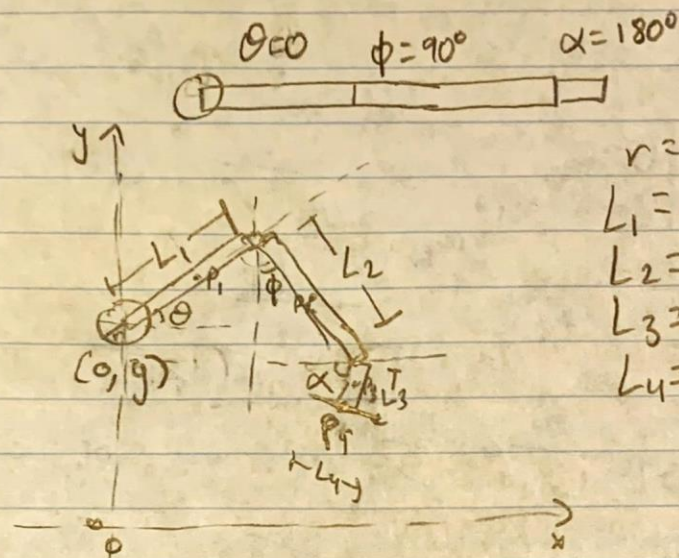


add at joints

$$h = 1.25$$

$$d = 0.75 \cdot 1.1$$

$$r = \frac{0.75}{2} \cdot 1.1$$



$$r =$$

$$L_1 = 6 + r$$

$$L_2 = 7$$

$$L_3 = 2$$

$$L_4 = 4.5$$

$$P_0 = (0, 0)$$

$$P_1 = (0, y) + \frac{L_1}{2} (\cos \theta, \sin \theta) = (\frac{L_1}{2} \cos \theta, y + \frac{L_1}{2} \sin \theta)$$

$$P_2 = (L_1 \cos \theta, y + L_1 \sin \theta) + \frac{L_2}{2} (\sin \phi, -\cos \phi)$$

$$= (L_1 \cos \theta + \frac{L_2}{2} \sin \phi, y + L_1 \sin \theta - \frac{L_2}{2} \cos \phi)$$

$$P_3 = (L_1 \cos \theta + L_2 \sin \phi, y + L_1 \sin \theta - L_2 \cos \phi) + \frac{L_3}{2} (-\cos \alpha, -\sin \alpha)$$

$$= (L_1 \cos \theta + L_2 \sin \phi - \frac{L_3}{2} \cos \alpha, y + L_1 \sin \theta - L_2 \cos \phi - \frac{L_3}{2} \sin \alpha)$$

$$P_4 = (L_1 \cos \theta + L_2 \sin \phi - L_3 \cos \alpha, y + L_1 \sin \theta - L_2 \cos \phi - L_3 \sin \alpha)$$

$$R_1 = (0, 0, \theta) \quad R_2 = (0, 0, \phi - 90) \quad R_3 = (0, 0, \alpha)$$

$$S_1 = (L_1, 0.75, 1.25) \quad S_2 = (L_2, 0.75, 1.25) \quad R_4 = (0, 0, \alpha)$$

$$S_3 = (L_3, 0.75, 1.25)$$

$$S_4 = (0.1, L_4, L_4)$$

$$J_1 = (L_1 \cos \theta, y + L_1 \sin \theta)$$

$$J_2 = (L_1 \cos \theta + L_2 \sin \phi, y + L_1 \sin \theta - L_2 \cos \phi)$$