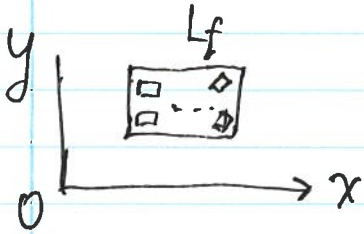
Constraints

$\delta \in [-25, 25°]$

$a \in [-1, 1]$

SS

$$x_{t+1} = x_t + v_t \cdot \cos(\psi_t) \cdot dt$$
$$y_{t+1} = y_t + v_t \cdot \sin(\psi_t) \cdot dt$$
$$\psi_{t+1} = \psi_t + \frac{v_t}{L_f} \cdot \delta_t \cdot dt$$
$$v_{t+1} = v_t + a_t \cdot dt$$
$$cte_{t+1} = cte_t + v_t \cdot \sin(e\psi_t)\, dt = f(x_t) - y_t + v_t \sin(e\psi_t) \cdot dt$$
$$e\psi_{t+1} = \psi_t - \psi des_t + \frac{v_t}{L_f} \cdot \delta_t \cdot dt$$



state: $\chi = [x_1, y_1, \psi_1, v_1, cte_1, e\psi_1]$

cost function: $J = \sum_{t=1}^{N} (cte_t - cte\_ref)^2 + (e\psi_t - e\psi\_ref)^2 + \cdots$

output: $\begin{bmatrix} \delta_1 & a_1 \\ \delta_2 & a_2 \\ \vdots & \\ \delta_{N-1} & a_{N-1} \end{bmatrix}$, $(N-1) \times 2$

#vars: $6 \cdot N + (N-1) \times 2$

states inputs

gcc -O3

$a_{max} = 3.75\ m/s^2$

$L_f = 1.17\ m$

brake?