

Trajectory Planning - Polinomiali Di Terzo Grado con $t \in [0, t_f]$:

$$x(t) = -\left(\frac{t-t_f}{t_f}\right)^3 x_i + \left(\frac{t}{t_f}\right)^3 x_f + \alpha_x \left(\frac{t}{t_f}\right)^2 \left(\frac{t-t_f}{t_f}\right) + \beta_x \left(\frac{t}{t_f}\right) \left(\frac{t-t_f}{t_f}\right)^2$$

$$y(t) = -\left(\frac{t-t_f}{t_f}\right)^3 y_i + \left(\frac{t}{t_f}\right)^3 y_f + \alpha_y \left(\frac{t}{t_f}\right)^2 \left(\frac{t-t_f}{t_f}\right) + \beta_y \left(\frac{t}{t_f}\right) \left(\frac{t-t_f}{t_f}\right)^2$$

Boundary Conditions:

$$\begin{aligned} x(0) &= x_i & x(t_f) &= x_f \\ y(0) &= y_i & y(t_f) &= y_f \end{aligned}$$

Orientation Constraints:

$$\begin{aligned} \dot{x}(0) &= K_i \cos(\theta_i) & \dot{x}(t_f) &= K_f \cos(\theta_f) \\ \dot{y}(0) &= K_i \sin(\theta_i) & \dot{y}(t_f) &= K_f \sin(\theta_f) \end{aligned} \quad K_i = K_f = K > 0$$

$$\alpha_x = K \cos(\theta_f) - 3 x_f$$

$$\alpha_y = K \sin(\theta_f) - 3 y_f$$

$$\beta_x = K \cos(\theta_i) + 3 x_i$$

$$\beta_y = K \sin(\theta_i) + 3 y_i$$