PERVASIVE SENSING SYSTEMS IT574

EXERCISE I

Due August 15, Wednesday 5 PM.

Submit a PDF with the commands used, scripts, and plots clearly labelled.

Submission is on Turnitin.

Ex 1. Variables, Random rample generation, Plotting, and Saving :

a) Generate a 1000 x 1 vector of random samples from Normal distribution N(5, 3), i.e., with a mean value 5 and standard deviation 3. Save the vector to a variable Data.
b) Generate a 1000 x 1 vector of random samples from Normal distribution N(0, 2), i.e., with a zero mean and standard deviation 2. Save the vector to variable Noise.
c) Plot the variables Data and Noise on the same figure (with different colors).
d) Save the figure to file EX1.png, and both variables Data and Noise to file: EX1.mat.
e) As shown in class, learn how FFT works in MATLAB or any other software, run fft on the the signal generated in the above steps, and plot the resp graphs.
f) Explain in one or two lines what the results of FFT show

Ex 2. Write a script to do the following:

a) Load variables Data and Noise from file EX1.mat
b) Iterate through Data, calculating running mean and standard deviation of 100 most recent samples. Plot the progress of iterative mean and standard deviation.
c) Adds Noise to Data to create a variable NoisyData, and recalculate running mean and standard deviation for NoisyData as above.
d) Again plot the iterative mean and standard deviation.
e) What do you observe from plots of step b) and d)?

Ex 3. Write a function to do the following

a) Takes a vector v as an input

b) Counts the number of peaks -, where - is defined as an occurrence where vector v value vi is greater than a threshold value $\alpha = \text{mean}(v) + 2 * \text{std}(v)$.

c) Run the function with Data.

d) Modify the above function to accept only one peak - within distance of 25 samples (i.e., within index range v_{i-25} to v_{i+25}). Run the function with Data.

Ex 4: Familiarize yourself with the Android Sensor API found at:

http://developer.android.com/guide/topics/sensors/index.html

a) Load example sensor data from:

b) http://www.cs.helsinki.fi/u/shemmink/MobileSensing/Ex4_Sensors.mat

c) Find out what data each column in the different sensors represents. The data is stored in a struct format. Write a script that shows how to access/read data from a struct

d) Can you find out from what activity the data is from?