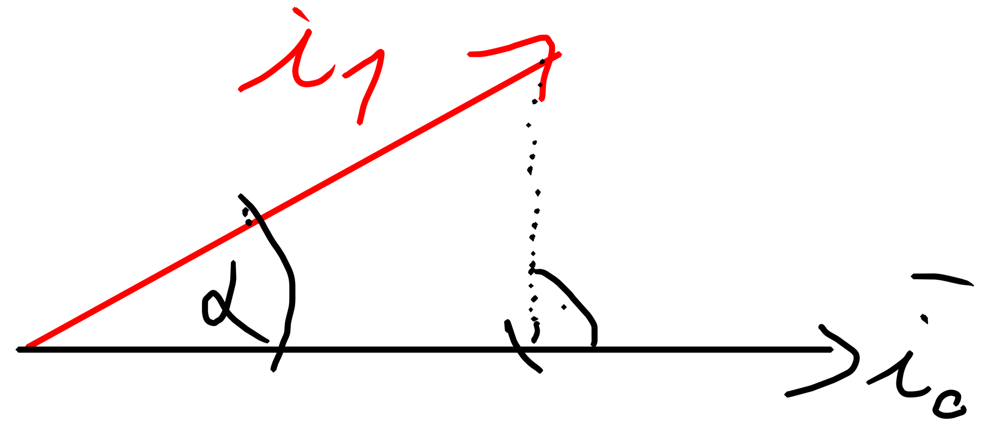
Pomocou transformačných matíc, tzv. homogénnej tranformácie, ktoré obsahujú rotačný aj translačný pohyb medzi dvoma navzájom posunutými a natočeným súradnicovými systémami.

Majme súradnicový systém x_0, y_0, z_0, ktorý je zviazaný s pevnou základňou robota a vzťažný súradnicový systém x_1, y_1, z_1, ktorý je zviazaný s pracovným bodom P (bod P je niekde v priestore)



$$\bar{P}_1 = \begin{pmatrix} x_{P1} \\ y_{P1} \\ z_{P1} \end{pmatrix} \qquad \bar{P}_0 = \begin{pmatrix} x_{P0} \\ y_{P0} \\ z_{P0} \end{pmatrix}$$

$$\bar{U}_0 = \begin{pmatrix} x_{U0} \\ y_{U0} \\ z_{U0} \end{pmatrix} \qquad \bar{P}_0 = \bar{U}_0 + \bar{P}_1$$



smerové kosínusy

$$\bar{P}_1 = \begin{pmatrix} x_{p1} \\ y_{p1} \\ z_{p1} \end{pmatrix} \qquad \bar{P}_0 = \begin{pmatrix} x_{p0} \\ y_{p0} \\ z_{p0} \end{pmatrix}$$

$$\bar{U}_0 = x_{u_0} \cdot \bar{i}_0 + y_{u_0} \cdot \bar{j}_0 + z_{u_0} \cdot \bar{k}_0$$

$$\bar{P}_1 = x_{p1} \cdot \bar{i}_1 + y_{p1} \cdot \bar{j}_1 + z_{p1} \cdot \bar{k}_1$$

$$\bar{U}_0 = \begin{pmatrix} x_{u_0} \\ y_{u_0} \\ z_{u_0} \end{pmatrix}$$

$$\bar{P}_0 = \bar{U}_0 + \bar{P}_1$$

$$\bar{P}_0 = x_{p0} \cdot \bar{i}_0 + y_{p0} \cdot \bar{j}_0 + z_{p0} \cdot \bar{k}_0$$

$$\bar{P}_0 = x_{u_0} \cdot \bar{i}_0 + y_{u_0} \cdot \bar{j}_0 + z_{u_0} \cdot \bar{k}_0 + a_{11} \cdot \underline{x_{p1}}\, \bar{i}_0 + a_{21}\, \underline{x_{p1}} \cdot \bar{j}_0 + a_{31}\, \underline{x_{p1}} \cdot \bar{k}_0 +$$

$$+ a_{12} \cdot y_{p1} \cdot \bar{i}_0 + a_{22}\, y_{p1} \cdot \bar{j}_0 + a_{32}\, y_{p1} \cdot \underline{\bar{k}_0} +$$

$$+ a_{13} \cdot z_{p1} \cdot \bar{i}_0 + a_{23}\, z_{p1} \cdot \bar{j}_0 + a_{33}\, z_{p1}\, k_0$$

Priemety

$i_1 \to i_0 : a_{11}$	$i_1 \to j_0 : a_{21}$	$i_1 \to k_0 : a_{31}$
$j_1 \to i_0 : a_{12}$	$j_1 \to j_0 : a_{22}$	$j_1 \to k_0 : a_{32}$
$k_1 \to i_0 : a_{13}$	$k_1 \to j_0 : a_{23}$	$k_1 \to k_0 : a_{33}$

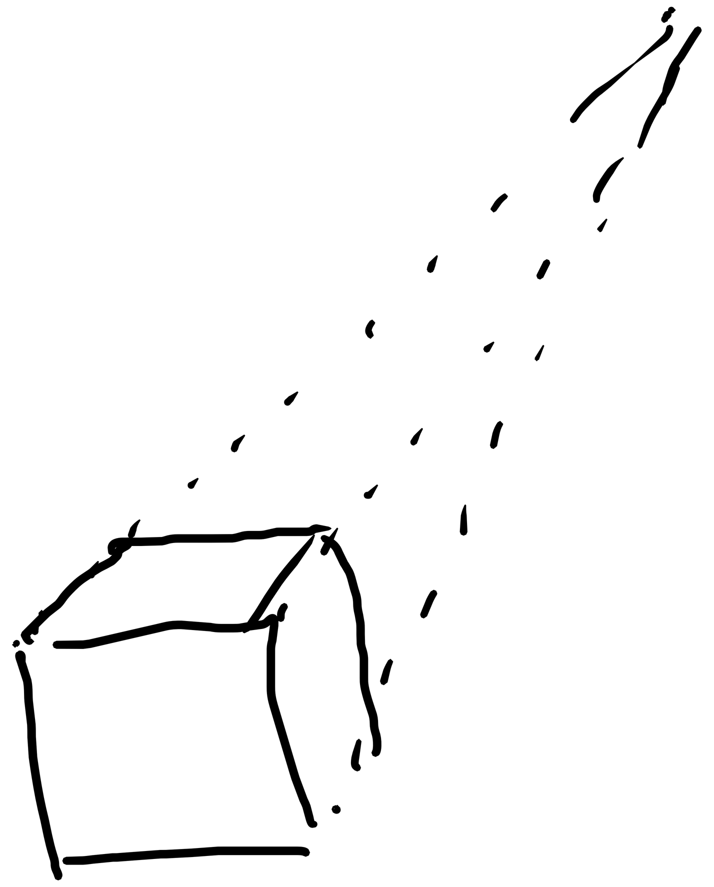
$$\bar{P}_0 = x_{u_0}\cdot\bar{i}_0 + y_{u_0}\cdot\bar{j}_0 + z_{u_0}\cdot\bar{k}_0 + a_{11}\cdot x_{p1}\,\bar{i}_0 + a_{21}x_{p1}\cdot\bar{j}_0 + a_{31}x_{p1}\cdot\bar{k}_0 \; +$$

$$+\, a_{12}\cdot y_{p1}\cdot\bar{i}_0 + a_{22}y_{p1}\cdot\bar{j}_0 + a_{32}y_{p1}\cdot\bar{k}_0 \; +$$

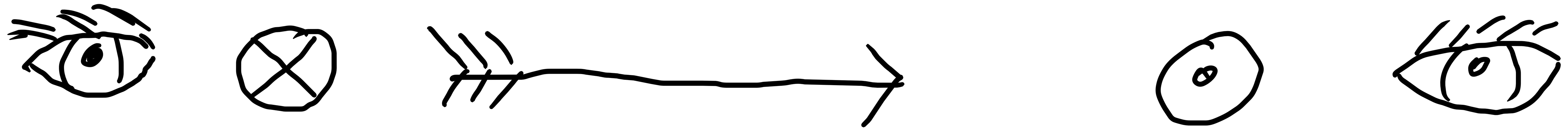
$$+\, a_{13}\cdot z_{p1}\cdot\bar{i}_0 + a_{23}z_{p1}\cdot\bar{j}_0 + a_{33}z_{p1}\,\bar{k}_0$$

$$\bar{P}_0 = \begin{pmatrix} x_{p0} \\ y_{p0} \\ z_{p0} \end{pmatrix} \qquad \bar{P}_1 = \begin{pmatrix} x_{p1} \\ y_{p1} \\ z_{p1} \end{pmatrix}$$

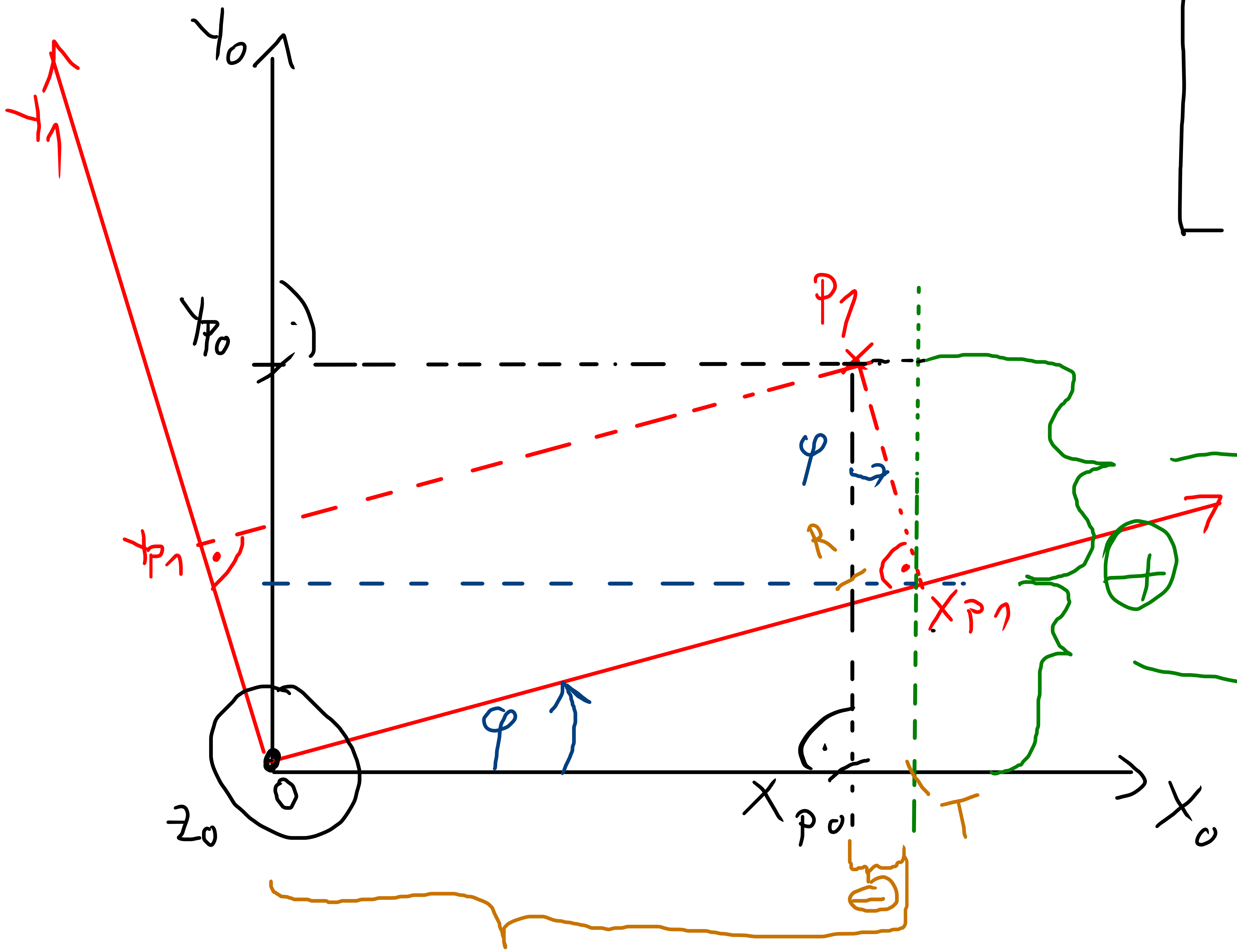
$$\bar{P}_0 = \begin{pmatrix} x_{p0} \\ y_{p0} \\ z_{p0} \\ 1 \end{pmatrix} = \begin{array}{c} \\ i_0 \end{array}\!\!\begin{array}{c} \begin{array}{cccc} i_1 & j_1 & & \end{array} \\ \left(\begin{array}{ccc|c} a_{11} & a_{12} & a_{13} & x_{u_0} \\ a_{21} & a_{22} & a_{23} & y_{u_0} \\ a_{31} & a_{32} & a_{33} & z_{u_0} \\ \hline 0 & 0 & 0 & 1 \end{array}\right) \end{array} \cdot \begin{array}{c} \bar{p}_1 \\ \begin{pmatrix} x_{p1} \\ y_{p1} \\ z_{p1} \\ 1 \end{pmatrix} \end{array} = T\cdot\bar{p}_1 = \bar{p}_0$$



Rotácia	Posun
perspektíva	Mierka



dané: Xp1, Yp1, Zp1, Phi



$$\begin{bmatrix} X_{P_0} \\ Y_{P_0} \\ Z_{P_0} \end{bmatrix} \begin{matrix} = X_{P_1} \cdot \cos\varphi - Y_{P_1} \cdot \sin\varphi \\ = X_{P_1} \cdot \sin\varphi + Y_{P_1} \cdot \cos\varphi \\ = Z_{P_1} \end{matrix}$$

$$\triangle P_1 R X_{P_1}: \frac{|R P_1|}{|P_1 X_{P_1}|} = \cos\varphi \Rightarrow$$

$$\Rightarrow |R P_1| = \underline{\overset{Y_{P_1}}{|P_1 X_{P_1}|} \cdot \cos\varphi}$$

$$\triangle O T X_{P_1}: \frac{|T X_{P_1}|}{|O X_{P_1}|} = \sin\varphi \Rightarrow$$

$$\Rightarrow |T X_{P_1}| = \underline{\overset{X_{P_1}}{|O X_{P_1}|} \cdot \sin\varphi}$$

$$\begin{bmatrix} X_{p_0} \\ Y_{p_0} \\ Z_{p_0} \end{bmatrix} \begin{matrix} = x_{p_1} \cdot \cos\varphi - y_{p_1} \cdot \sin\varphi \\ = x_{p_1} \cdot \sin\varphi + y_{p_1} \cdot \cos\varphi \\ = z_{p_1} \end{matrix}$$

$$\overset{P_0}{\begin{pmatrix} X_{p_0} \\ Y_{p_0} \\ Z_{p_0} \\ 1 \end{pmatrix}}_{[4\times1]} = \begin{pmatrix} \quad & \quad & \quad & \quad \end{pmatrix}_{[4\times4]} \circ \overset{\bar{p}_1}{\begin{pmatrix} X_{p_1} \\ Y_{p_1} \\ Z_{p_1} \\ 1 \end{pmatrix}}_{[4\times1]}$$