EE-384 Class work 3

Due:

Problem 1: Using filter and difference equation

Matlab provides the filter function which is a direct form II transposed implementation of the standard difference equation. Such function saves coding time and helps us focus more on system behavior.

a) Re-do problem 3 of class work 2 and implement $y(n) = \frac{x(n)+x(n-1)+x(n-2)}{3}$ using the 'filter' command to filter out the high frequency components of the ECG signal.

b) Instead of using 'filter' command, convolute the ECG signal with h=[1/3, 1/3, 1/3] using 'conv' function. Compare the result with that of (a).

c) Write your own convolution function and re-do (b) with yours.

Problem 2: basic about sinusoids and sampling rate

Let the sampling rate *Fs* be 50 Hz, and the time array *t* varies from 0 to 1 second.

a) Create and plot a sine signal $\boldsymbol{y_1(t) = \sin(2\pi f_1 t)}$, where $\boldsymbol{f_1 = 10\ Hz}$

b) Create and plot a sine signal $\boldsymbol{y_2(t) = \sin(2\pi f_2 t)}$, where $\boldsymbol{f_2 = 60\ Hz}$

c) Can you differentiate between $\boldsymbol{y_1(t)}$ and $\boldsymbol{y_2(t)}$ plot? Why?

Problem 3: sound

Let the sampling rate *Fs* be 50 kHz, and the time *t* varies from 0 to 1 second.

a) Create and plot a 2 kHz signal $\boldsymbol{y_1(t) = \sin(2\pi f_1 t)}$ using Matlab. Let the horizontal axis vary from 0 to 0.01 second. Using the command '*sound(signal, sampling rate)*' to listen to the tone.

b) Create, plot and listen to a sine signal $\boldsymbol{y_2(t) = \sin(2\pi f_2 t)}$**,** where $\boldsymbol{f_2 = 6\ kHz}$**.** How the sound of y_2 in comparison to the sound of y_1?

c) Create, plot and listen to a sine signal $\boldsymbol{y_3(t) = \sin(2\pi f_3 t)}$**,** where $\boldsymbol{f_3 = 25\ kHz}$**.** Can you still hear the sound this time?