AH2923 Global Navigation Satellite Systems

Kalman Filtering

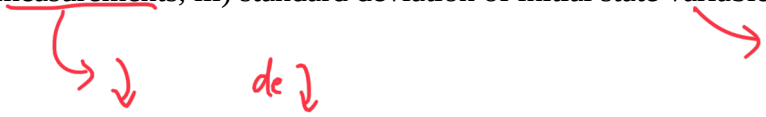
Apply Kalman filter to compute optimal (filtered and smoothed) 2D position and velocity of a moving vehicle. Use the constant velocity kinematic model for the motion of the vehicle. The position (coordinates n, e) and speed (absolute value of velocity) of the vehicle is measured in 2 s intervals.

Given values:

- PSD (power spectral density) of the random acceleration: $0.01\ \mathrm{m^2 s^{-3}}$
- Standard deviation of measured coordinates (σ_e , σ_n): 3 m
- Standard deviation of measured abs. velocity (σ_v): 0.5 m/s
- Standard deviation of initial velocity (both components): 3 m/s
- Standard deviation of initial coordinates (both components): 10 m
- Initial velocity: v_e = 3.53 m/s, v_n = 0.86 m/s
- The measurements and the true values of the state variables are given in Excel file Measeurements.xlsx

Write report with standard IMRAD structure. The report should include

- code
- filtered and smoothed coordinates, velocities and their standard deviations
- plot of the measured, filtered and smoothed trajectory
- plot of differences between the true, smoothed and filtered state variables
- discussion: what happens if we change the values of i) PSD, ii) standard deviation of measurements, iii) standard deviation of initial state variables?



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