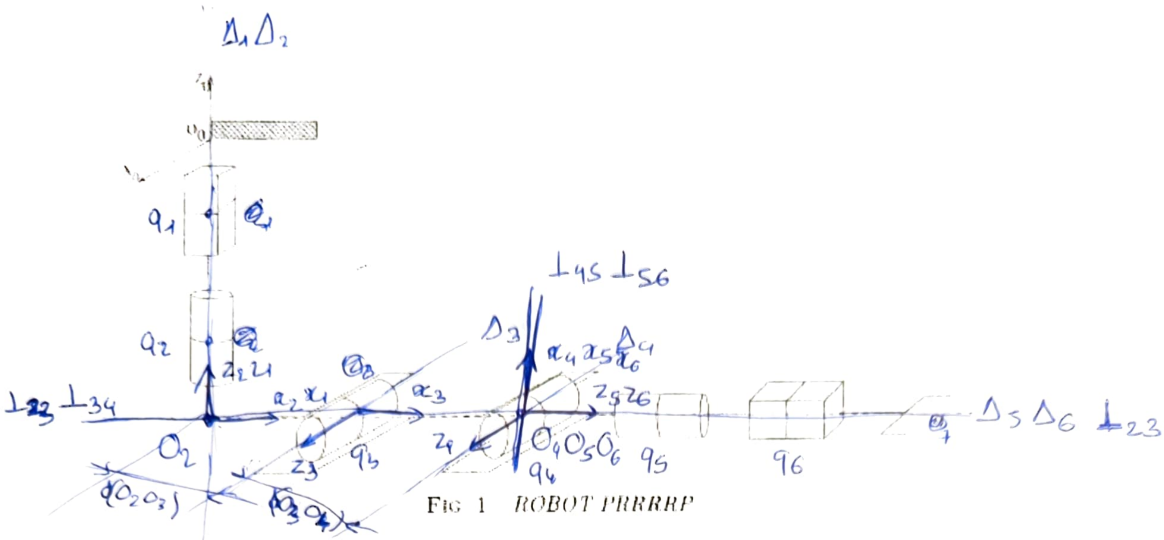

FIG. 1 – ROBOT PRRRRP

Paramètres de Denavit-Hartenberg :

	1	2	3	4	5	6
σ_i	1	0	0	0	0	1
α_{i-1}	0	0	$\pi/2$	0	$\pi/2$	0
a_{i-1}	0	0	$d(O_2O_3)$	$d(O_3O_4)$	0	0
θ_i	0	q_2	q_3	q_4	q_5	0
r_i	q_1	0	0	0	0	q_6
$q_i(figure)$	<0	$\pi/2$	0	$\pi/2$	0	>0

① 1 si prismatique
0 si rotoïde

② $q_i = r_i$ si $\sigma_i = 1$
$q_i = \theta_i$ si $\sigma_i = 0$

$$T_{01} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right) \qquad T_{12} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{23} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right) \qquad T_{34} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{45} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right) \qquad T_{56} = \left(\begin{array}{ccc|c} & & & \\ & & & \\ & & & \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

Calcul de $T_{0,6}$ pour le robot PRRRRP.

$$T_{46} = \underbrace{\left(\begin{array}{ccc|c} c5 & -s5 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ s5 & c5 & 0 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{45}} . \underbrace{\left(\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & q_6 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{56}} = \left(\begin{array}{ccc|c} c5 & . & 0 & 0 \\ 0 & . & -1 & -q_6 \\ s5 & . & 0 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{36} = \underbrace{\left(\begin{array}{ccc|c} c4 & -s4 & 0 & a_3 \\ s4 & c4 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{34}} .T_{46} = \left(\begin{array}{ccc|c} c4.c5 = D_1 & . & s4 & s4.q_6 + a_3 = D_3 \\ s4.c5 = D_2 & . & -c4 & -c4.q_6 = D_4 \\ s5 & . & 0 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{26} = \underbrace{\left(\begin{array}{ccc|c} c3 & -s3 & 0 & a_2 \\ 0 & 0 & -1 & 0 \\ s3 & c3 & 0 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{23}} .T_{36} = \left(\begin{array}{ccc|c} c3.D_1 - s3.D_2 = D_5 & . & s_{34} = s3.c4 + s4.c3 & D_7 = c3.D_3 - s3.D_4 + a_2 \\ -s5 & . & 0 & 0 \\ s3.D_1 + c3.D_2 = D_6 & . & -c_{34} = -c3.c4 + s3.s4 & D_8 = s3.D_3 + c3.D_4 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{16} = \underbrace{\left(\begin{array}{ccc|c} c2 & -s2 & 0 & 0 \\ s2 & c2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{12}} .T_{26} = \left(\begin{array}{ccc|c} c_2.D_5 + s_2.s_5 & x & c_2.s_{34} & c_2.D_7 \\ s_2.D_5 - c_2.s_5 & x & s_2.s_{34} & s_2.D_7 \\ D_6 & x & -c_{34} & D_8 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

$$T_{06} = \underbrace{\left(\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & q_1 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)}_{T_{01}} .T_{16} = \left(\begin{array}{ccc|c} c_2.D_5 + s_2.s_5 & x & c_2.s_{34} & c_2.D_7 \\ s_2.D_5 - c_2.s_5 & x & s_2.s_{34} & s_2.D_7 \\ D_6 & x & -c_{34} & D_8 + q_1 \\ \hline 0 & 0 & 0 & 1 \end{array}\right)$$

Calcul de $\underline{X_p}$, et $\underline{X_R}$ pour le robot PRRRRP

$\underline{X_R}$: la matrice T_{06} contient les cosinus directeurs partiels.
$\underline{X_p}$: $\underline{O_0O_7} = \underline{O_0O_6} + \underline{O_6O_7}$

$$\underline{O_0O_7}_{(O)} = \underline{O_0O_6}_{(O)} + R_{0,6} \,.\, \underline{O_6O_7}_{(6)}$$

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} c2.D_7 \\ s2.D_7 \\ D_8 + q_1 \end{pmatrix} + \begin{pmatrix} t_{11} & . & t_{13} \\ t_{21} & . & t_{23} \\ t_{31} & . & t_{33} \end{pmatrix} . \begin{pmatrix} 0 \\ 0 \\ r_7 \end{pmatrix} = \begin{pmatrix} c2.D_7 + c2.s_{34}.r_7 \\ s2.D_7 + c2.s_{34}.r_7 \\ D_8 + q_1 - c_{34}.r_7 \end{pmatrix}$$

Algorithme de calcul du MGD pour le robot PRRRRP

Data: lecture des 6 valeurs des codeurs q_i
Result: Calcul du MGD : $\underline{X_p}^t = (x, y, z)$, $\underline{X_R}^t = (x_x, x_y, x_z, z_x, z_y, z_z)$
for *i=2 à 5* **do**
    ci = $\cos(q_i)$;
    si = $\sin(q_i)$;
end
$D_1 = c4.c5$;
$D_2 = s4.c5$;
$D_3 = s4.q_6 + a_3$;
$D_4 = -c4.q_6$;
$D_5 = c3.D_1 - s3.D_2$;
$D_6 = s3.D_1 + c3.D_2$;
$D_7 = c3.D_3 - s3.D_4 + a_2$;
$D_8 = s3.D_3 + c3.D_4$;
$s_{34} = s3.c4 + s4.c3$;
$c_{34} = c3.c4 - s3.s4$;
Position :
$x = c2.(D_7 + s_{34}.r_7)$;
$y = s2.(D_7 + s_{34}.r_7)$;
$z = D_8 + q_1 - c_{34}.r_7$
Orientation :
$x_x = c2.D_5 + s2.s5$;
$x_y = s2.D_5 - c2.s5$;
$x_z = D_6$;
$z_x = c2.s_{34}$;
$z_y = s2.s_{34}$;
$z_z = -c_{34}$