arm - Pygame

- Given:

$L_1 = 8$ cm (upper arm)

$L_2 = 10$ cm (forearm)

(x, y) = target point

θ_1 = shoulder angle

θ_2 = elbow angle

- Distance to target:

$$r^2 = x^2 + y^2$$

$$r = \sqrt{x^2 + y^2}$$

- Law of cosines

$$\cos(\theta_2) = (r^2 - L_1^2 - L_2^2) / (2 L_1 L_2)$$

$$\theta_2 = \arccos\left((r^2 - L_1^2 - L_2^2) / (2 L_1 L_2)\right)$$

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

- Reachability condition:

unreachable if:

$r > L_1 + L_2$ or $r < |L_1 - L_2|$