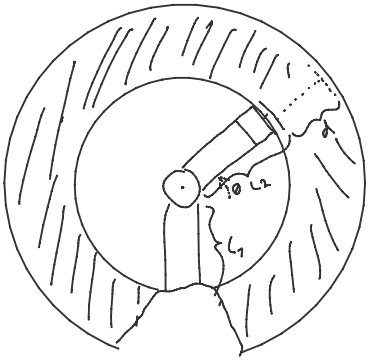
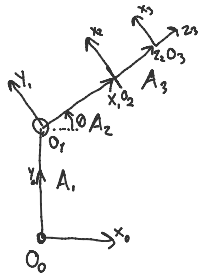
1

søndag 17. september 2023 21:48

a)



b)



$$T_3^0 = A_1 A_2 A_3$$

$$A_1 = \begin{bmatrix} 1 & 0 & 0 & L_1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad d=\alpha=0,\ a=L_1,\ \theta=0$$

$$A_2 = \begin{bmatrix} C_{\theta_1} & -S_{\theta_1} & 0 & L_2 C_{\theta_1} \\ S_{\theta_1} & C_{\theta_1} & 0 & L_2 S_{\theta_1} \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad d=\alpha=0,\ a=L_2,\ \theta=\theta_1$$

$$A_3 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & d_2 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad d=d_2,\ \alpha=0,\ a=\theta=0$$

$$A_1 A_2 = \begin{bmatrix} 1 & 0 & 0 & L_1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} C & -S & 0 & L_2 C \\ S & C & 0 & L_2 S \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} C & -S & 0 & L_2 C + 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$T_3^0 = A_1 A_2 A_3 = \begin{bmatrix} C & -S & 0 & L_2 C + 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & d_2 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} C & -S & 0 & L_2 C + 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

2

søndag 17. september 2023 22:05

a) $\frac{2\pi}{1024}\,\text{rad} = 6.136 \cdot 10^{-3}\,\text{rad/puls}$

$= 0{,}0061\,\text{rad/puls}$

b)

$r \cdot \Delta\theta = (l_2 + d)\Delta\theta$

3

søndag 17. september 2023 22:11

a) $R_3^2 = (R_2^3)^{-1}$ $\quad R_2^1 = R_0^1 R_2^0 = (R_1^0)^{-1} R_2^0$

$R_3^1 = R_2^1 R_3^2 = R_2^0 (R_2^3)^{-1}$

b) $R = R_{y,\phi} R_{z,\theta} R_{y,\psi} R_{x,\alpha} R_{y,\beta}$

c) $R_2^0 = R_1^0 R_2^1 = R_{z,\frac{\pi}{6}} R_{x,\frac{\pi}{4}} = \begin{bmatrix} \cos\frac{\pi}{6} & -\sin\frac{\pi}{6} & 0 \\ \sin\frac{\pi}{6} & \cos\frac{\pi}{6} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\frac{\pi}{4} & -\sin\frac{\pi}{4} \\ 0 & \sin\frac{\pi}{4} & \cos\frac{\pi}{4} \end{bmatrix}$

$R_2^0 = \begin{bmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{bmatrix}$

$R_2^0 = \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{-1}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{2} & \frac{-\sqrt{2}}{2} \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} & \frac{-\sqrt{2}}{4} & \frac{\sqrt{2}}{4} \\ \frac{1}{2} & \frac{\sqrt{6}}{4} & \frac{-\sqrt{6}}{4} \\ 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \end{pmatrix}$

$p_0 = R_2^0 p^2 =$

$$\begin{pmatrix} \frac{3^{0,5}}{2} & \frac{-2^{0,5}}{4} & \frac{2^{0,5}}{4} \\ \frac{1}{2} & \frac{6^{0,5}}{4} & \frac{-6^{0,5}}{4} \\ 0 & \frac{2^{0,5}}{2} & \frac{2^{0,5}}{2} \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix} = \begin{pmatrix} \frac{\sqrt{3}}{2} & 0 & 0 \\ \frac{1}{2} & 0 & 0 \\ \sqrt{2} & 0 & 0 \end{pmatrix}$$