Lab 1: Kinematic Characterization of the Lynx (MATLAB)

University of Pennsylvania

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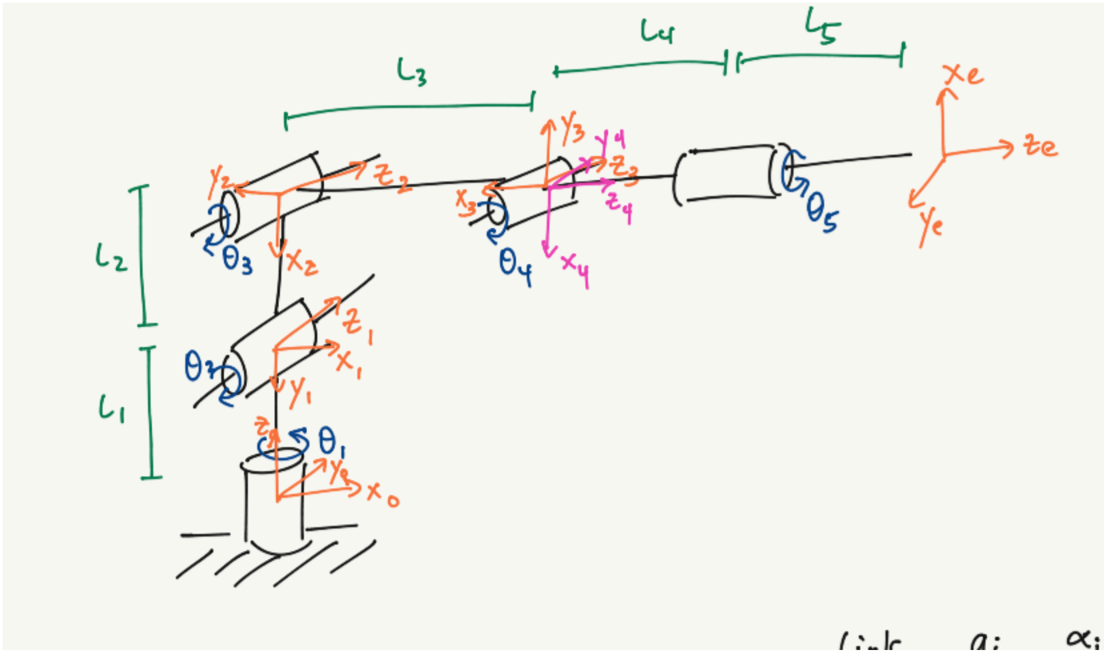

Figure 1: Revised symbolic representation

1 Methods

1.

2.

$$T_1^0 = \begin{bmatrix} 0 & 0 & 1 & 0mm \\ -1 & 0 & 0 & 0mm \\ 0 & -1 & 0 & 76.2mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{1}$$

$$T_2^1 = \begin{bmatrix} 0 & -1 & 1 & 0mm \\ 1 & 0 & 0 & 146.05mm \\ 0 & 0 & 1 & 0mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{2}$$

$$T_3^2 = \begin{bmatrix} -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 & -132.4588mm \\ \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 & 132.4588mm \\ 0 & 0 & 1 & 0mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{3}$$

$$T_4^3 = \begin{bmatrix} 0 & 0 & -1 & 0mm \\ -1 & 0 & 0 & 132.4588mm \\ 0 & 1 & 0 & 0mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{4}$$

$$T_5^4 = \begin{bmatrix} 0 & 1 & 0 & 0mm \\ -1 & 0 & 0 & 0mm \\ 0 & 0 & 1 & 68mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{5}$$

$$T_5^4 = \begin{bmatrix} -1 & 0 & 0 & 0mm \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 84.3755mm \\ 0 & -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 14.5255mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{6}$$

3.

4.

2 Evaluation

1.

$$T_e^0 = \begin{bmatrix} 0 & 0 & 1 & 255.325mm \\ 0 & -1 & 0 & 0mm \\ 1 & 0 & 0 & 222.25mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{7}$$

2. (a)

$$T_e^0 = \begin{bmatrix} 0 & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 180.542mm \\ 0 & -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 180.542mm \\ 1 & 0 & 0 & 222.25mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{8}$$

(b)

$$T_e^0 = \begin{bmatrix} -1 & 0 & 0 & 0mm \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & -180.542mm \\ 0 & -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 41.708mm \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{9}$$

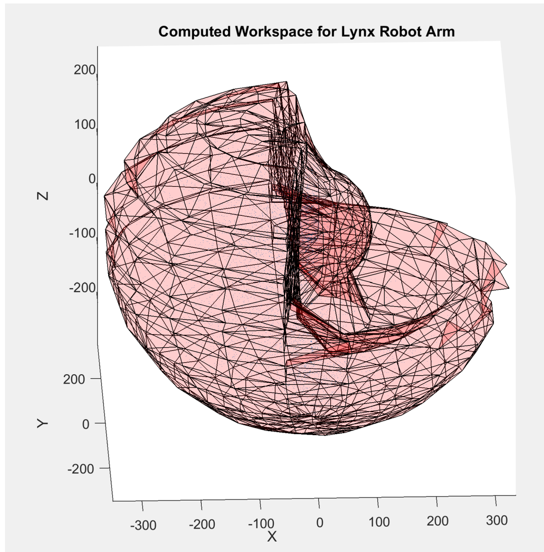

Figure 2: Computed Workspace of Lynx Robot

3.

4.

3 Analysis

1.

2.