Lab 4 Report
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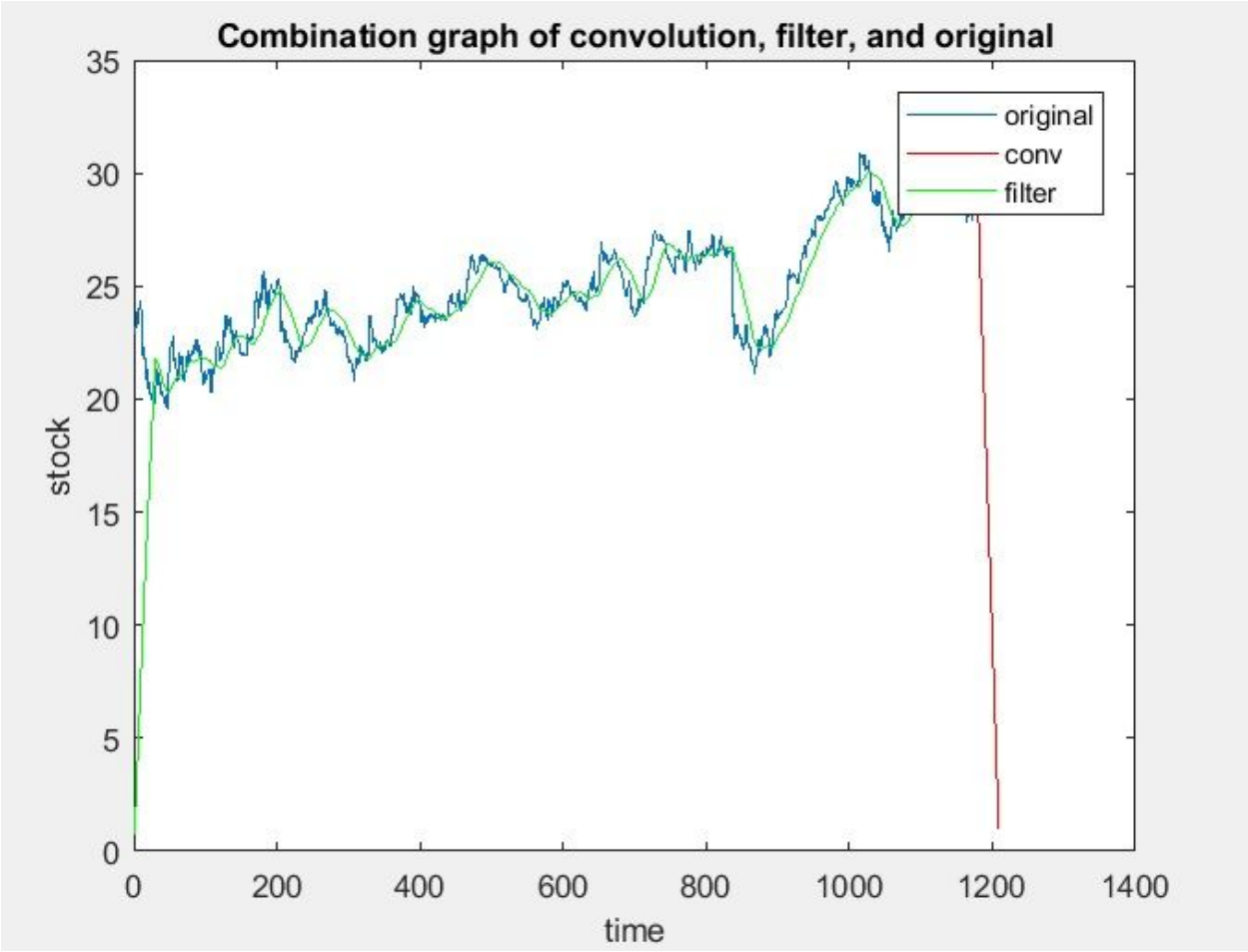
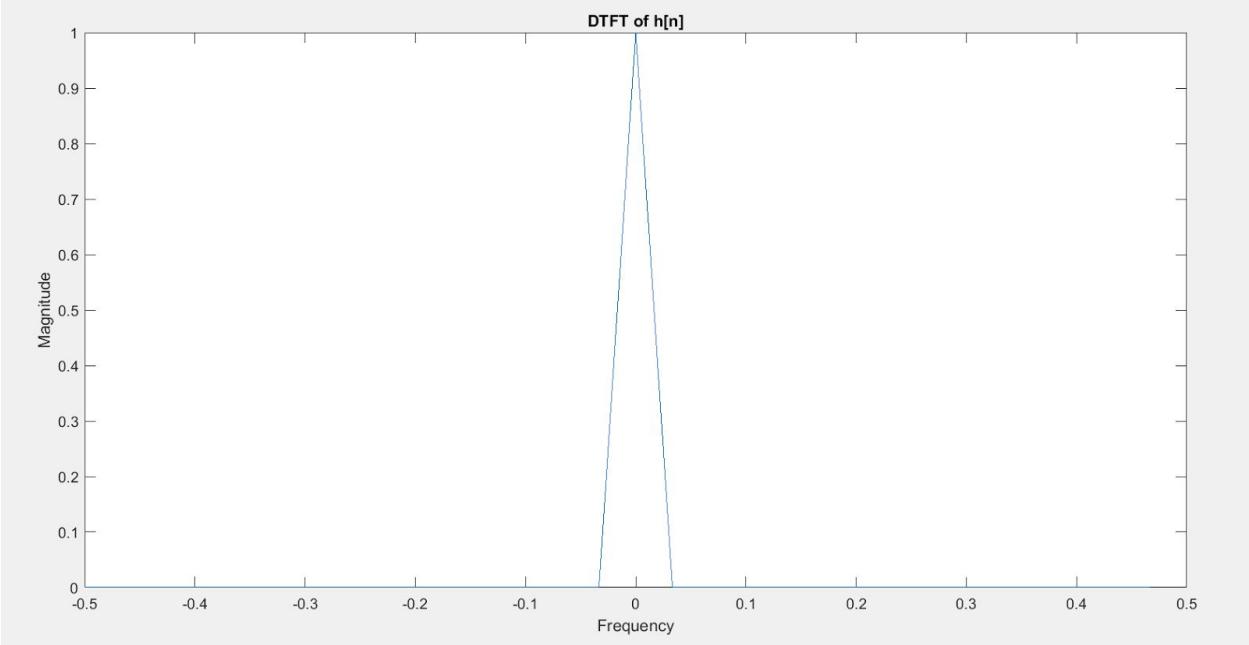
Part 1

In this first assignment, we successfully load the text data using load() command and create h[n] signal by creating ones vector first with a length of 30 (from 0 to 29) and scaled it by 1/30. After that, for convolution, we just used conv() command to convolve hn and xn(from stock data). Next, for filtered version, we used filter() command and set b as hn and a as 1. This is the result:



This graph already include the original, filtered, and convolution signal.The red color only show a little because from 0 to around 1500, the convolution signal and filtered signal are the same. As we can see from the graph, the original and filtered result looks very different. The filtered result are way more smoother. Pay attention that the filtered version has less jagged edge compared to original, In addition, we also did DTFT of signal h[n] using fft() command and abs(0 command. This is the result



To adjust so that they gave identical result, We use conv function and filter function. The result will be identical because filter also apply the principle of convolution.

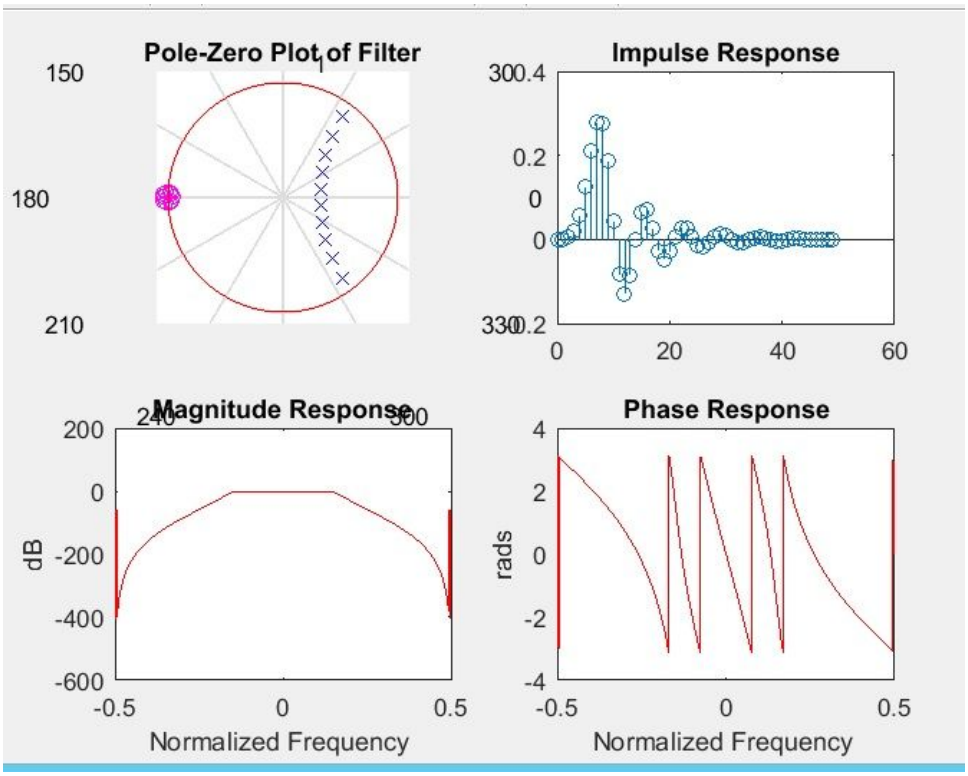
Part 2

We successfully create a FIR filter and IIR filter. Fir filter created using fir1() command. While IIR filter created using butter() command. After that we load the music file using audioread() command while also assign its y and Fs value. Furthermore, we created the pulse signal by concatenate the ones vector with a length of 20 and zeros signal with a length of 40.

For the FIR filter we assign the output value as variable d and c, while for the Butter filter, we assign the output value as variable b and a. Then we use those value in filter() command to apply the filter to designed signals.

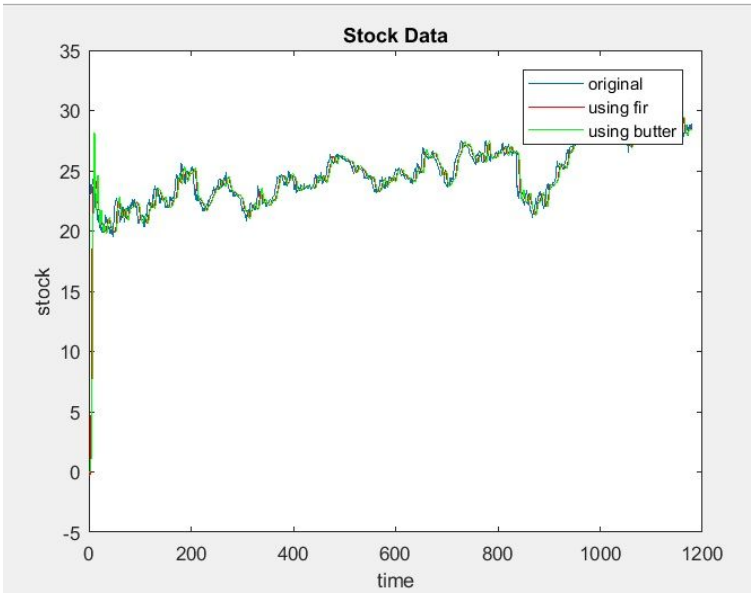
For the freevalz01 plot, we use freevals01() command that already given.

Freevalz01 plot:



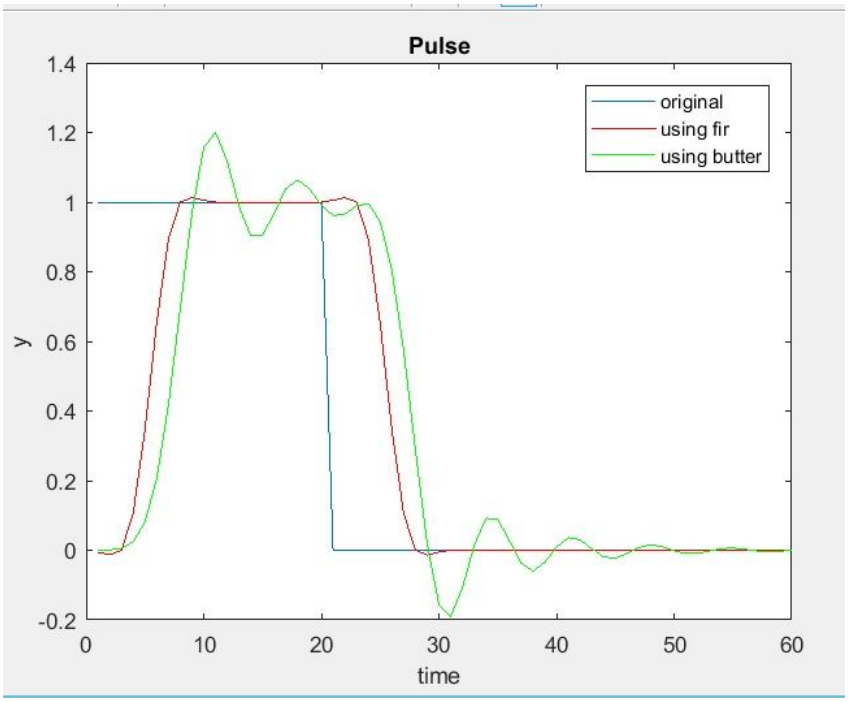
As you can see from this freevalz01 plot, we can conclude that the filter we used for this part is a low pass filter since the shape of magnitude response and the shape of phase response is similar to the properties of low pass filter.

Stock market plot:

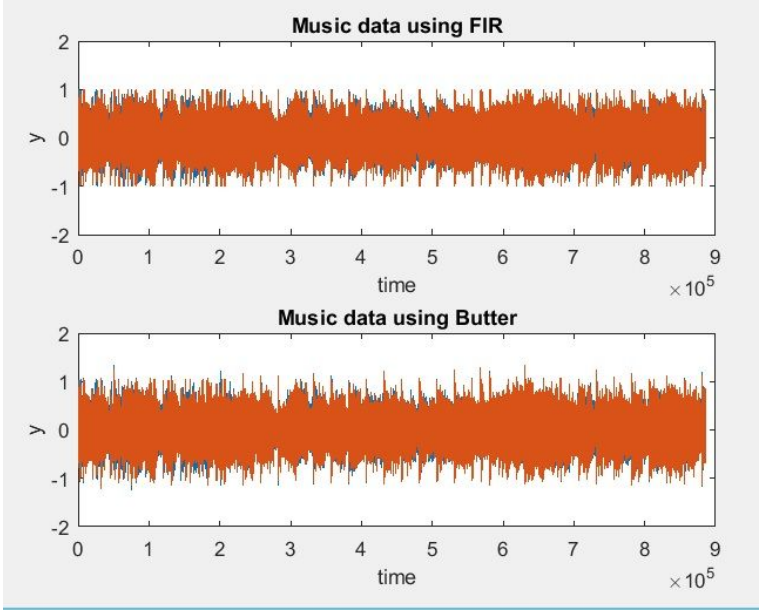


As you can see from the picture, the filtered result looks a little bit smoother than the original. While it's not as smooth as the first filter from part 1, it still did its job. In addition, we also finished applying the FIR filter and Butter filter to both pulse signal and sound signal.

Pulse plot:

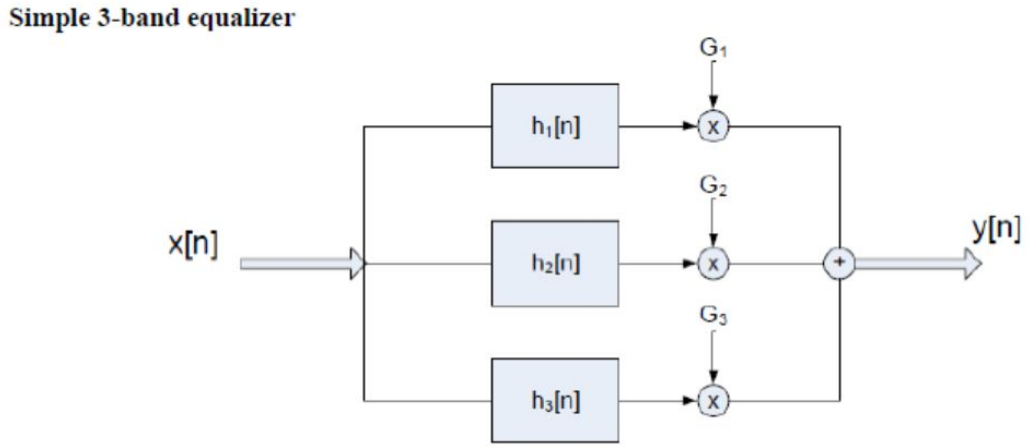


Music plot:



Part 3

For this part, we created a 3 band equalizer like in the lab module.



For the h[n], we created using filter coefficients present in the lab module.

Filter coefficients						LP, HP, or BP?
B1 =	0.0495	0.1486	0.1486	0.0495		
A1 =	1.0000	-1.1619	0.6959	-0.1378		
B2 =	0.1311	0	-0.2622	0	0.1311	
A2 =	1.0000	-0.4824	0.8101	-0.2269	0.2722	
B3 =	0.0985	-0.2956	0.2956	-0.0985		
A3 =	1.0000	0.5772	0.4218	0.0563		

B1 and A1 refers to a Low Pass Filter
B2 and A2 refers to a Band Pass Filter
B3 and A3 refers to a High Pass Filter
The equalizer created is a function. The function has 4 inputs, the music file, G1,G2 and G3. The G1,G2 and G3 has a gain and can be assigned a different value every time. G1 is multiplied with the Low Pass Filter and G2 with Band Pass Filter and G3 with High Pass Filter. We summed the result of the three multiplication and played it with values of G1, G2 and G3 like the one below.
We tested out the following cases for the lab

1. G1=G2=G3=1
   The sound quality for this part is still as good as the sound quality for the original music. There is not a lot of different in my opinion.

2. G1=G2=0, G3=1

The sound quality got this part is not as good as the original. When running it, we can feel that the sound for this part is not as clear as the original. It sounds very high in frequency.

3. G1=G3=0, G2=1
   The sound quality got this part is not as good as the original. However, it is better than the first one. It sounds like it is played at a very high and not very low frequency.

4. G2=G3=0, G1=1

The sound quality of this one is not good. It is like the first one but it is played in low frequency. When compared to the second and the first one, this is not as good as them.