

MFC CDT Probability and Statistics Coursework

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1 Model

The model will be a two-dimensional linear Gaussian state space model

$$\mathbf{x}_t = \mathbf{A}\mathbf{x}_{t-1} + \mathbf{w}_t \quad (1)$$

where $\mathbf{x}_t \in \mathbb{R}^2$ is the state vector at time t , \mathbf{A} is the state transition matrix, and $\mathbf{w}_t \sim \mathcal{N}(\mathbf{0}, \mathbf{Q})$ is the process noise at time t with covariance matrix \mathbf{Q} . At each time t the state is observed according to

$$\mathbf{y}_t = \mathbf{C}\mathbf{x}_t + \mathbf{v}_t \quad (2)$$

where $\mathbf{y}_t \in \mathbb{R}^2$ is the observation vector at time t , \mathbf{C} is the observation matrix, and $\mathbf{v}_t \sim \mathcal{N}(\mathbf{0}, \mathbf{R})$ is the observation noise at time t with covariance matrix \mathbf{R} .

2 Kalman Filter

3 Particle Filter

4 Results