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Exercise 3 master

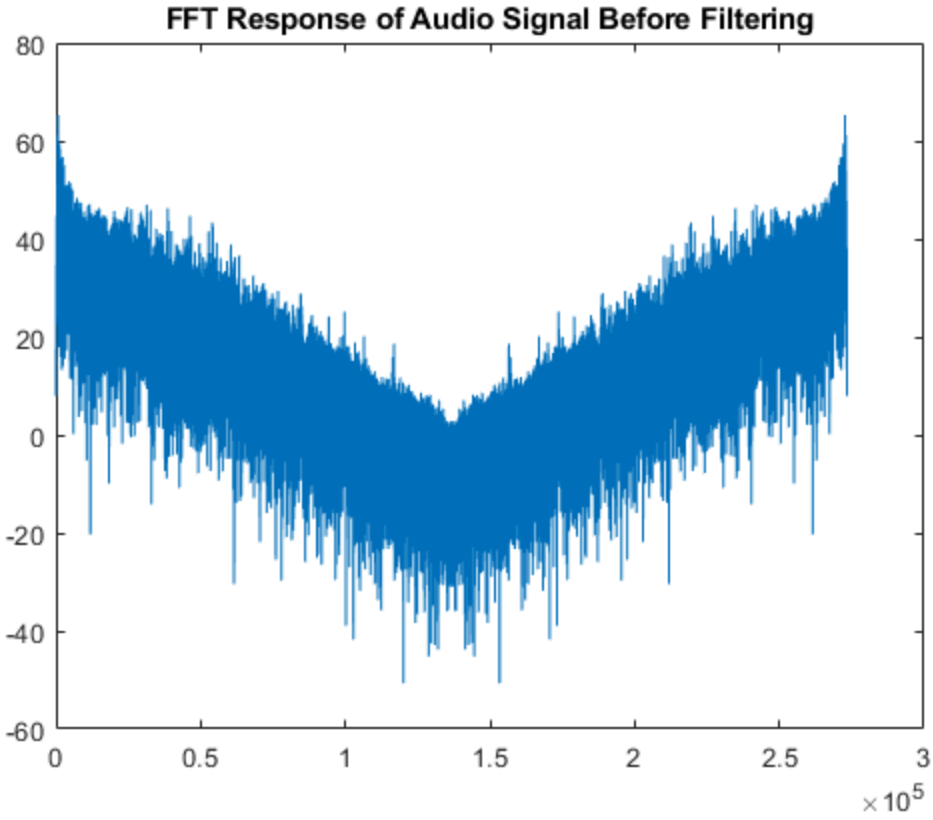
```
clear all;
close all;
```

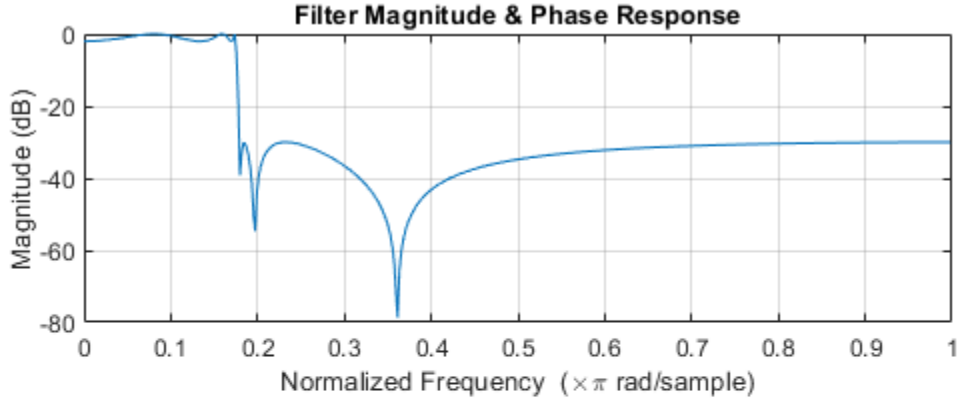
Exercise 3_1 Notch filter coeff calculator

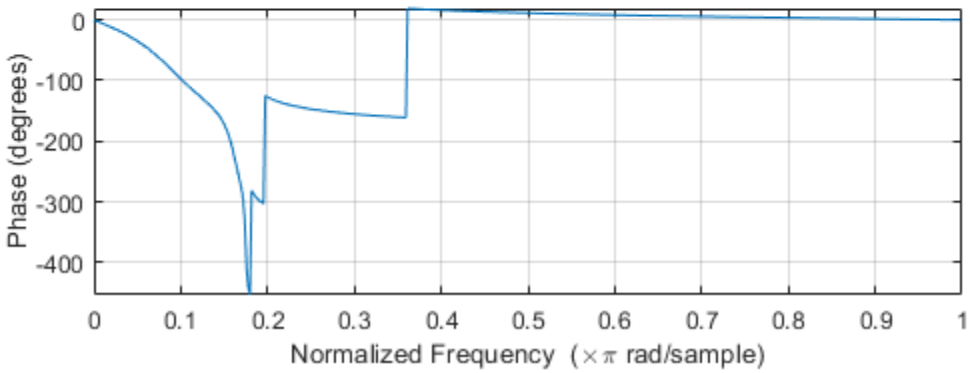
```
fs = 44100; % fs 44.1 kHz
G = 5; %5 dB of gain
Q = 2;% Q value of the filter
fc = 1000; % Center Frequency

fs2 = 44100; % fs 44.1 kHz
G2 = -12; %5 dB of gain
Q2 = 1;% Q value of the filter
fc2 = 15000; % Center Frequency


[a0 a1 a2 b0 b1 b2] =  Exe3_1(fs, fc, G, Q);
[a0_2 a1_2 a2_2 b0_2 b1_2 b2_2] =  Exe3_1(fs2, fc2, G2, Q2);
```

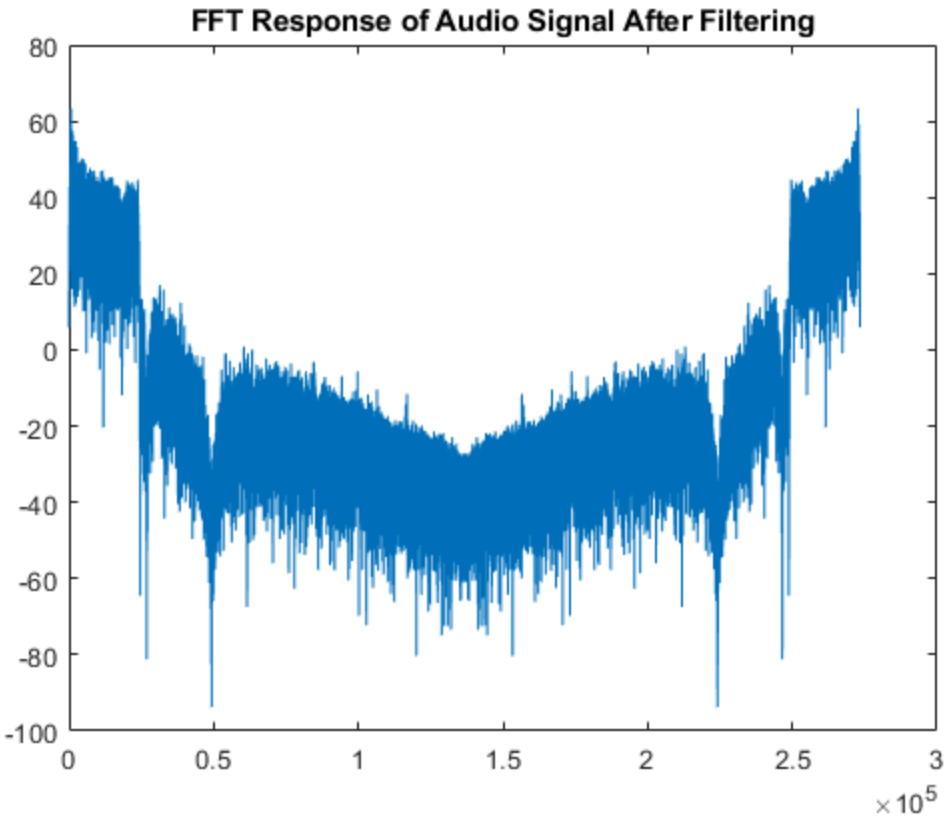
Exercise 3_2

```
ds_coeff = 2;
[A fs] = audioread('Exe3_2track.wav'); % Original Track
[A_ds fs_ds] = audioread('Exe3_2track_ds2.wav'); %Downsampled track
A_mono = A(:,1);
A_mono_ds = A_ds(:,1);

figure(1); plot(20*log10(abs(fft(A_mono)))); title("FFT Response of Audio
 Signal Before Filtering");

[A_mono, b ,a] = Exe3_2(A_mono,fs,fs_ds); % Calculate your filters and make
 the filters here

%soundsc(A_mono,fs); % Listen Original signal here
%soundsc(A_mono_ds,fs_ds); Listen filtered signal here
figure(2); freqz(b,a); title("Filter Magnitude & Phase Response") % Plotting
 the filter magnitude and phase response.
figure(3); plot(20*log10(abs(fft(A_mono)))); title("FFT Response of Audio
 Signal After Filtering");
```


FFT Response of Audio Signal Before Filtering
80
60
40
20
0
-20
-40
-60
0
0.5
1
1.5
2
2.5
3
×10^5

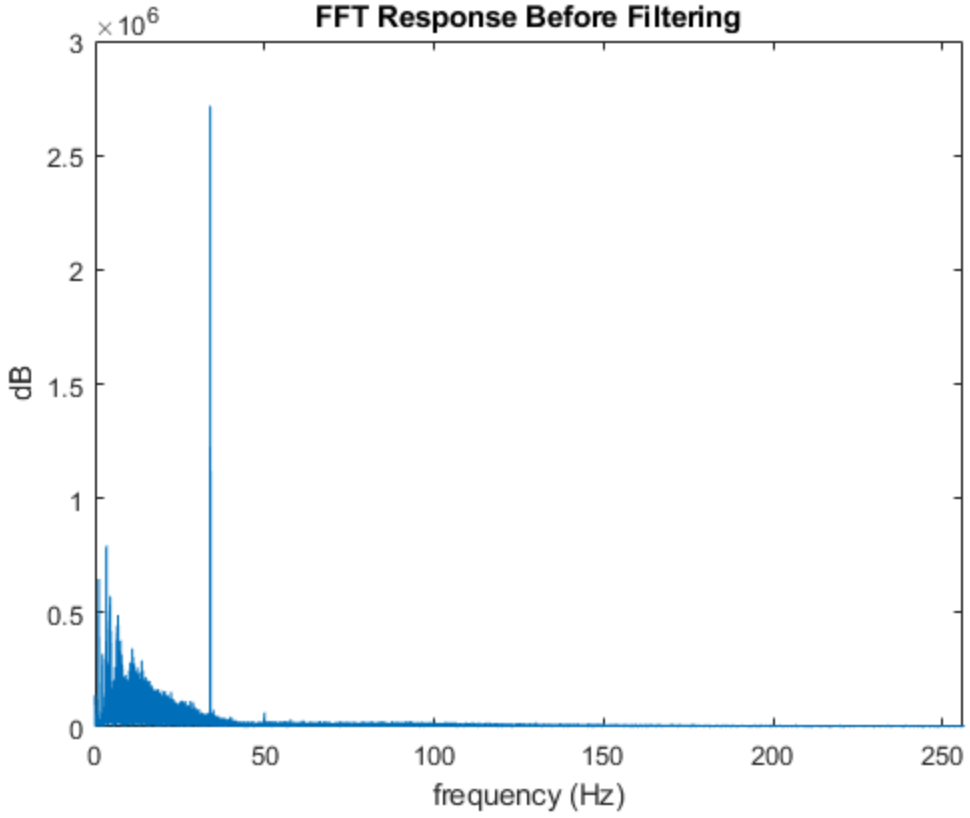

Filter Magnitude & Phase Response
Magnitude (dB)
0
-20
-40
-60
-80
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Normalized Frequency (×π rad/sample)

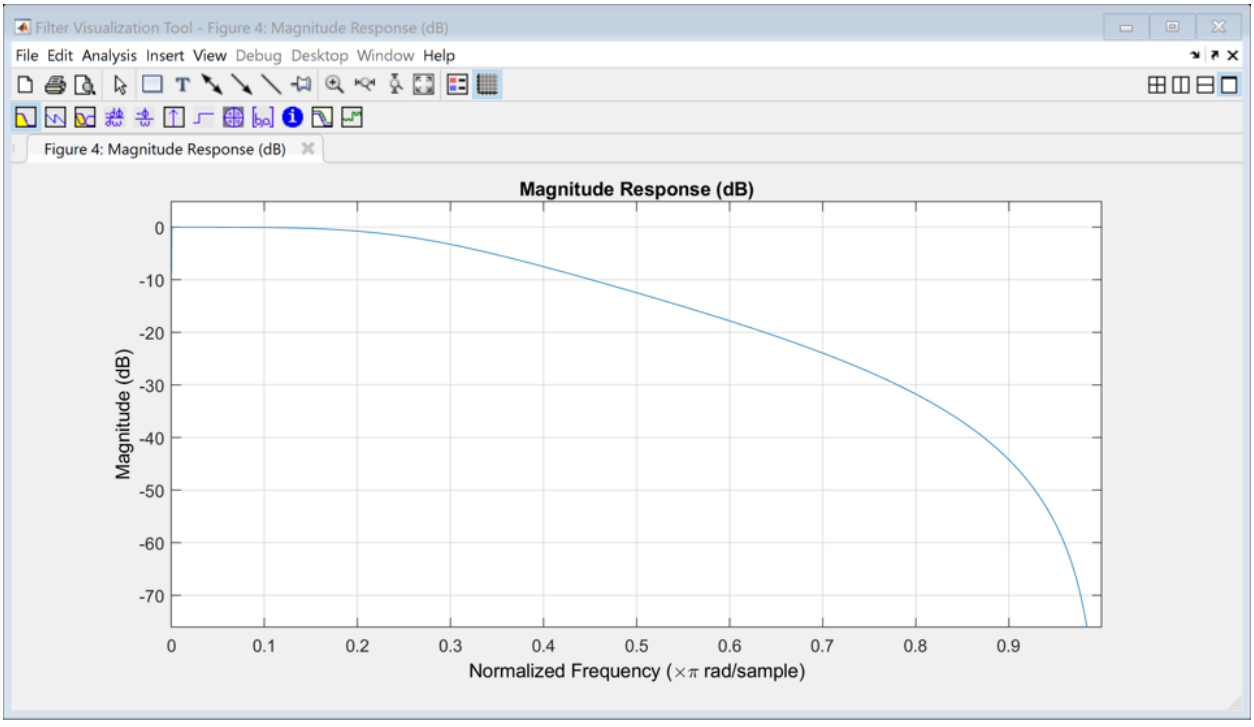

Phase (degrees)
0
-100
-200
-300
-400
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Normalized Frequency (×π rad/sample)

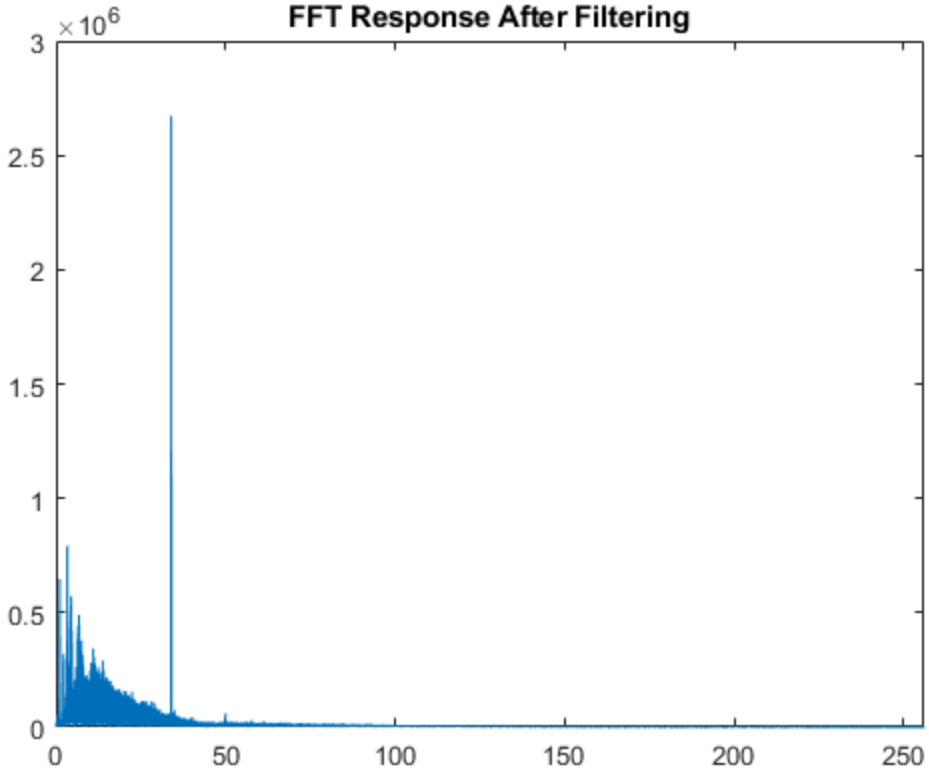


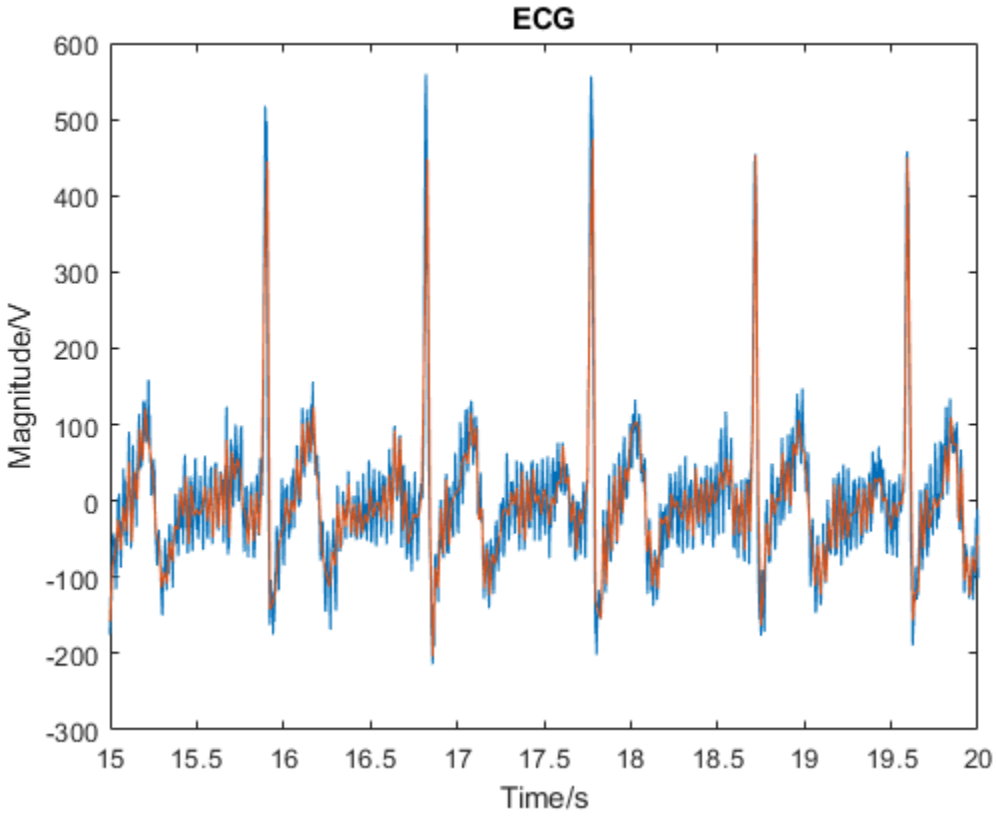
Exercise 3_3

```
% Produce an fft of existing ECG data, filter the data and extract pulse from

M = load('data.mat');
sig = Exe3_3(M);
```


FFT Response Before Filtering
×10^6
3
2.5
2
1.5
1
0.5
0
dB
0
50
100
150
200
250
frequency (Hz)


Filter Visualization Tool - Figure 4: Magnitude Response (dB)
File Edit Analysis Insert View Debug Desktop Window Help
Figure 4: Magnitude Response (dB)
Magnitude Response (dB)
0
-10
-20
-30
-40
-50
-60
-70
Magnitude (dB)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Normalized Frequency (×π rad/sample)


FFT Response After Filtering
×10^6
3
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250


ECG
600
500
400
300
200
100
0
-100
-200
-300
Magnitude/V
15
15.5
16
16.5
17
17.5
18
18.5
19
19.5
20
Time/s

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