Assignment - Classical Autonomous System

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1 Kalman Filter

Consider the following mass-spring-damper system

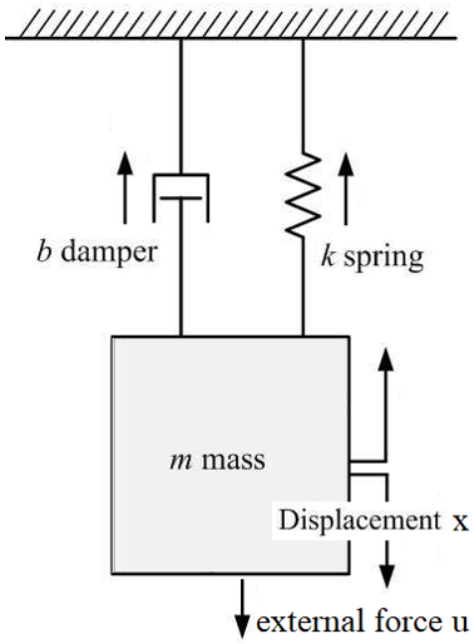

Figure 1: A mass-spring-damper system.

Initially, the spring is placed at $x = 20cm$. The mass is $10kg$, while the damping and spring coefficient are unknown. The error covariance matrices

for the model and measurement are given by $0.1\boldsymbol{I}_{4\times4}$ and $0.1\boldsymbol{I}_{2\times2}$, respectively. In the attached file *DATA.mat* you can find data of the position (first row) and velocity (second row). The time step is 0.001s. Your task is to estimate the damping and spring coefficient using extended Kalman filter.

2 Sensor Fusion

An object is moving in 3D space. In the attached file *GNSSINS.mat* you can find the recorded data of the object from GNSS, IMU, and Speedometer. Your task is to find the position of the object using:

- Only GNSS
- GNSS and accelerometer
- GNSS, accelerometer, and Speedometer.