ECE 5283: Kalman Filtering
Project 1

Fall 2005 Dr. Havlicek

Consider the α-β Kalman filter developed in class with the following combinations of velocity noise variance σ_v^2 and measurement noise variance σ_n^2:

Case	σ_v^2	σ_n^2
1	1	1
2	1	100
3	1	1000
4	1	5000
5	25	50
6	25	500
7	25	5000
8	25	10000

For each case, compute the Kalman gains α_k and β_k for a sufficient number of timesteps to show convergence. Run two simulations of each case using zero-mean white Gaussian noises for the velocity and measurement noises. Simulate both the actual system and the combined Kalman predictor/filter. Initialize the system state vector at time $k = -2$ using $i_{-2}^c = v_{-2} = 0$. Run each simulation for a number of timesteps equal to several times the gain convergence time.

Turn in the following:

1. For each case, plots of the Kalman gain sequences α_k and β_k.

2. For each simulation (two per case), a plot showing the true position i_k^c, the observed position z_k, and the filtered (smoothed) position $\widehat{i_k^c}$.

   Note: you may also find it interesting to plot the predicted positions $\widehat{i_k^c}^-$, but do not turn this in if the plots become too overcrowded.

3. Listings of all programs.

Be sure to label all plots carefully !

DUE: 11/15/05