

CmpE 362: Homework 3: Frequency Domain Filtering and Processing

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Problem 1

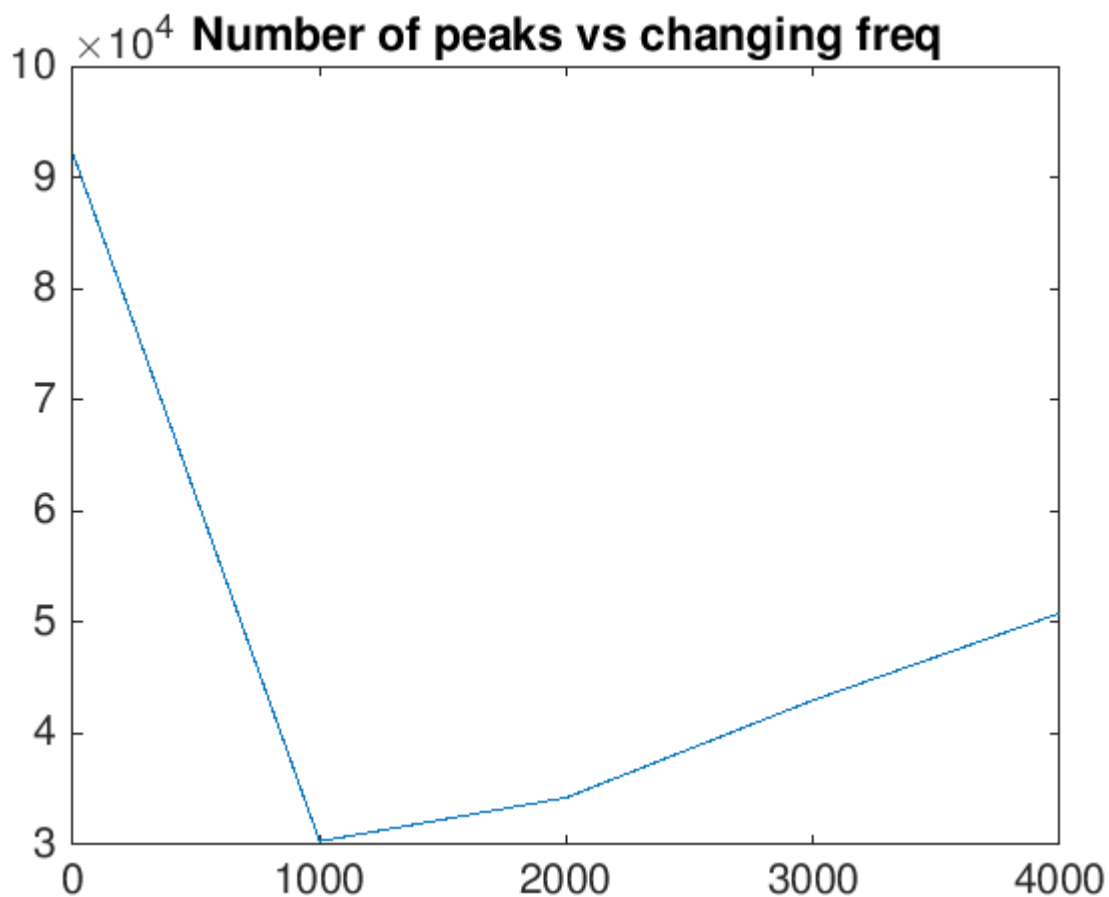
```
clc;clear;
% Read audio file
[y, Fs] = audioread('PinkPanther30.wav');

% Initialize the vector that holds cutoff frequencies
cutoffFrequencies = [0 1000 2000 3000 4000];
% Initialize the vector that holds number of peaks
numberOfPeaks = zeros(1, 5);

% Find number of peaks for no filter option
numberOfPeaks(1) = length(findpeaks(y));

for i = 2:5
    % Filter the data with low pass filters
    filtered = lowpass(y, cutoffFrequencies(i), Fs);
    % Find peaks from low pass filtered data
    peaks = findpeaks(filtered);
    % Save the total number of peaks
    numberOfPeaks(i) = length(peaks);
end

plot(cutoffFrequencies, numberOfPeaks);
title('Number of peaks vs changing freq');
```



Problem 2

```
clc;clear;clear sound;
% Read the image file into a matrix
img = imread('Hubble-Massive-Panorama.png');
% Convert the image to black&white
bw = rgb2gray(img);
% Binarize grayscale image
bin = imbinarize(bw);

result = [];

% Iterate over 1024 columns
for col = 1:1024
    % Initialize the vector that holds amplitudes
    wave = zeros(900, 1);
    % Iterate over 900 pixels in the column
    for row = 1:900
        % if pixel is not black
        if bin(row, col) ~= 0
            % Create amplitude as index of the part
            wave(row) = ceil(row / 90);
        end
    end
    % Convert column spectrum to time domain
    s = ifft(wave, 'symmetric');
    % Concatenate spectra
    result = [result repelem(s, 2)];
end

% Create a wav file from resulting signal
audiowrite('SonifiedDeepSpace.wav', result, 1800);

% Play the created sound
sound(result, 1800);

% Data is duplicated because sound function doesn't allow for 900 sample
% rate so I used 1800 sample rate with duplicated data
```