

# **Team TTD**

## **Project 1: Report**

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a) Forward Kinematics Model for RRR Robot Arm

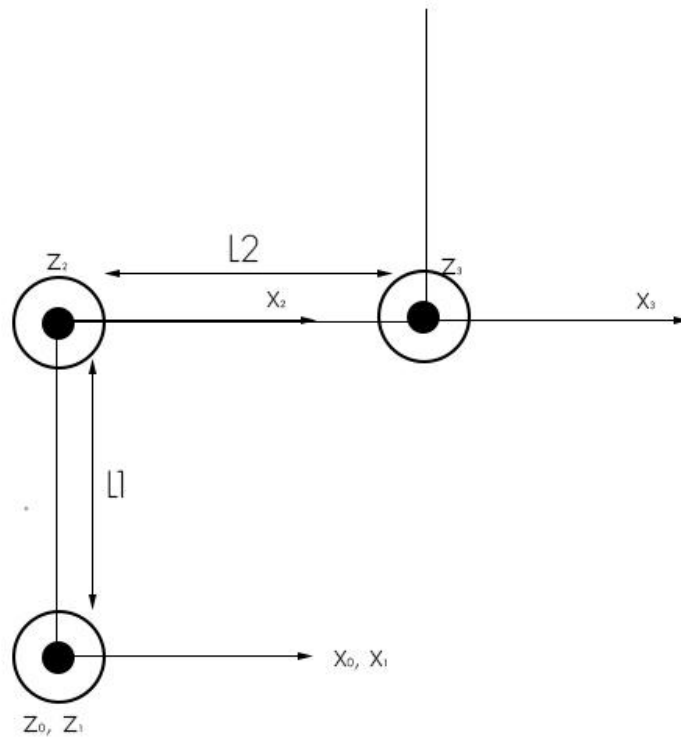


Figure 1: Robot Arm with frame attachments

$i$	$\alpha_{i-1}$	$a_{i-1}$	$d_i$	$\theta_i$
1	0	0	0	$\theta_1$
2	-90	$L1$	0	$\theta_2$
3	90	$L2$	0	$\theta_3$

Table 1: D-H Parameters

$c\theta_1$	$-s\theta_1$	0	0
0	0	0	0
0	0	0	0
0	0	0	1

Table 2: T-Matrix for Link 1

$c\theta_2$	$-s\theta_2$	0	L1
0	0	-1	0
$-s\theta_2$	$-c\theta_2$	0	0
0	0	0	1

Table 3: T-Matrix for Link 2

$c\theta_3$	$-s\theta_3$	0	L2
0	0	1	0
$s\theta_3$	$c\theta_3$	0	0
0	0	0	1

Table 4: T-Matrix for Link 3

b) Typos in the Handout

- a. In the set of 12 Euler Angles, the set  $R_{Z^*Y^*X^*}(\alpha, \beta, \gamma)$  should be the same as the  $R_{XYZ}(\gamma, \beta, \alpha)$  fixed angle set.

$c\alpha c\beta$	$c\alpha\beta s\gamma - s\alpha c\gamma$	$c\alpha\beta c\gamma + s\alpha s\gamma$
$s\alpha c\beta$	$s\alpha\beta s\gamma + c\alpha c\gamma$	$s\alpha\beta c\gamma - c\alpha s\gamma$
$-s\beta$	$c\beta s\gamma$	$c\beta c\gamma$

Table 4: Correction for Euler Angle Set  $R_{Z^*Y^*X^*}(\alpha, \beta, \gamma)$