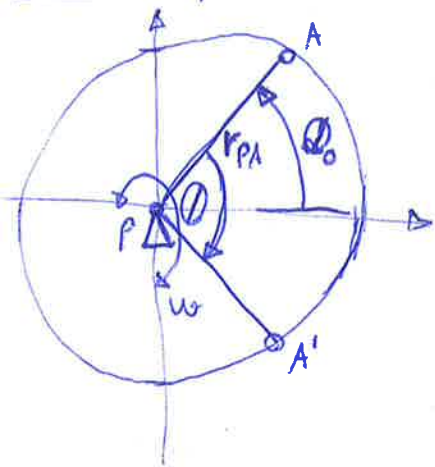


Robot theory

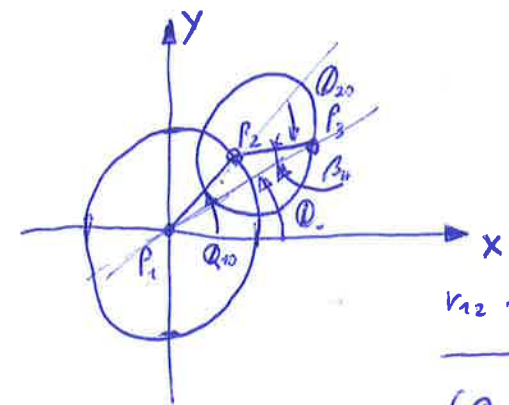


$$\omega_p = \text{const}$$

$$r_{PA} = \text{const}$$

$$T(\theta) = \frac{|\theta - \theta_0|}{\omega}$$

Only positions on the circle possible



$$\omega_1 = \text{const} \quad \omega_2 = \text{const}$$

$$r_{12} = \text{const} \quad r_{23} = \text{const}$$

Only positions between

$$r_{12} - r_{23} \leq r(\theta_1, \theta_2) \leq r_{12} + r_{23}$$

$$r(\theta_1, \theta_2) = \sqrt{r_{12}^2 + r_{23}^2 - 2 \cos(\pi + \theta_{20}) r_{12} r_{23}} \Rightarrow r(\theta_1, \theta_2) = \sqrt{r_{12}^2 + r_{23}^2 - 2 \cos(\pi + \theta_2) r_{12} r_{23}} + 2 \cos r_{12} r_{23} \cdot r_{12} \cdot r_{23}$$

$$\pi = (\underbrace{\theta_{10} - \theta}_\alpha) + (\underbrace{\pi - \theta_{20}}_\gamma) + (\underbrace{\beta_H}_\beta) \quad | -\pi | + \theta \quad \theta_2'(r') = \arccos\left(\frac{r'^2}{2 r_{12} r_{23}}\right) - \pi$$

$$\theta = \theta_{10} - \theta_{20} + \beta_H \quad \text{with } \beta_H = \arccos\left(\frac{r_{12}^2 + r_{23}^2 - r_0^2}{2 r_{12} r_{23}}\right)$$

$$T(\theta_1, \theta_2) = \min(t_1, t_2)$$

$$\beta_{H0} = \arcsin\left(\frac{r_{12} r_{23} \sin(\pi + \theta_{20})}{r_0}\right)$$

$$\beta_H(\theta_2) = \arcsin\left(\frac{r_{12} \sin(\pi + \theta_2)}{r(\theta_2)}\right)$$

$$T(\theta_1, \theta_2) = \text{min}(t_1, t_2)$$

$$\Delta \theta_1 = \theta_1' - \theta_{10}$$

$$\Delta \theta_2 = \theta_2' - \theta_{20}$$

$$t_1 = \frac{\Delta \theta_1}{\omega_1}$$

$$t_2 = \frac{\Delta \theta_2}{\omega_2}$$