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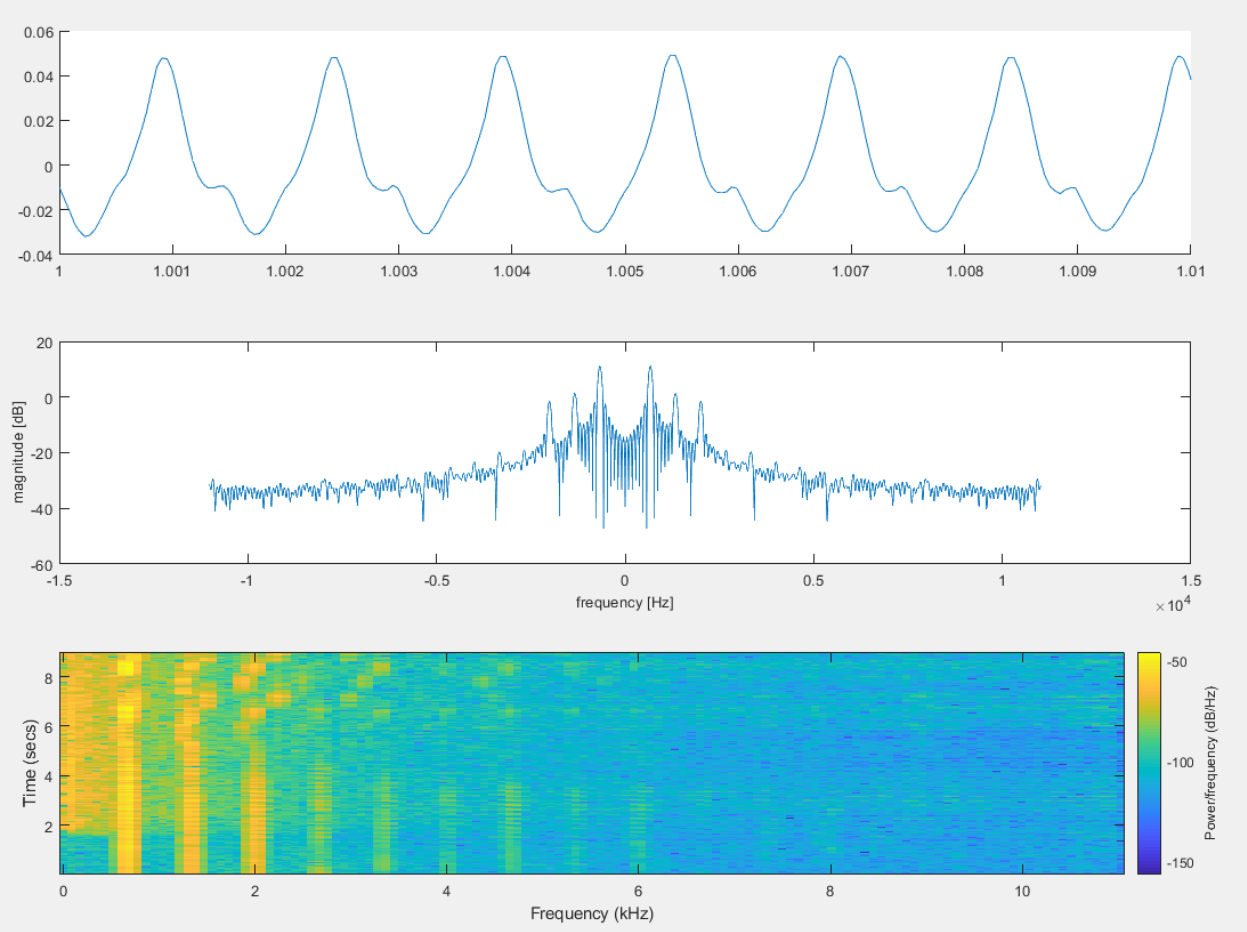
Computer Assignment 1

In this assignment I learned how to interface with files and convert between file formats. I also learned how to graph data in a way that is meaningful. During this assignment I was able to understand the data format and features of both audio and image files in MATLAB. The skill about which I learned the most is the plotting function. I am now able to place my data in a plot that meets the criteria necessary for the project.

Problem 1

Output from flute22.wav



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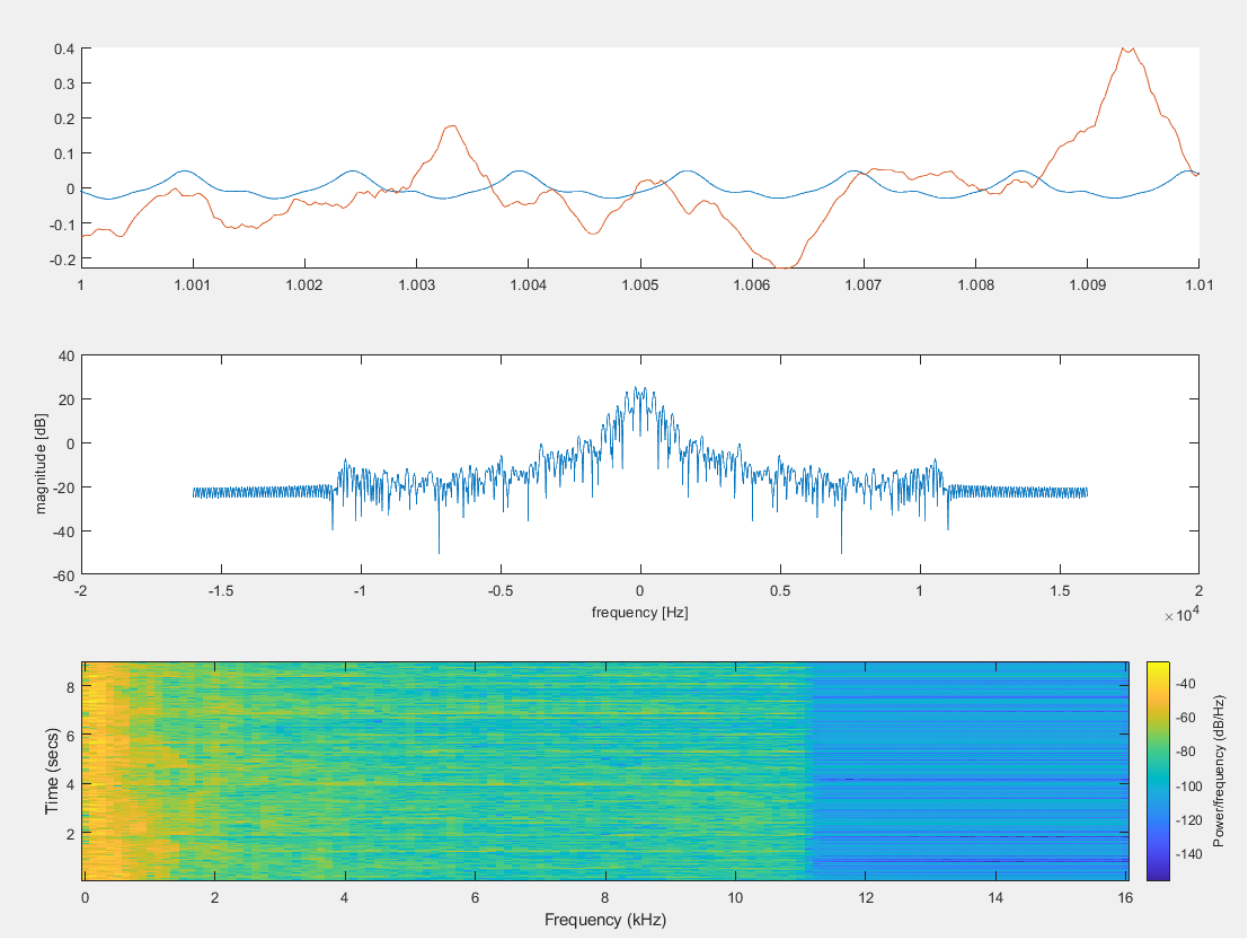
Output from music.mp3



Code from problem 1:

```
%filename = 'flute22.wav' %put the file path inside these quotes
filename = 'music.mp3'

ai = audioinfo(filename) ;
disp(ai)% display audio header structure
[originalsoundData,fs] = audioread(filename,[1 10]*ai.SampleRate); % read
audio file
%part A
resultBinFile = audio2bin(filename, ai.SampleRate)
%part B
newWavFile = bin2audio(resultBinFile, ai.SampleRate)
%part C
ai = audioinfo(newWavFile);
[processedsoundData,fs] = audioread(newWavFile,[1 10]*ai.SampleRate); % read
audio file
soundsc(processedsoundData, fs)
```

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```
%part D
subplot(3,1,1)
t = [0:length(processedsoundData)-1]/fs;
hold on
xlim([1 1.01]);
plot(t, processedsoundData)
hold off

%part E
subplot(3,1,2)
t1 = 1.0; % seconds
t2 = 1.01; % seconds
i1 = round(t1*fs); % convert time to index
i2 = round(t2*fs); % convert time to index
nfft = 2^12; % FFT size
freq = ([0: nfft-1]/nfft-0.5)*fs; % frequency [Hz]
X = fft (processedsoundData(i1:i2),nfft); % compute the discrete - Fourier
transform
plot(freq ,20*log10(abs(fftshift(X))));
% plot with accurately scaled frequency axis
xlabel ('frequency [Hz]','FontSize' ,10) ;
ylabel ('magnitude [dB]','FontSize' ,10) ;

%part F
subplot(3,1,3)
nfft = 2^8; % FFT size
overlap = round (0.8*nfft);
window = hamming(nfft) ;
spectrogram (processedsoundData,window ,overlap ,nfft ,fs ) ;


function y = audio2bin(filename, samplerate)
[soundData, fs] = audioread(filename);
% t = [0: length(soundData)-1]/fs;
% plot(t,soundData)
outputfilename = 'binaryout.bin'
fileID = fopen( outputfilename,'w' );
fwrite(fileID,soundData,'float');
fclose(fileID);
y =outputfilename;
end

function y = bin2audio(filename, samplerate)
outputfilename = 'outputAudio.wav';
binfile = fopen(filename,'rb');
if(binfile ==-1) fprintf('ERROR : Could not open file'); end
[s, cnt] = fread(binfile ,inf ,'float'); % read to the end of the file
fclose(binfile);
audiowrite(outputfilename, s, samplerate);
y = outputfilename;
end
```

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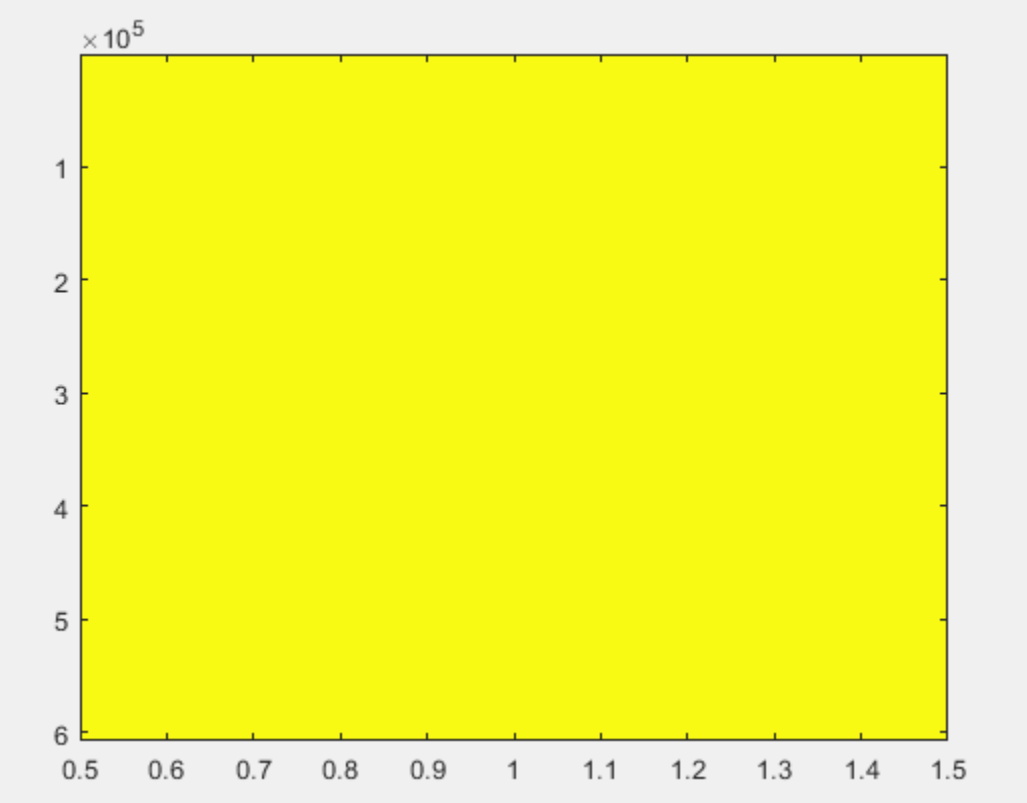
Problem 2

Output from coloredChips.png



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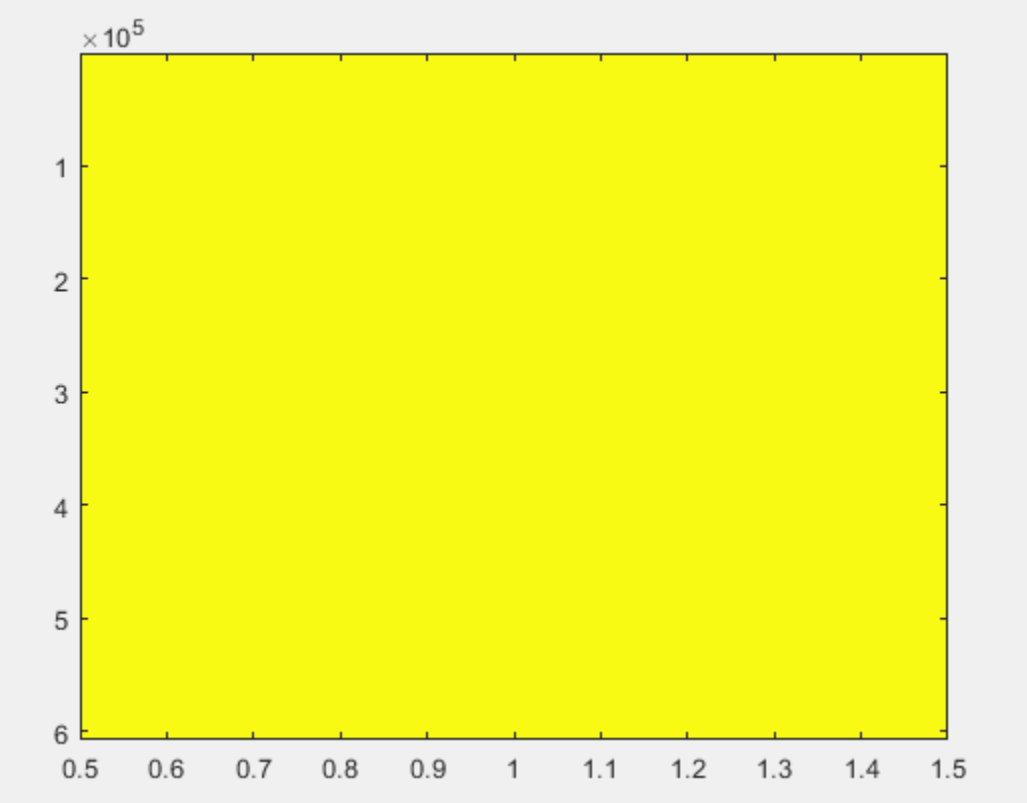
Output from liftingbody.png



Code form problem 2

```
%inputImage = 'coloredChips.png'
inputImage = 'liftingbody.png'
%part A
imageBin = image2bin(inputImage)
%part B
newImage = bin2image(imageBin)

%part C
img = imread(newImage);
image(img)

function y = image2bin(filename)
outputfilename =  'binaryImage.bin'
imageData = imread(filename) ;
fileID = fopen(outputfilename,'w' );
fwrite(fileID,imageData,'uint8');
fclose(fileID);
y =outputfilename;
end

function y = bin2image(filename)
outputfilename = 'newImage.png';
```

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```
binfile = fopen(filename,'rb');
if(binfile ==-1) fprintf('ERROR : Could not open file'); end
[rawImageData, cnt] = fread(binfile ,inf ,'uint8'); % read to the end of the
file
fclose(binfile);
% r = abs ( real (x) ) ;
% g = abs ( imag (x) ) ;
% b = abs ( real (x) ) ;
% x = cat (3 ,r,g,b) ; % concatenate along the third dimension.

imagesc(rawImageData)
% imwrite(rawImageData,outputfilename,'PNG');

% image(rawImageData);
% axis image; % make the pixels square
% print -dpng dftmtx_color_matlab.png;
% [nrows ,ncols , nrgb ] = size (x) ;
y = outputfilename;
end
```