

CE 597 Adj. Geospatial Obs. Homework 8

Find File hw8.mat which contains x_{act} , y_{act} (solid line below) and x_{obs} , y_{obs} (circles in figure), 100 element arrays. Matlab command = "load hw8". Use:

$$Q = \begin{bmatrix} .0006 & .0013 & 0 & 0 \\ .0013 & .0025 & 0 & 0 \\ 0 & 0 & .0006 & .0013 \\ 0 & 0 & .0013 & .0025 \end{bmatrix}, \quad R = \begin{bmatrix} 25 & 0 \\ 0 & 25 \end{bmatrix}, \quad T = 1, \quad \Phi = \begin{bmatrix} 1 & T & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & T \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

(constant velocity)

$$X = \begin{bmatrix} x \\ \dot{x} \\ y \\ \dot{y} \end{bmatrix}, \quad H = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

Begin with $X_0^- = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \quad P_0^- = \begin{bmatrix} 5 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Make 100 loops through the KF algorithm to produce an estimate of the trajectory. Plot actual, observations, and estimated (together).

What happens after the turn?
Why?

$$K = P^- H^T (H P^- H^T + R)^{-1}$$

$$X = X^- + K (z - H X^-)$$

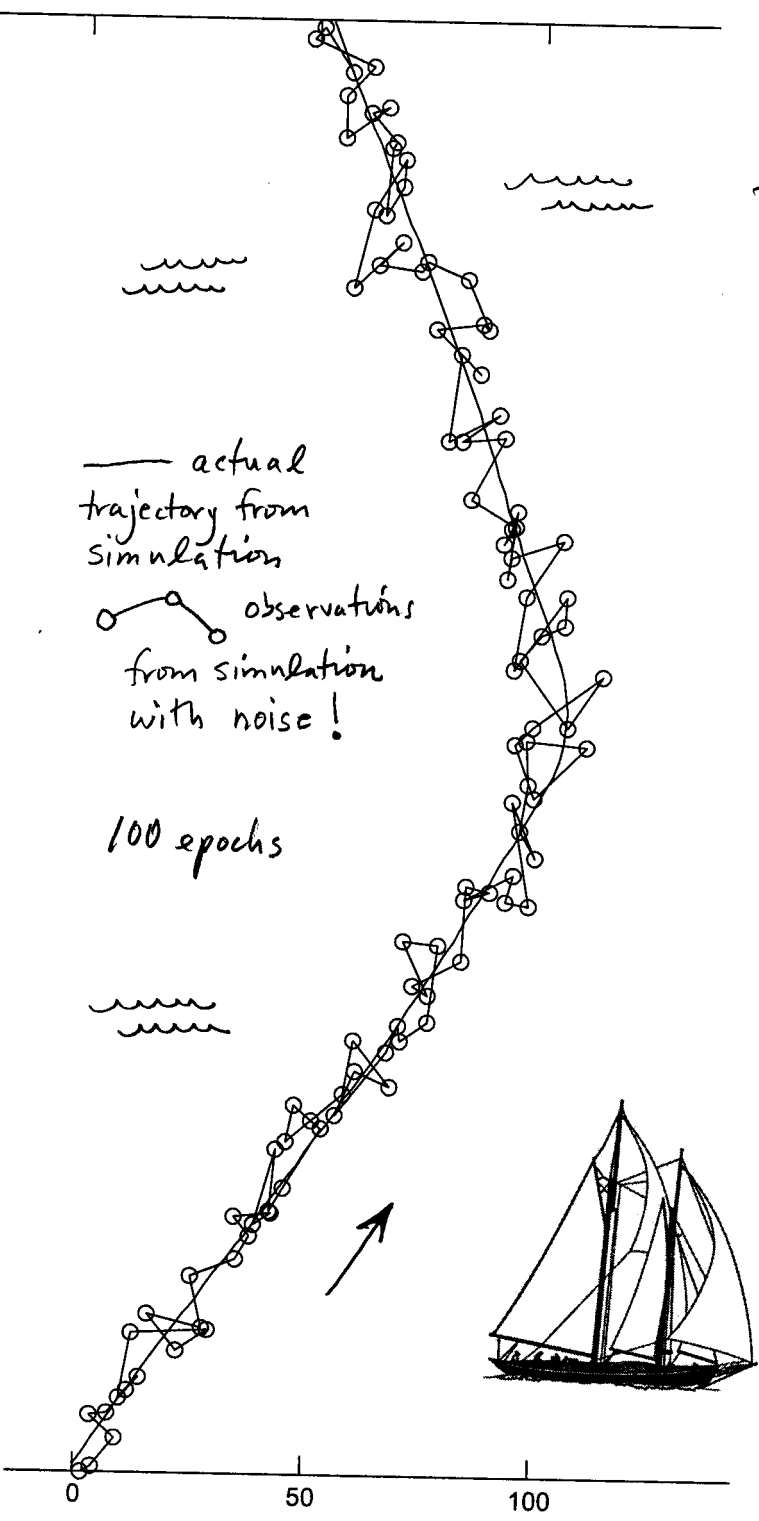
$$P = (I_4 - K H) P^-$$

$$X^- = \Phi X$$

$$P^- = \Phi P \Phi^T + Q$$

$$z = \begin{bmatrix} x_{obs} \\ y_{obs} \end{bmatrix}$$

Due Thursday, 8 Dec.



— actual trajectory from simulation
○ observations from simulation with noise!

100 epochs