CPE-2600 **FALL 2024**

Systems Programming

Programming Assignment 2

Description

The purpose of this assignment is to design, code, and test a C program that serves as a FIR filter for discrete data. The math for an FIR filter is:

$$y(n) = \sum_{k=0}^{M-1} h(k)x(n-k) \qquad for\ all\ n$$

Requirements

The following are the requirements of the filter:

- The filter shall accept 7 floating point filter coefficients.
- The filter shall accept 512 floating point input data samples
- The filter shall produce 512 output data samples which are the filtered values.
- The calculation of the first 6 outputs result in negative input data index and shall by handled by utilizing the first sample
- The filter coefficients can be found with the Matlab command >h=fir1(6,0.1).
- The input data can be generated with Matlab command >x=0.1*randn(1,512).
- The desired output data can be generated with Matlab command >y=filter(h,1,x).
- The filter shall be testing for constant input data with no shift in output data expected
- The filter shall be tested with single value of 1 at location 256 in the input data and the filter coefficients are expected as output data values
- The filter shall be tested with noisy input data with noise reduced output data expected

Assignment Submission Requirements

The following are the submission requirements for the assignment:

- The files will be submitted to Canvas
- The C code with compile instructions in the banner
- The test code with compile instructions in the banner
- A screen shot of your filter coefficients test of your code showing the correct filter coefficients produced.

Due: 9-30-2024