Pre-Class Assignment 1, Part II

Biomedical Imaging & Analysis (ECE J1-791) - Fall 2014

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Instructions: Please show your solutions to each problem in full, writing them neatly. For computer programs, please remember to turn in your code through the course's blackboard session, as well as any plots / figures that are requested. If you have collaborated with another student on solving this homework assignment please state so (e.g. "I helped John with question 1").

This assignment is due on **Tuesday, 9 Sept 2014** via Blackboard, including an MS Word Document "report" or scanned PDFs of hand-written ones for the written explanations associated with each question in the assignment, as well as any associated code and result files required to be submitted.

BASIC MATH & APPLIED PROGRAMING

1. **(25 points)** Consider the arbitrary signal f[x], with k = 1 to N, and a linear signal model v[x] = αx + β, with a & b constants to be determined so that v[x] fits f[x] in the least squares sense i.e. **min $|v[x]^2 - f[x]^2| = 0$**. Write down the algebraic matrix formulation of this fitting problem, A . *Coeffs* = *b*, where A is a matrix, *Coeffs* is a vector and *b* is a vector. Write a Matlab program to compute the least squares fit of the model to the data stored in the i.e. '**HW1_Part2Q1.mat**' contains a signal (data stored in the variable '**f**'). Plot the raw data as well as the best fit found (overlaid on top of each other). Remember to upload your code through Blackboard.

   NOTE: You may use the starter code provided with this assignment and notice the Matlab usage of the "\" operator to divide a Matrix by a vector. You may choose to ignore the starter code if you find it confusing. **However, please submit snapshots of the 'plots' generated by the starter code!**

2. **(25 points) Find the unit normal vector** the following three points P1(5,0,0), P2(0,0,5) and P3(10,0,5). **HINT:** The vector normal to two vectors in-plane is in the direction of their cross product. **Finally, write a Matlab function for this which accepts three vectors as input, *function computeNormals (P1, P2, P3)*, where P1, P2 and P3 are 1x3 vectors.** Remember to upload your code through Blackboard.