HW#5 Advanced Geospatial Estimation - Spring 2009 - Kalman Filter
Assigned Monday 13-April, due Wednesday 22-April

You must track a vehicle in 2D for a period of 42 seconds. Observations arrive at 1-second intervals beginning at T=1, ending at T=42. You have a reference trajectory beginning at T=0 and continuing throughout the mission. Use the "constant velocity" dynamic model and the "newtonian" state stransition matrix. Find the accompanying data file with format: time, reference X, reference Y, reference X-velocity, reference Y-velocity, actual X, actual Y, distance observation, control station. One line per epoch.

T	refX	refY	refX-vel	refY-vel	actX	actY	dist	CP
0.0	-11.1916	193.5010	12.432995	4.998064	0.0000	0.0000	0.0000	0.0
1.0	1.2500	198.5025	12.432995	4.998064	0.0000	200.0000	223.5635	1.0
2.0	13.6916	203.5040	12.432995	4.998064	12.4416	204.9766	347.5950	2.0
3.0	26.1332	208.5055	12.432995	4.998064	24.8832	209.9533	206.7869	1.0
...	...	...	...	...	...	...	...	...
41.0	498.9135	398.5632	12.432995	4.998064	497.6635	399.0654	421.7918	1.0
42.0	511.3551	403.5647	12.432995	4.998064	510.1051	404.0420	210.0448	2.0

Note that the distance observations alternate between CP1 and CP2. The corresponding control point coordinates are CP1=200,100, CP2=300,400.

Use the following uncertainty data: distance observation sigma = 0.1 , The initial P-matrix and the Q-matrix are given below.

$$\mathbf{P} = \begin{bmatrix} 4 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 0.25 & 0 \\ 0 & 0 & 0 & 0.25 \end{bmatrix}$$

$$\mathbf{Q} = \begin{bmatrix} 4 & 0 & 0 & 0 \\ 0 & 4 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Do problem with LKF and EKF, in each case compile an RMSE (distance error compared to actual location) and plot the error versus time.