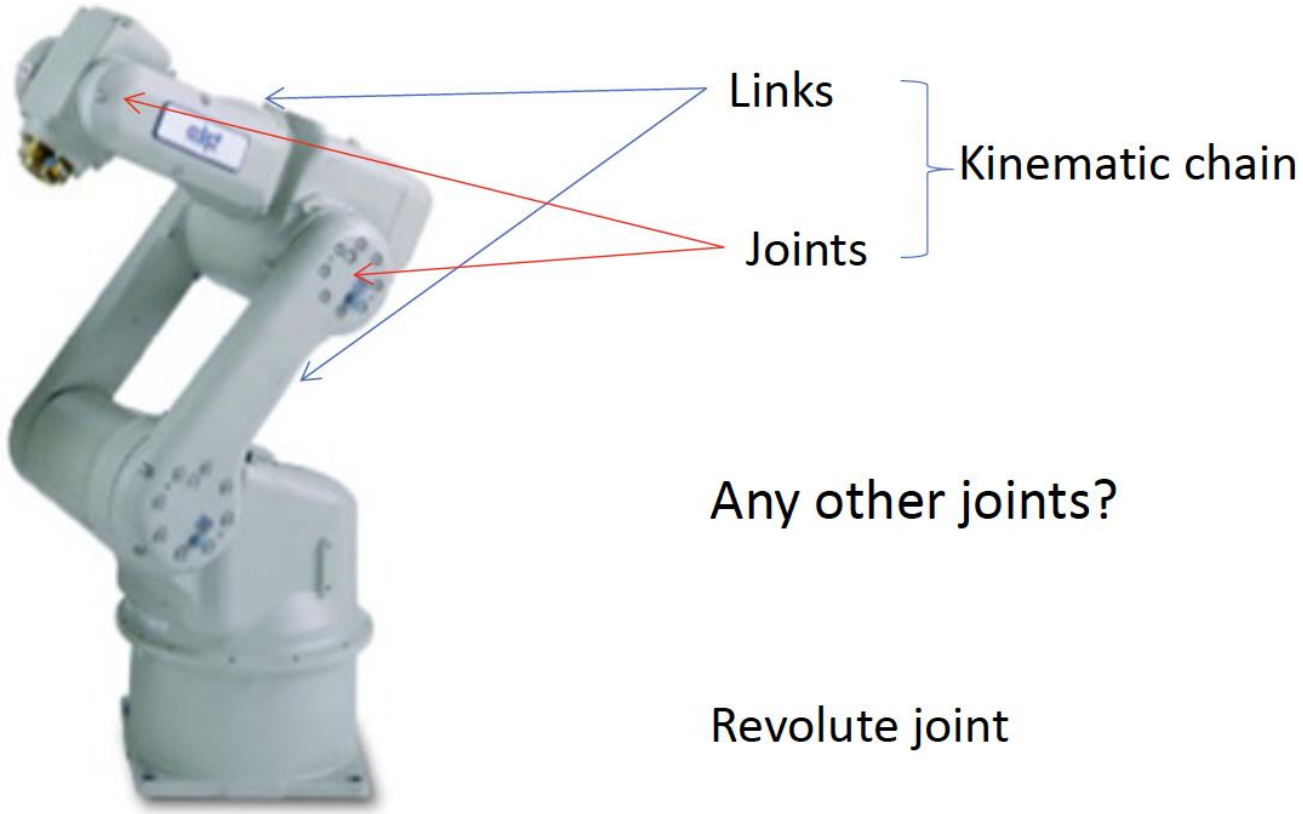
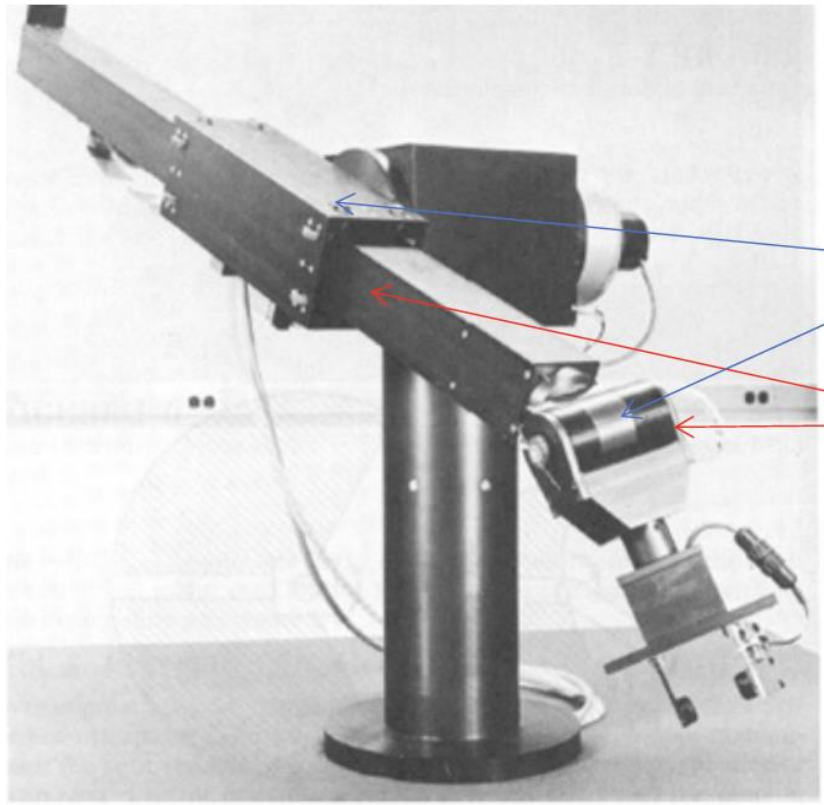
# Intro to Robotics

Lecture 2

# *Modeling*

- *Represent basic geometric aspects of robotic manipulation*



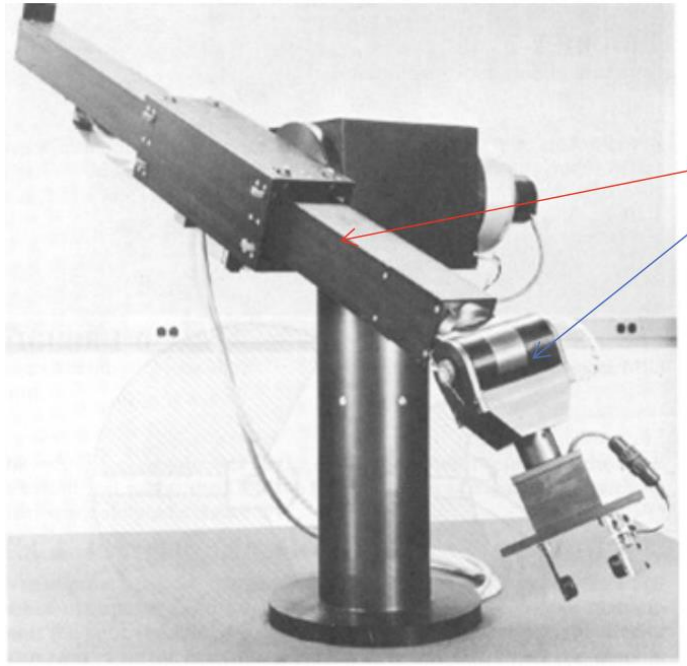


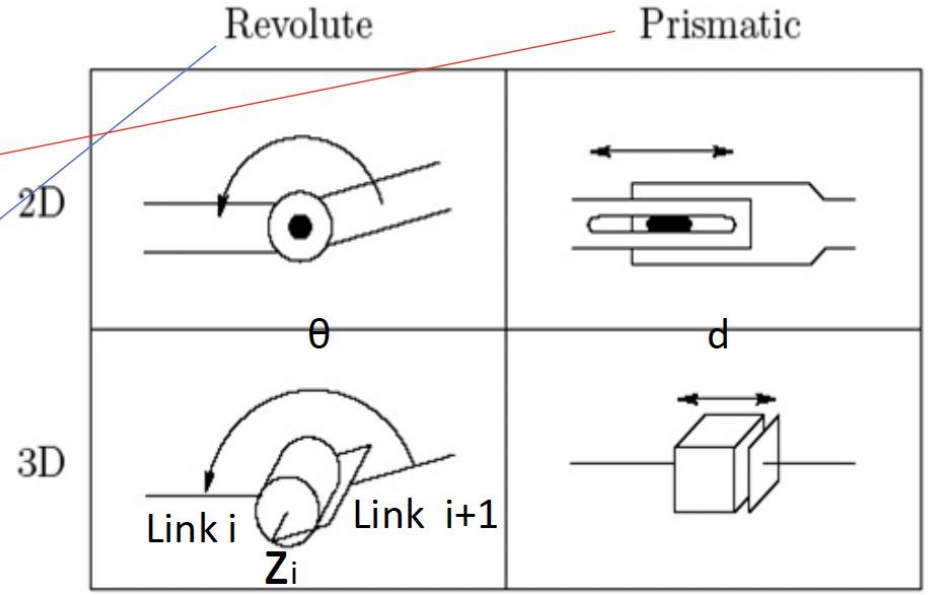
Links

Joints

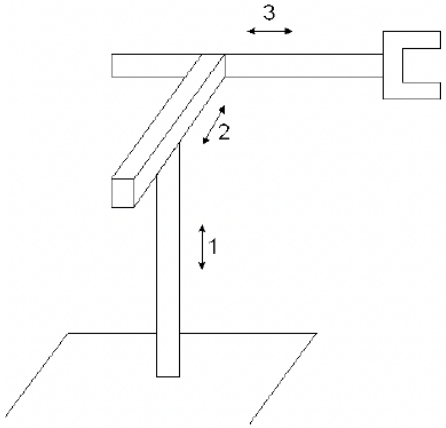
Prismatic joint

# Joints

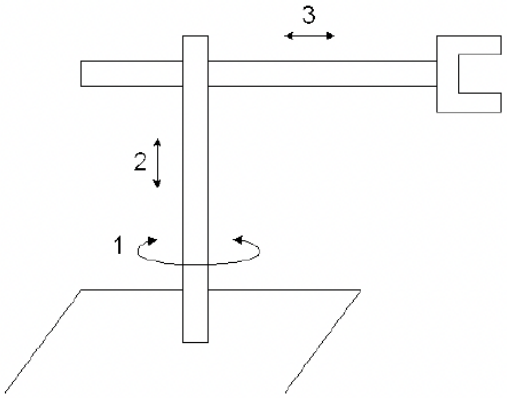




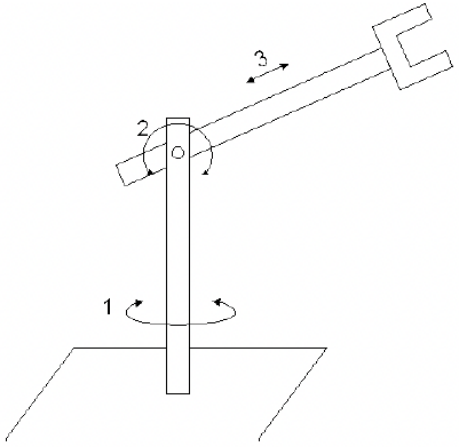
# *Geometric Types*



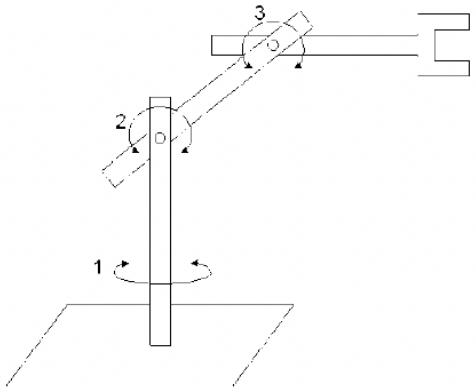

Cartesian: PPP



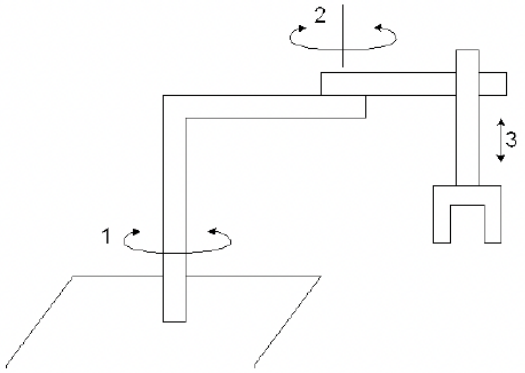

Cylindrical: RPP



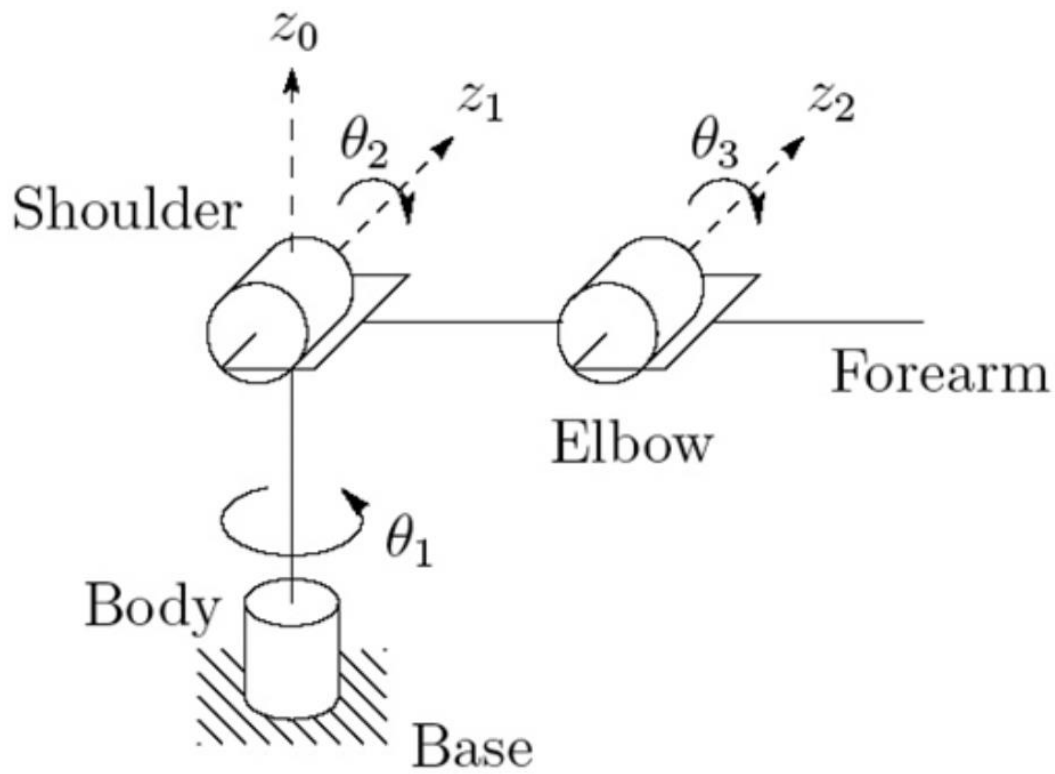

Spherical: RRP



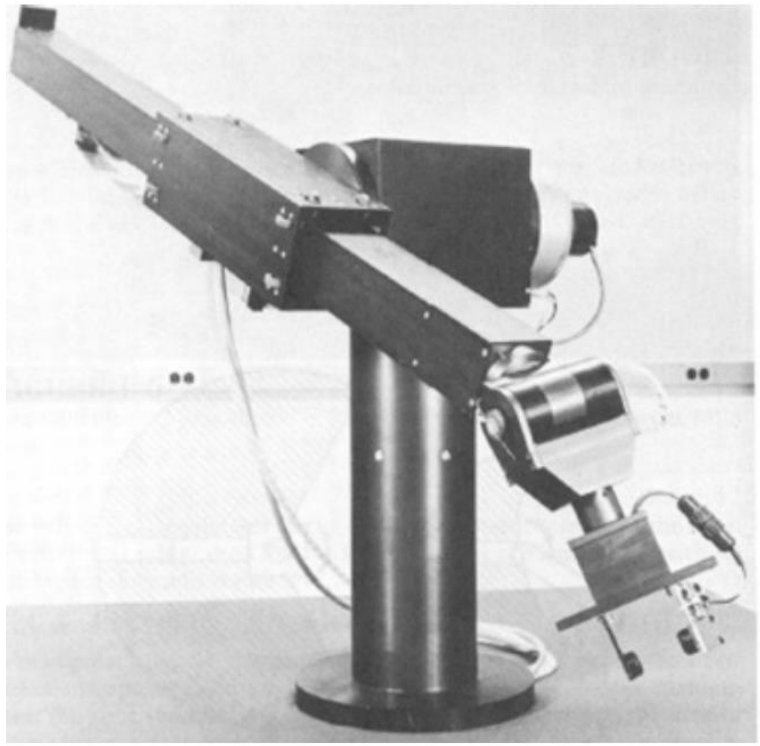

Articulated: RRR

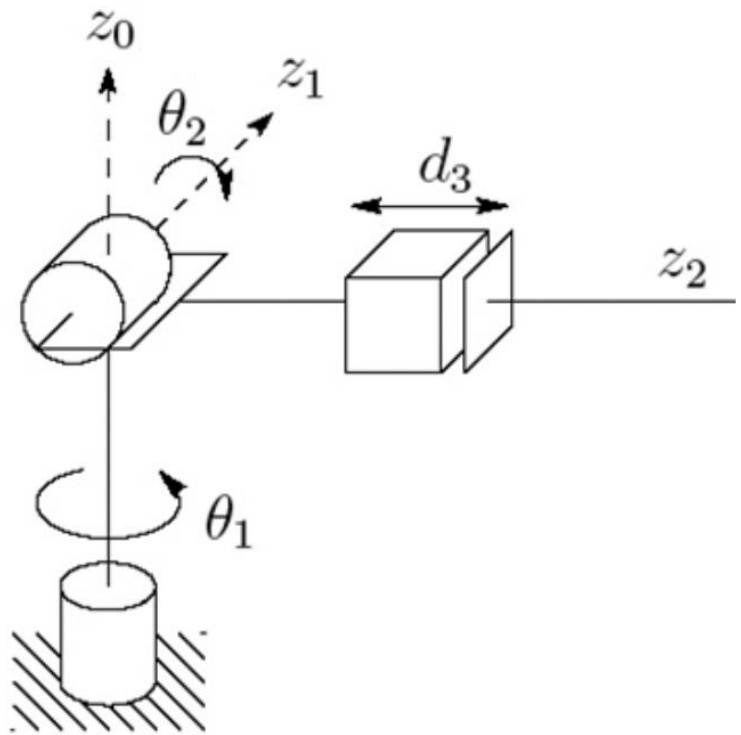



SCARA RRP

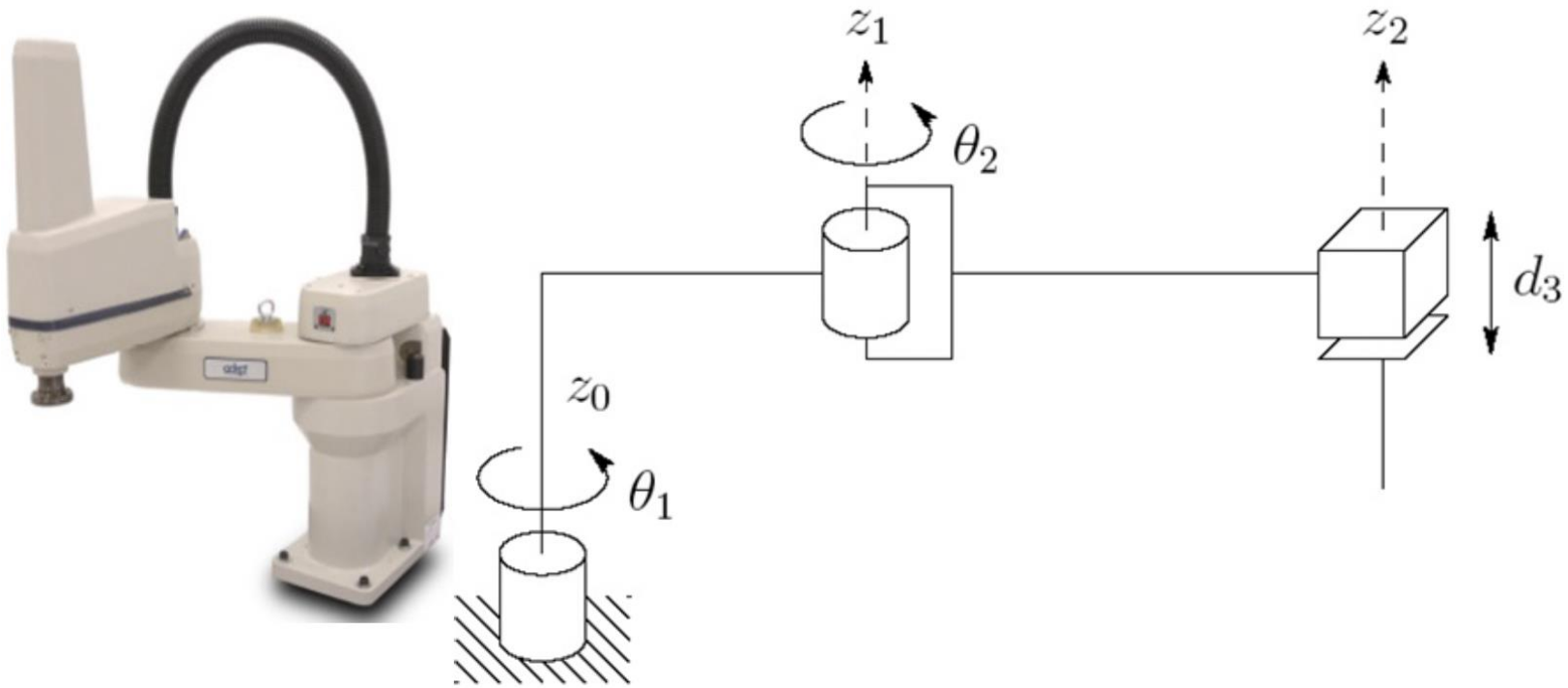



Articulated: RRR

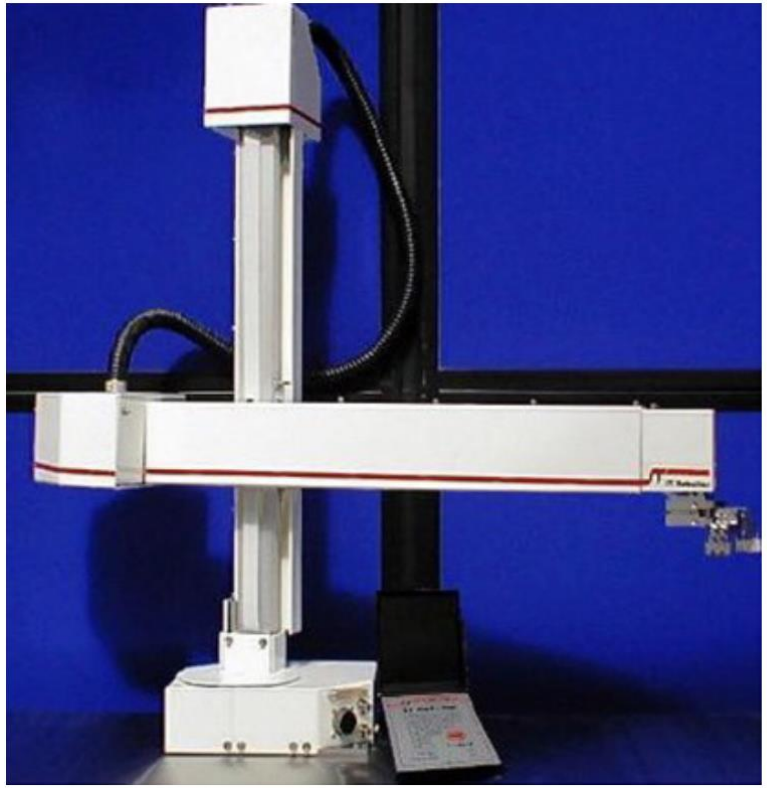


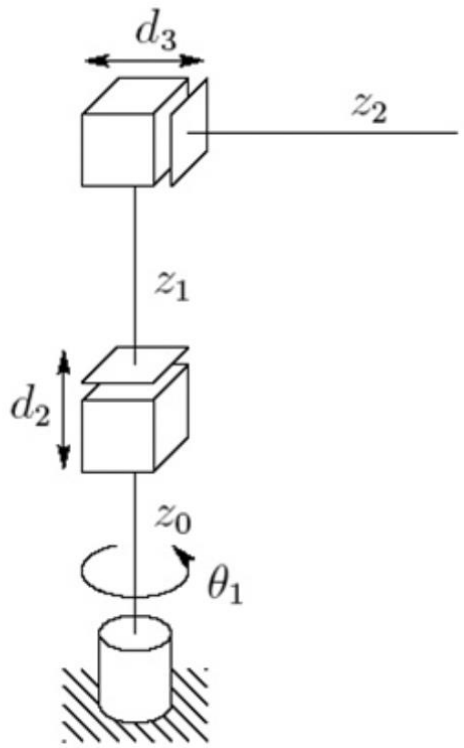



Spherical: RRP



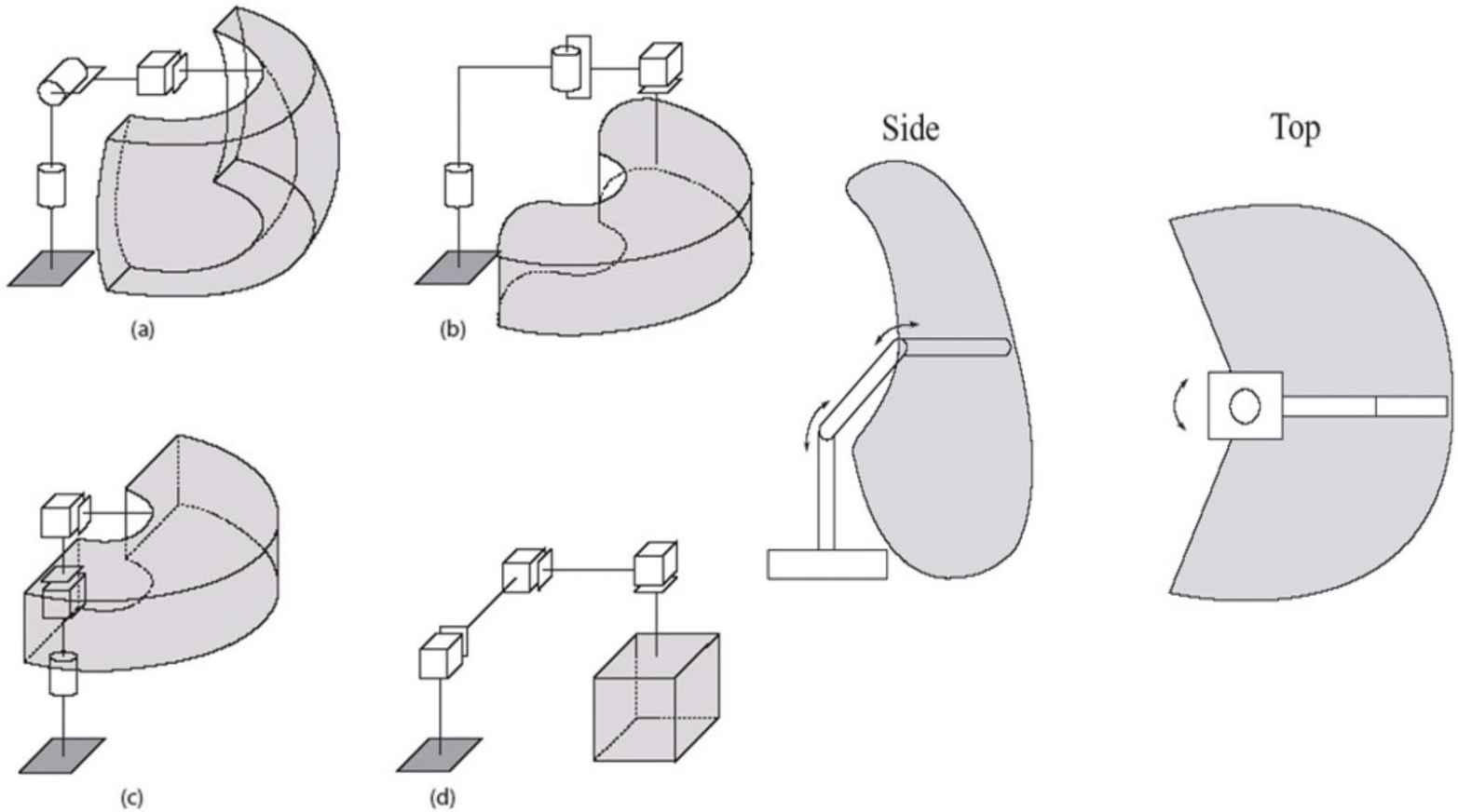

SCARA RRP



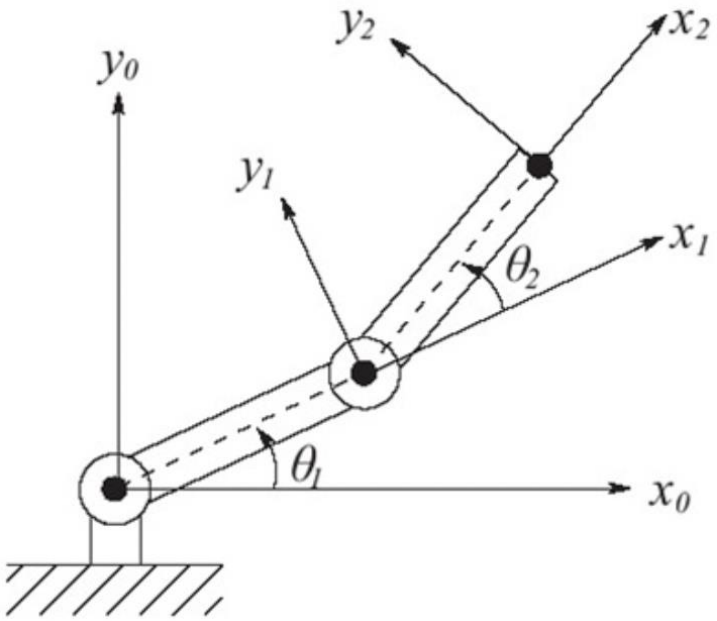



Cylindrical: RPP

# Workspace

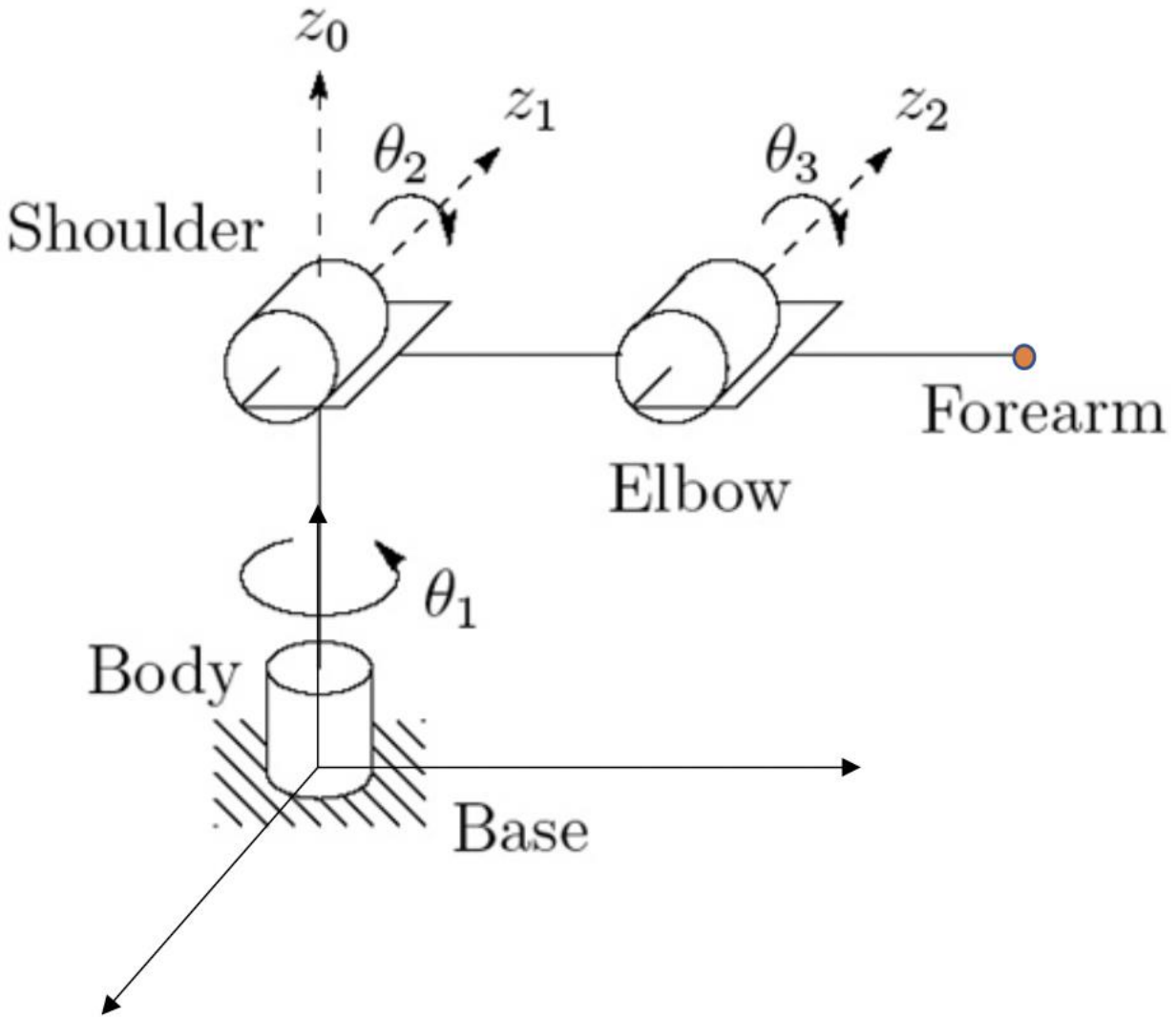


# *Forward Kinematics*

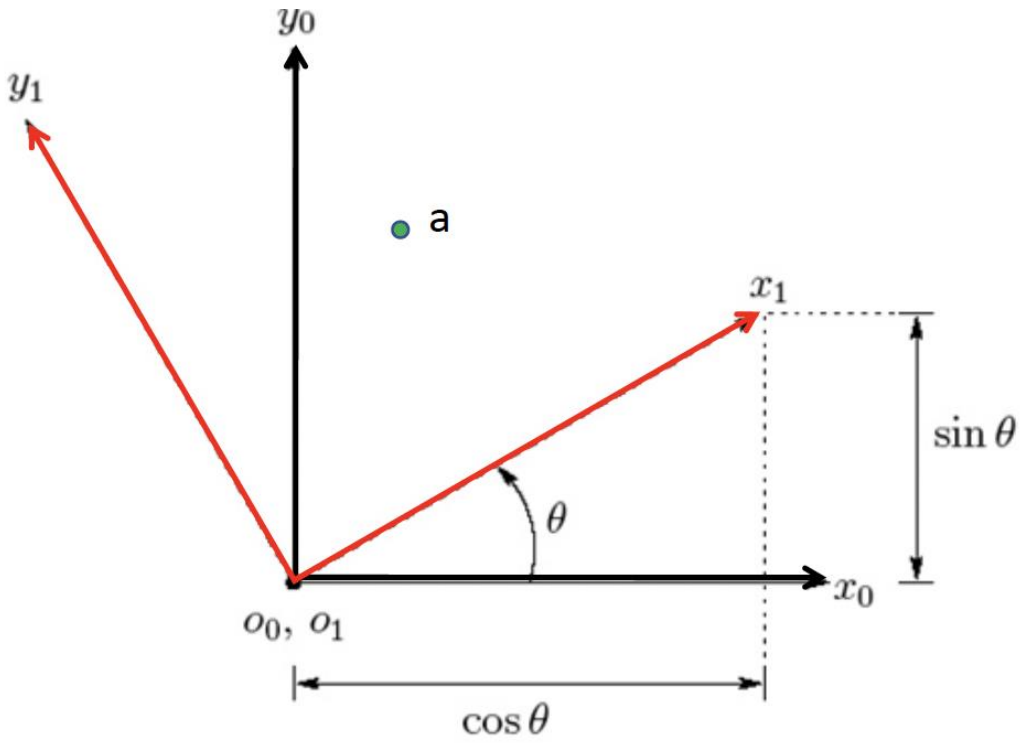



Sensor reading of joint angles
⇒what is the position and orientation of the end effector?

# *Robotic Arm Modeling*



# *Transformation*

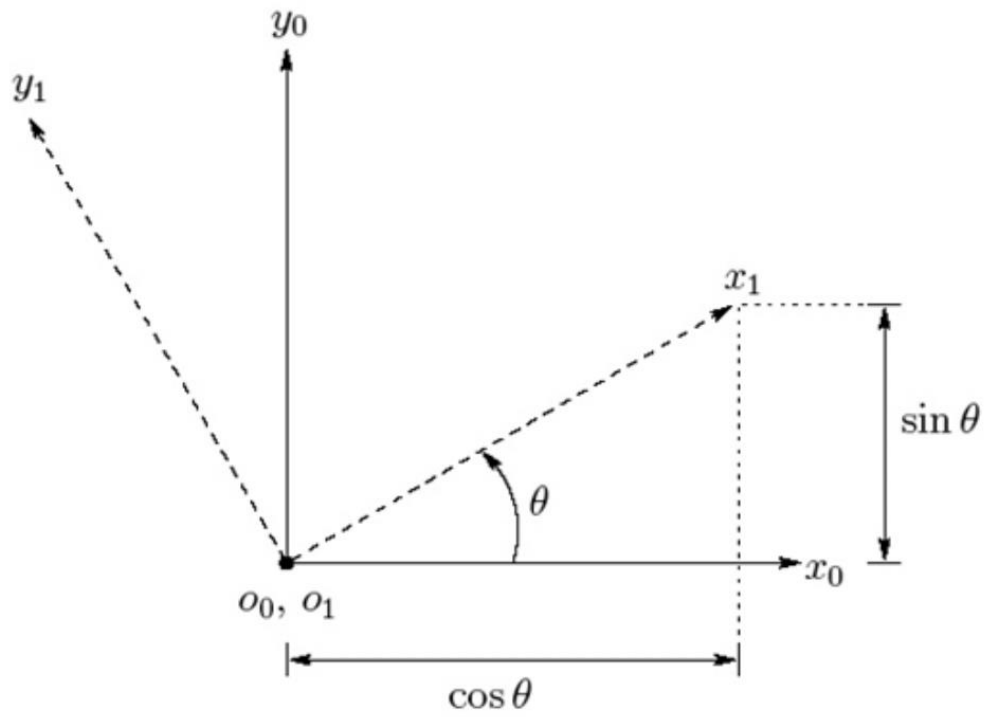



$$x_1^0 \quad y_1^0 \quad ?$$

$$a_0^1 = \begin{pmatrix} a_{x1}, & a_{y1} \end{pmatrix}$$

$$a_0^0 \quad ?$$

# *Coordination Rotation in 2D*




$$x_1^0 = \begin{bmatrix} \cos\theta \\ \sin\theta \end{bmatrix}$$

$$y_1^0 = \begin{bmatrix} -\sin\theta \\ \cos\theta \end{bmatrix}$$

$$R_1^0 = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$