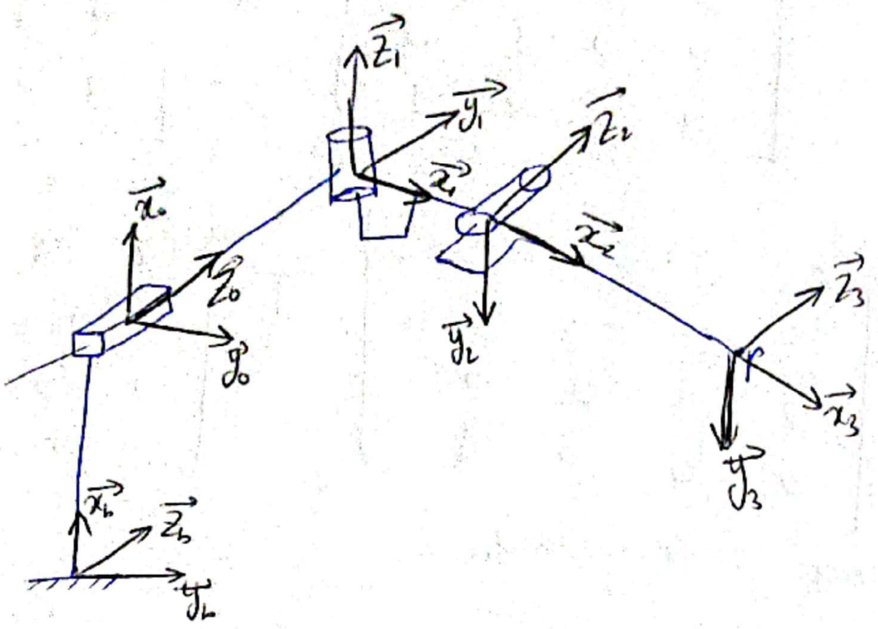
1)



6) pour $\theta_2 = \theta_3 = 0$

$$\begin{cases} x = l_0 \\ y = l_2 + l_3 \\ z = q_1 \end{cases}$$

et par la suite

$${}^{b}T_3 = \begin{bmatrix} 0 & 1 & 0 & l_0 \\ 1 & 0 & 0 & l_2+l_3 \\ 0 & 0 & 1 & q_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

4) La configuration de la figure est tel que
q2=q3=0
q1>0

TD2)

2)

Liaison	θ_i	d_i	a_i	α_i
$S_0 \to S_1$	$\pi/2$	q_1	0	$\pi/2$
$S_1 \to S_2$	q_2	0	l_2	$-\pi/2$
$S_2 \to S_3$	q_3	0	l_3	0

3)

$$
{}^{b}T_{0} = \begin{bmatrix} 1 & 0 & 0 & l_0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \; ; \; {}^{0}T_{1} = \begin{bmatrix} & & & 0 \\ & & & 0 \\ & & & q_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}
$$

$$
{}^{1}T_{2} = \begin{bmatrix} & & & l_2 C_2 \\ & & & l_2 S_2 \\ & & & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \; ; \; {}^{2}T_{3} = \begin{bmatrix} C_3 & -S_3 & 0 & l_3 C_3 \\ S_3 & +C_3 & 0 & l_3 S_3 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}
$$

$C_i = \cos q_i \; ; \; S_i = \sin q_i$

$$
{}^{b}T_{3} = {}^{b}T_{0} \cdot {}^{0}T_{1} \cdot {}^{1}T_{2} \cdot {}^{2}T_{3}
$$

$$
= \begin{bmatrix} -S_3 & -C_3 & 0 & l_0 - l_3 S_3 \\ C_2 C_3 & -C_2 S_3 & -S_2 & C_2 l_2 + C_2 C_3 l_3 \\ C_3 S_2 & -S_2 S_3 & C_2 & q_1 + l_2 S_2 + C_3 l_3 S_2 \\ 0 & 0 & 0 & 1 \end{bmatrix}
$$

5) <u>H.G.D</u> :

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = {}^{b}T_3 \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}_{P/R_3}$$

$$\begin{cases} x = l_0 - l_3 S_3 \\ y = C_2 l_2 + C_2 C_3 l_3 \\ Z = q_1 + l_2 S_2 + C_3 l_3 S_2 \end{cases}$$

7) <u>Relations vectorielle de Chasles</u>

$$\overrightarrow{O_bP} = \overrightarrow{O_bO_0} + \overrightarrow{O_0O_1} + \overrightarrow{O_1O_2} + \overrightarrow{O_2P}$$

$$= \begin{pmatrix} l_0 \\ 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ q_1 \end{pmatrix} + \begin{pmatrix} 0 \\ l_2 C_2 \\ l_2 S_2 \end{pmatrix} + \begin{pmatrix} -l_3 S_3 \\ l_3 C_3 C_2 \\ l_3 C_3 S_2 \end{pmatrix}$$

$$= \begin{pmatrix} l_0 - l_3 S_3 \\ C_2 l_2 + C_2 C_3 l_3 \\ q_1 + l_2 S_2 + C_3 l_3 S_2 \end{pmatrix}$$

Ex2 RPR

	θ_i	d_i	a_i	α_i
$S_0 \to S_1$	q_1	0	l_1	$\pi/2$
$S_1 \to S_2$	$\pi/2$	q_2	0	$\pi/2$
$S_2 \to S_3$	q_3	0	l_3	0

$$^0T_1 = \begin{bmatrix} C_1 & 0 & S_1 & l_1 C_1 \\ S_1 & 0 & -C_1 & l_1 S_1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^1T_2 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & q_2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$^0T_2 = \begin{bmatrix} 0 & S_1 & C_1 & q_2 S_1 + l_1 C_1 \\ 0 & -C_1 & S_1 & -q_2 C_1 + l_1 S_1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^2T_3 = \begin{bmatrix} & & & \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$^bT_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & l_0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^0T_3 = \begin{bmatrix} S_1 S_3 & S_1 C_3 & C_1 & l_3 S_1 S_3 + q_2 S_1 + l_1 C_1 \\ -C_1 S_3 & -C_1 C_3 & S_1 & -l_3 C_1 S_3 - q_2 C_1 + l_1 S_1 \\ C_3 & -S_3 & 0 & l_3 C_3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$^bT_3 = \begin{bmatrix} S_1 S_3 & S_1 C_3 & C_1 & l_3 S_1 S_3 + q_2 S_1 + l_1 C_1 \\ C_3 & -S_3 & 0 & l_3 C_3 + l_0 \\ +C_1 S_3 & +C_1 C_3 & -S_1 & l_3 C_1 S_3 + q_2 C_1 - l_1 S_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Configuration de la figure $q = [0, q_2, \pi/2]^T$

$$^bT_3 = \begin{bmatrix} 0 & 0 & 1 & l_1 \\ 0 & -1 & 0 & l_0 \\ +1 & 0 & 0 & l_3 + q_2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Vérification sur le graphique OK.