C Robot DH Parameter

The robots kinematic transformations for each link are given by Denavite-Hartenberg(DH) parameters.

C.1 UR3

	$\theta\,[rad]$	$a\,[m]$	$d\,[m]$	$\alpha\,[rad]$
Joint 1:	0	0	0.118	$\frac{\pi}{2}$
Joint 2:	0	−0.2437	0	0
Joint 3:	0	−0.2133	0	0
Joint 4:	0	0	0.1124	$\frac{\pi}{2}$
Joint 5:	0	0	0.0854	$\frac{-\pi}{2}$
Joint 6:	0	0	0.0819	0

Table C.1: Denavit-Hartenberg parameters for the UR3 robot

C.2 UR5

	$\theta\,[rad]$	$a\,[m]$	$d\,[m]$	$\alpha\,[rad]$
Joint 1:	0	0	0.08920	$\frac{\pi}{2}$
Joint 2:	0	−0.42500	0	0
Joint 3:	0	−0.39243	0	0
Joint 4:	0	0	0.10900	$\frac{\pi}{2}$
Joint 5:	0	0	0.09300	$\frac{-\pi}{2}$
Joint 6:	0	0	0.08200	0

Table C.2: Denavit-Hartenberg parameters for the UR5 **serie 1**

	$\theta\,[rad]$	$a\,[m]$	$d\,[m]$	$\alpha\,[rad]$
Joint 1:	0	0	0.08920	$\frac{\pi}{2}$
Joint 2:	0	−0.42500	0	0
Joint 3:	0	−0.39225	0	0
Joint 4:	0	0	0.11000	$\frac{\pi}{2}$
Joint 5:	0	0	0.09475	$\frac{-\pi}{2}$
Joint 6:	0	0	0.08250	0

Table C.3: Denavit-Hartenberg parameters for the UR5 **serie 2**

	$\theta\,[rad]$	$a\,[m]$	$d\,[m]$	$\alpha\,[rad]$
Joint 1:	0	0	0.089159	$\frac{\pi}{2}$
Joint 2:	0	−0.42500	0	0
Joint 3:	0	−0.39225	0	0
Joint 4:	0	0	0.10915	$\frac{\pi}{2}$
Joint 5:	0	0	0.09465	$\frac{-\pi}{2}$
Joint 6:	0	0	0.08230	0

Table C.4: Denavit-Hartenberg parameters for the UR5 **serie 3**.

C.3 UR10

	$\theta\,[rad]$	$a\,[m]$	$d\,[m]$	$\alpha\,[rad]$
Joint 1:	0	0	0.118	$\frac{\pi}{2}$
Joint 2:	0	−0.6127	0	0
Joint 3:	0	−0.5716	0	0
Joint 4:	0	0	0.1639	$\frac{\pi}{2}$
Joint 5:	0	0	0.1157	$\frac{-\pi}{2}$
Joint 6:	0	0	0.0922	0

Table C.5: Denavit-Hartenberg parameters for the UR10 robot