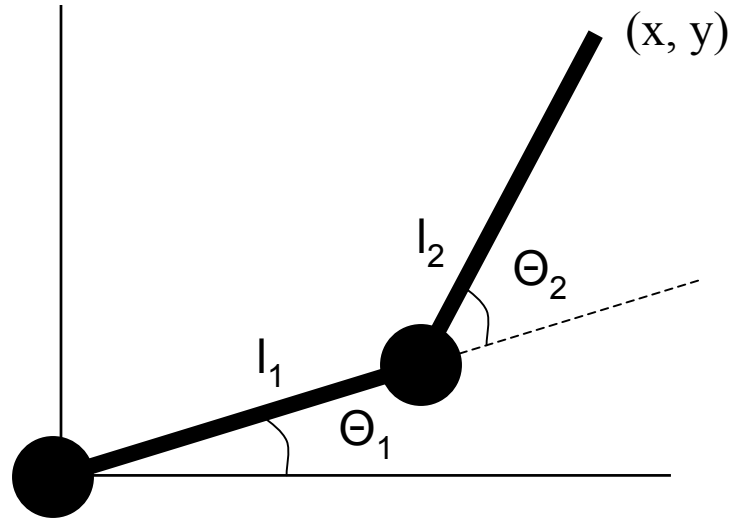# Two dimensional kinematics of arm

Direct kinematics

$$x = l_1\cos(\Theta_1) + l_2 \cos(\Theta_1 + \Theta_2)$$

$$y = l_1\sin(\Theta_1) + l_2 \sin(\Theta_1 + \Theta_2)$$

Inverse kinematics

$$\Theta_1 = \frac{-(l_2 \sin(\Theta_2))x + (l_1 + l_2\cos(\Theta_2))y}{(l_2 \sin(\Theta_2))y + (l_1 + l_2\cos(\Theta_2))x}$$

$$\Theta_2 = \cos^{-1}\{(x^2 + y^2 - l_1{}^2 - l_2{}^2) / 2l_1l_2\}$$