ROB 530 Project Notes

rlybrdgs

April 8, 2024

1 Prediction Step

$$\mathbf{x}_k = \begin{bmatrix} a_k \\ q_k \\ \omega_k \\ \theta_k \\ \dot{\theta}_k \end{bmatrix} \in \mathbb{R}^{10+2N}$$

$$\begin{aligned} \mathbf{x}_k &= f(\mathbf{x}_{k-1}, \mathbf{u}_k) + \mathbf{w}_k \\ &= \begin{bmatrix} e^{-\tau\Delta t} a_{k-1} \\ \exp\left(-\frac{1}{2}\Psi(\omega_{k-1})\Delta t\right) q_{k-1} \\ \omega_{k-1} \\ \theta_{k-1} + \dot{\theta}_{k-1}\Delta t \\ (1-\lambda)\dot{\theta}_{k-1} + \lambda \mathbf{u}_k \end{bmatrix} \end{aligned}$$

$$F_k = \frac{\partial f}{\partial \mathbf{x}_{k-1}} = \begin{bmatrix} e^{-\tau\Delta t} & 0 & 0 & 0 & 0 \\ 0 & \exp\left(-\frac{1}{2}\Psi(\omega_{k-1})\Delta t\right) & TODO & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & \Delta t \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$