Lab4

November 12, 2020 10:10 PM

1 b) Here is the audio information.

The sampling rate: 44100
Duration of video: 22.0297 sec
# of Bits/sample: 16 bits
bit rate = (16)(44100)(2) = 1,411,200 bits

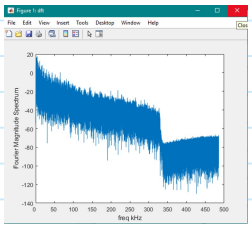
The matrix 971511 x2

Then the audio file was transformed into DFT.

```
Xr = fft(x);
```

2 b) X[0] = -70.0448
x[1] = -41.1795 - 28.7603i
X[2] = 64.9041 + 20.0717i
These value correspond to the amplitude and phase of the audio signal strength.

2 c) Plot for fft after using the function
$X_r = \frac{X_n}{N}$ where N is samples and r is $\frac{N}{2}+1$

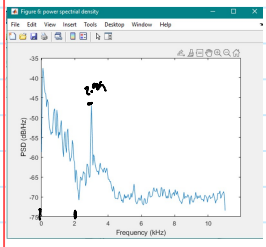


code to generate the plot

```
N = info.TotalSamples;
X_r = abs(Xr/sqrt(N));
X_r = X_r(1:N/2+1);
figure('Name' , "dft")
plot (20*log10(X_r))
xlabel("freq kHz")
ylabel("Fourier Magnitude Spectrum")
xt = get(gca, 'XTick');
set(gca, 'XTick', xt, 'XTickLabel', xt/1000);
```

The trend of the plot is
As you increase the frequency, the magnitude of sound decreases

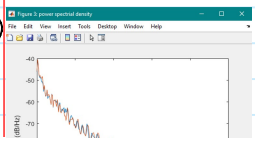
3e



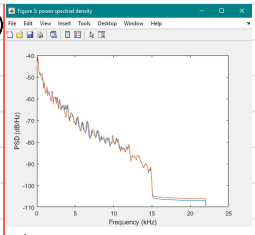
Frequency range of most energy: 0-2kHz

Frequency of Tonal noise: 2.99 kHz. You hear this weird pitch when you listen to the audio

3f)

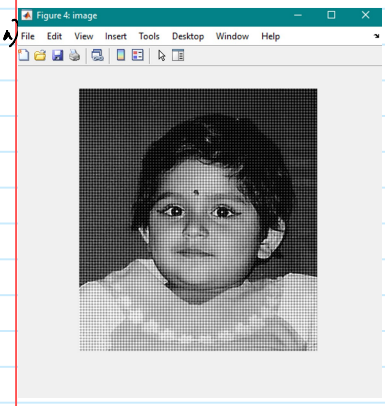


3d)



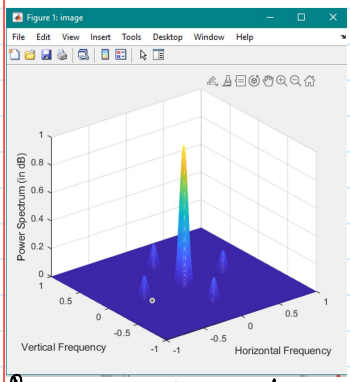
The graphs plotted represent the 2 channels since it's stereo and not mono. The reason why some parts of the graph is different is to make the audio more pleasing to listen.

4a)



4b) The grid lines and possibly the black mark between the eyebrows

4c)



Range -1 to 1 vertical
-1 to 1 Horizontal

4d) Center peak 0, 0
other peaks (0, -0.523438)
(0, 0.523438)
(0.523438, 0)
(-0.523438, 0)