Robotics Experiment - 1

DH Table, Forward Kinematics and Joint Control of Denso VP6 Robot Arm

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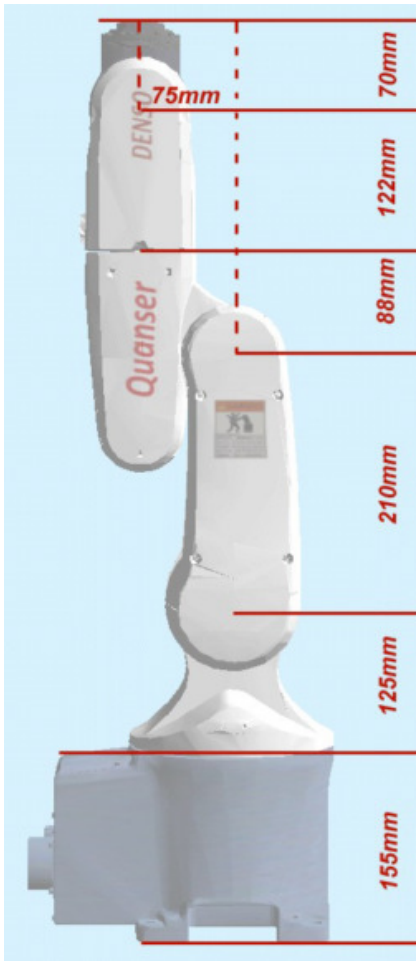
1. Denso VP6 Robot Arm: Assignment of Joint Co-ordinate Frames

Referring to the Figure 1 below, draw joint co-ordinate frames, and deduce DH table of the Denso arm.



Draw Joint frames in this box [supervised in-class activity]

2. Denso VP6 Robot Arm: Derivation of DH Table

Referring to Appendix where link and joint parameters are defined, fill the following DH table for Denso VP6 robot Arm [supervised in class activity]

joint	α_{i-1}	a_{i-1}	d_i	θ_i
1				
2				
3				
4				
5				
6				

3. Denso VP6 Robot Arm: Building Forward Kinematic Model

3.1. Derive forward kinematic matrices ${}^{i-1}_{i}T$; i = 1, 2, 3, 4, 5, 6 from the DH table and write Matlab code to calculate position and orientation of the last joint with respect to the first joint [10 marks]

3.2 Do any sign adjustmant and or offset in joint angles so that your kinematic model agrees one-to-one with Denso VP6 arm. [10 marks]

3.3 Control Denso VP6 arm to a few joint configurations and verify the accuracy of your forward kinematic model by comparing MatLab answer with actual position and orientation of the robot arm [10 marks]

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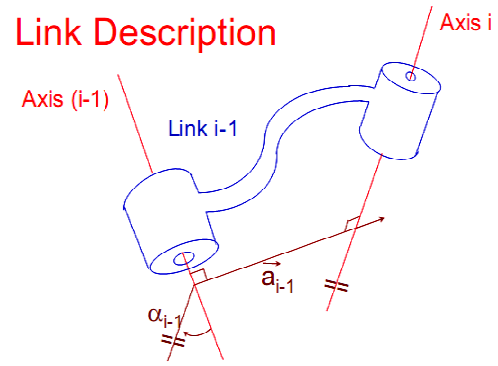
Appendix : DH Parameters

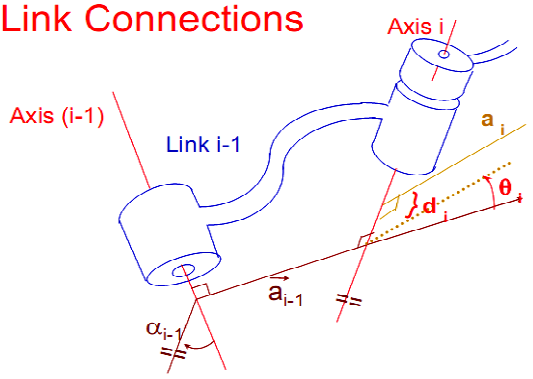
Link Description



a_{i-1}: Link Length - mutual perpendicular
unique except for parallel axis

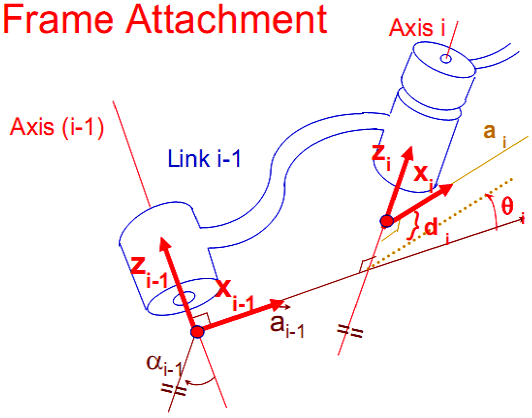
α_{i-1}: Link Twist - measured in the right-hand sense about $\vec{a}_{i-1}$

Link Connections



d_i: Link Offset -- variable if joint i is *prismatic*
θ_i: Joint Angle – variable if joint i is *revolute*

Frame Attachment



y-vectors: complete right-hand frames