With :

- q_1 the first rotation angle between the base and the upper-leg, this rotation makes the leg move in the frontal plane (you can call it the hip abduction joint)
- q_2 the second rotation angle between the base and the upper-leg, this rotation makes the leg move in the sagittal plane (you can call it the hip flexion joint)
- q_3 the rotation angle between the upper-leg and the lower-leg (the knee flexion joint)

$$base\_aile\_LF\_ = \begin{pmatrix} x_{01} \\ y_{01} \\ z_{01} \end{pmatrix} = \begin{pmatrix} 0.3305 \\ 0.175 \\ -0.051 \end{pmatrix}$$

$$base\_aile\_LH\_ = \begin{pmatrix} -x_{01} \\ y_{01} \\ z_{01} \end{pmatrix}$$

$$base\_aile\_RF\_ = \begin{pmatrix} x_{01} \\ -y_{01} \\ z_{01} \end{pmatrix}$$

$$base\_aile\_RH\_ = \begin{pmatrix} -x_{01} \\ -y_{01} \\ z_{01} \end{pmatrix}$$

$$aile\_epaule\_LF\_ = \begin{pmatrix} x_{12} \\ y_{12} \\ z_{12} \end{pmatrix} = \begin{pmatrix} 0 \\ 0.1077 \\ 0 \end{pmatrix}$$

$$epaule\_coude\_LF\_ = \begin{pmatrix} x_{23} \\ y_{23} \\ z_{23} \end{pmatrix} = \begin{pmatrix} -0.35192 \\ 0 \\ -0.041509 \end{pmatrix}$$

$$coude\_pied\_LF\_ = \begin{pmatrix} x_{34} \\ y_{34} \\ z_{34} \end{pmatrix} = \begin{pmatrix} 0.29604 \\ 0 \\ 0 \end{pmatrix}$$

Transformation Matrix

Left/right legs front/hind

For better clarity, let's have:

- $\cos(q_i) = c_i$
- $\sin(q_i) = s_i$

$$T_0^1 = \begin{pmatrix} 1 & 0 & 0 & \pm x_{01} \\ 0 & c_1 & \pm s_1 & \pm y_{01} \\ 0 & \pm s_1 & c_1 & z_{01} \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$T_1^2 = \begin{pmatrix} c_2 & 0 & -s_2 & x_{12} \\ 0 & 1 & 0 & \pm y_{12} \\ s_2 & 0 & c_2 & z_{12} \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$T_2^3 = \begin{pmatrix} c_3 & 0 & s_3 & x_{23} \\ 0 & 1 & 0 & y_{23} \\ -s_3 & 0 & c_3 & z_{23} \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$T_3^4 = \begin{pmatrix} 1 & 0 & 0 & x_{34} \\ 0 & 1 & 0 & y_{34} \\ 0 & 0 & 1 & z_{34} \\ 0 & 0 & 0 & 1 \end{pmatrix}$$