ECE 4550 - Homework 6 - Caitlyn Caggia

(3)

$$d1 = \begin{bmatrix} 0 \\ 0 \\ l_0 \end{bmatrix} \quad d2 = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad d3 = \begin{bmatrix} 0 \\ 0 \\ l_1 \end{bmatrix} \quad d4 = \begin{bmatrix} 0 \\ 0 \\ l_2 \end{bmatrix} \quad d5 = \begin{bmatrix} 0 \\ 0 \\ l_3 \end{bmatrix} \quad d6 = \begin{bmatrix} 0 \\ 0 \\ l_4 \end{bmatrix}$$

$$R_1 = R_z(\alpha_1) \quad R_2 = R_x(\alpha_2) \quad R_3 = R_x(\alpha_3) \quad R_4 = R_x(\alpha_4) \quad R_5 = R_z(\alpha_5) \quad R_6 = \mathbb{1}$$

$$g_1 = \left[\begin{array}{c|c} R_1 & d1 \\ \hline 0 & 1 \end{array}\right] \quad g_2 = \left[\begin{array}{c|c} R_2 & d_2 \\ \hline 0 & 1 \end{array}\right] \quad g_3 = \left[\begin{array}{c|c} R_3 & d3 \\ \hline 0 & 1 \end{array}\right] \quad g_4 = \left[\begin{array}{c|c} R_4 & d4 \\ \hline 0 & 1 \end{array}\right]$$

$$g_5 = \left[\begin{array}{c|c} R_5 & d5 \\ \hline 0 & 1 \end{array}\right] \quad g_6 = \left[\begin{array}{c|c} R_6 & d6 \\ \hline 0 & 1 \end{array}\right]$$

$$R_x = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\alpha & -\sin\alpha \\ 0 & \sin\alpha & \cos\alpha \end{bmatrix}$$

$$R_z = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$g_e = g_1(\alpha_1) g_2(\alpha_2) g_3(\alpha_3) g_4(\alpha_4) g_5(\alpha_5) g_6$$

$\longrightarrow$ d_e = translation of g_e

$$d_e = \begin{bmatrix} \sin(\alpha_1)\left[l_1\sin(\alpha_2) + l_2\sin(\alpha_2+\alpha_3) + (l_3+l_4)\sin(\alpha_2+\alpha_3+\alpha_4)\right] \\ -\cos(\alpha_1)\left[l_1\sin(\alpha_2) + l_2\sin(\alpha_2+\alpha_3) + (l_3+l_4)\sin(\alpha_2+\alpha_3+\alpha_4)\right] \\ l_0 + l_1\cos(\alpha_2) + l_2\cos(\alpha_2+\alpha_3) + (l_3+l_4)\cos(\alpha_2+\alpha_3+\alpha_4) \end{bmatrix}$$