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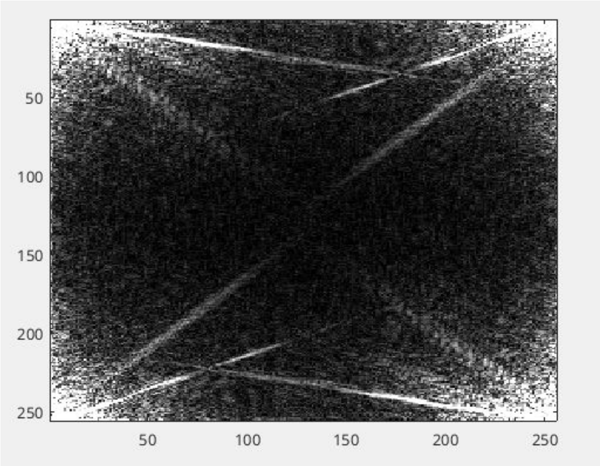
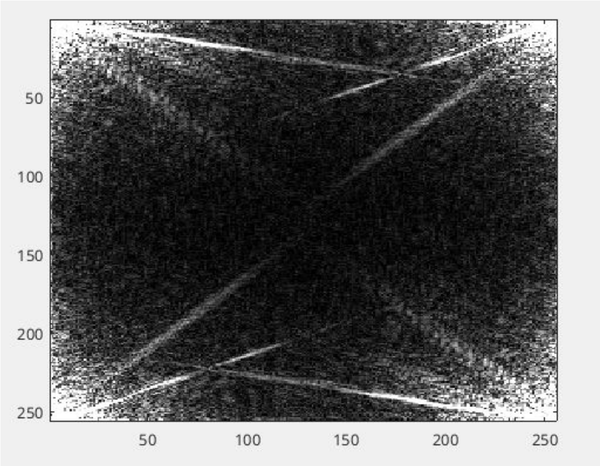
20161156

Dsaa-Assignment 2

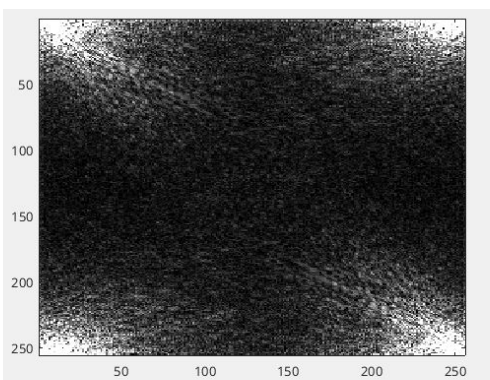
Q1

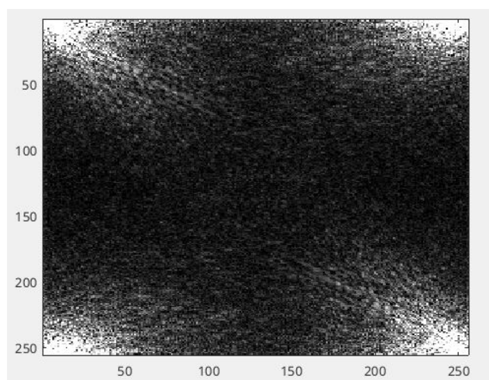


Original



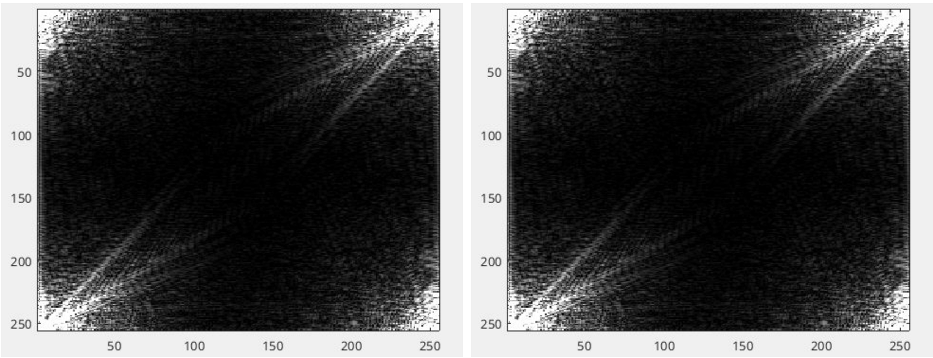
result





Original

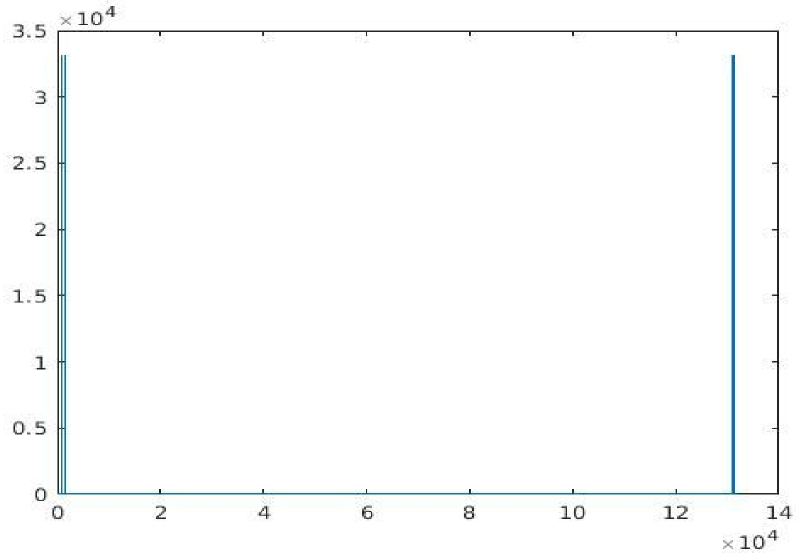
result



Original result

Q2

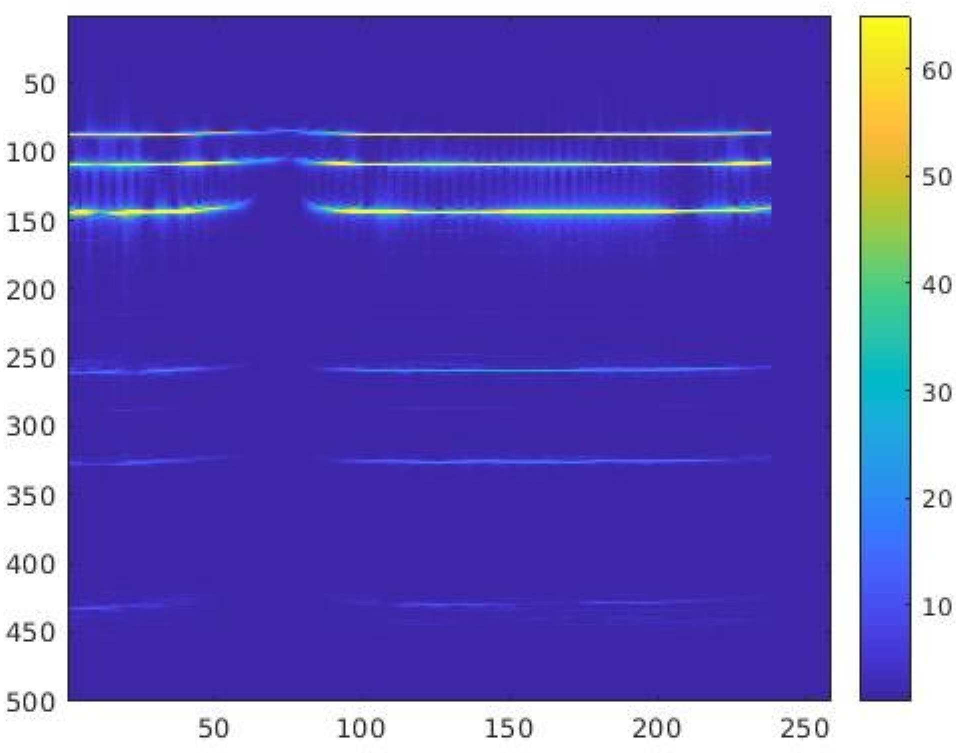
We observe that the FFT of q2.mat has two peaks at 882Hz and 1321Hz which are found in the first half of the FT. The other half consists of mirrored conjugate of the first half, so we take top four values instead of top two. Now allowing just these four frequencies and doing an IFT, we get filtered tone.



Q3

By decreasing the window length the frequencies are not clearly visible, but on increasing it too much, we cannot observe the changes with time.

If we keep a very large stride length the frequency changes are not clear. A very small stride would make the image too large.



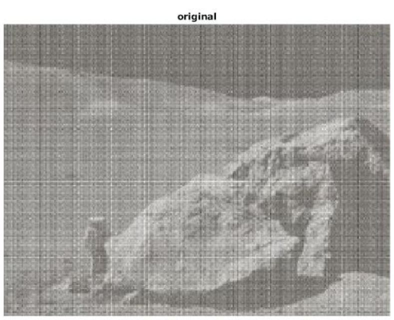
50
100
150
200
250
300
350
400
450
500
50
100
150
200
250
60
50
40
30
20
10

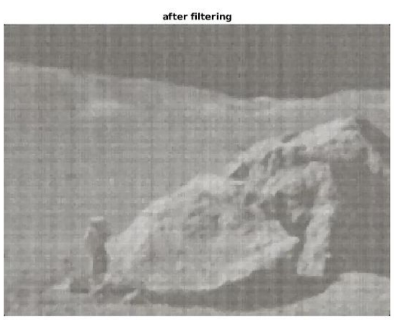
train.mat

Q4

To reduce the noise in the image, we just apply the median filter to each channel of the image matrix namely the Red channel, Green channel and the blue channel. The median is taken over [3,3] area around that pixel. We can change the [3,3] area of the median consideration and we observe that we get different outputs for different values.

We observe that absolute value of the FT just tells about the magnitude of frequencies and nothing more.





Q5

First we divide our original input audio into windows corresponding to the keys dialed. There will be 10 windows if 10 keys are dialed. Then we iterate over all the windows and take the fourier transform of that particular window only. Then we observe the peaks in the fourier transform of the window. Then we compare the frequencies at these peaks and the frequencies of all the digits from 0-9. And the digit at which we get the minimum difference between the frequencies at the peaks will be our answer. We store that particular digit in an array and then compute for the next window.

On calling our function for the file 'Police.ogg', we get 100 as our output.

Splitting the signal at an interval of 1 second (each dial time frame), and doing the fft for each one of these, and finding the two maximum frequencies, comparing with the actual dial tones we have for each digit. We finally get the whole number dialed.

Q6

We divide the FFT of the message into four parts and try out all the four permutations by reconstructing it back. Our message will be the one with least difference between adjacent values.

The method can be improved by just looking at the DFT signal and guessing. SInce the DFT cannot have stark differences for adjacent values.

The messages are- ‘If you are good at something, never do it for free’, ‘Why so serious?’ and ‘Let’s put a smile on that face’.