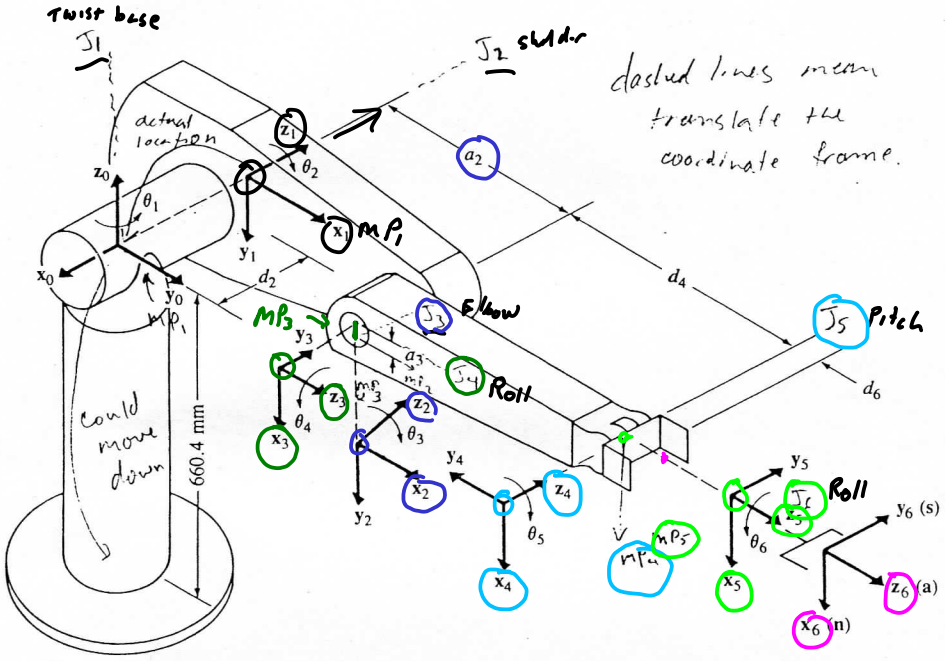
or prismatic joint. Referring to Fig. 2.10, these four parameters are defined as follows:

θ_i is the joint angle from the $\mathbf{x}_{i-1}$ axis to the $\mathbf{x}_i$ axis about the $\mathbf{z}_{i-1}$ axis (using the right-hand rule).

d_i is the distance from the origin of the $(i-1)$th coordinate frame to the intersection of the $\mathbf{z}_{i-1}$ axis with the $\mathbf{x}_i$ axis along the $\mathbf{z}_{i-1}$ axis.

a_i is the offset distance from the intersection of the $\mathbf{z}_{i-1}$ axis with the $\mathbf{x}_i$ axis to the origin of the ith frame along the $\mathbf{x}_i$ axis (or the shortest distance between the $\mathbf{z}_{i-1}$ and $\mathbf{z}_i$ axes).

α_i is the offset angle from the $\mathbf{z}_{i-1}$ axis to the $\mathbf{z}_i$ axis about the $\mathbf{x}_i$ axis (using the right-hand rule).



PUMA robot arm link coordinate parameters

Joint i	θ_i	α_i	a_i	d_i	Joint range
1	0	−90	0	0	−160 to +160
2	0	0	431.8 mm	149.09 mm	−225 to 45
3	−90	90	−20.32 mm	0	−45 to 225
4	0	−90	0	433.07 mm	−110 to 170
5	0	90	0	0	−100 to 100
6	0	0	0	56.25 mm	−266 to 266

Figure 2.11 Establishing link coordinate systems for a PUMA robot.