

Statistical Modelling Exercises

The following exercises should be performed in Matlab.

Trajectory Generation

Generate an ideal deterministic (without any noise disturbances) constant velocity trajectory in two dimensions with position and velocity components ($\mathbf{x}_k = (x, y, \dot{x}, \dot{y})$). Use discrete time steps of $T = 1$ second for a total of 60 seconds. Start at the origin with a y velocity of 10.

1. Make a plot of the trajectory.

Generate a nearly constant velocity trajectory (with noise disturbances – continuous white noise acceleration) with a process noise intensity of $\tilde{q} = 0.1$ using the same state vector and starting state as the previous exercise.

HINT: To generate a random vector from a multivariate normal distribution using `mvnrnd`

2. Generate four random trajectories and add them to the plot from (1) of the deterministic trajectory.

For a single trajectory from exercise 2, generate a measurement of the object at each time step.

Measurements are positions $\mathbf{z}_k = (x, y)'$, measurement error standard deviation $\sigma_x = \sigma_y = 5$ and so

$$\mathbf{R} = \begin{bmatrix} \sigma_x^2 & 0 \\ 0 & \sigma_y^2 \end{bmatrix}$$

3. Produce a plot showing a single trajectory from 2 as well as measurements