Kinematics Math

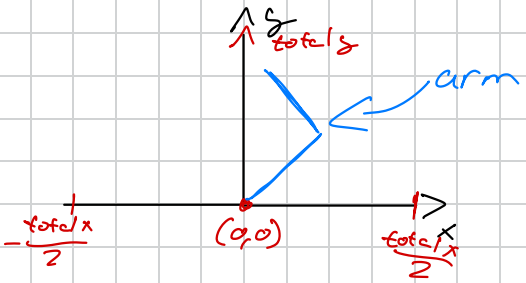
Getting real values

Medicpipe output is $[0 \to 1]$, so for example $x=0,5$ means that hand is in the midle of the x-axis

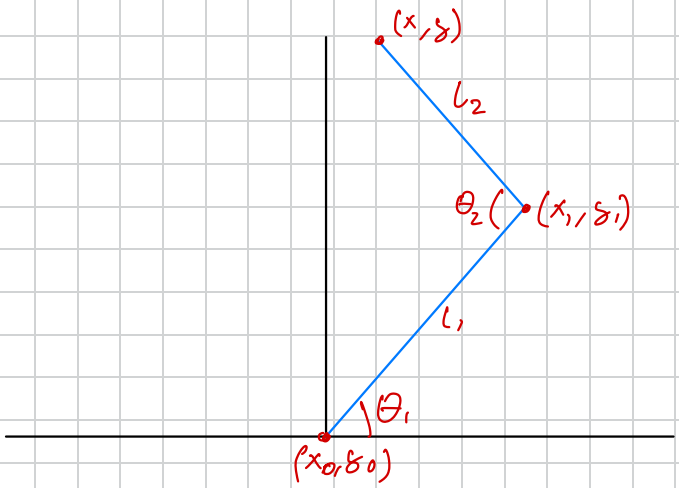
$$realX = (scaled\ x \cdot total\ len\ of\ x\text{-}axis) - \frac{total\ len\ of\ x\text{-}axis}{2}$$

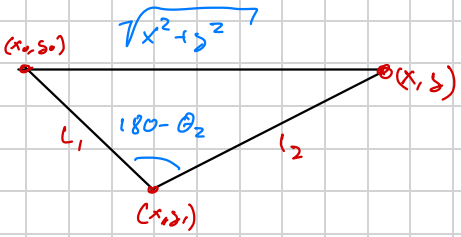
$$realY = (1 - scaled\ y) - total\ len\ of\ y\text{-}axis$$

In this case real values represents case where base of the arm is in origo $(0,0)$



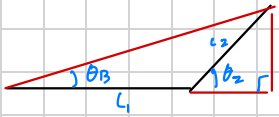
Calculating angles



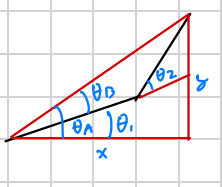


$$x^2 + y^2 = L_1^2 + L_2^2 - 2L_1L_2\cos(180-\theta_2)$$

$$\Rightarrow \boxed{\theta_2 = \cos^{-1}\left(\frac{x^2+y^2-L_1^2-L_2^2}{2L_1L_2}\right)}$$



$$\Rightarrow \theta_B = atan2(L_2\sin\theta_2,\ L_1 + L_2\cos\theta_2)$$



$$\Rightarrow \theta_A = atan2(y, x) \Rightarrow \theta_1 = \theta_A - \theta_B$$

$$\boxed{\theta_1 = atan2(y,x) - atan(L_2\sin\theta_2,\ L_1 + L_2\cos\theta_2)}$$