ISTANBUL TECHNICAL UNIVERSITY

COMPUTER ENGINEERING DEPARTMENT

BLG 354E
Signal & Systems for Comp. Eng.

Homework 2

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SPRING 2025

Contents

1 Question 1

In the first question, the mission is separating a wav file which has only two different frequencies into two different wav files which will include only one frequency sound. To achieve this mission, I firstly check the main sound file to see there is really only 2 different frequency.

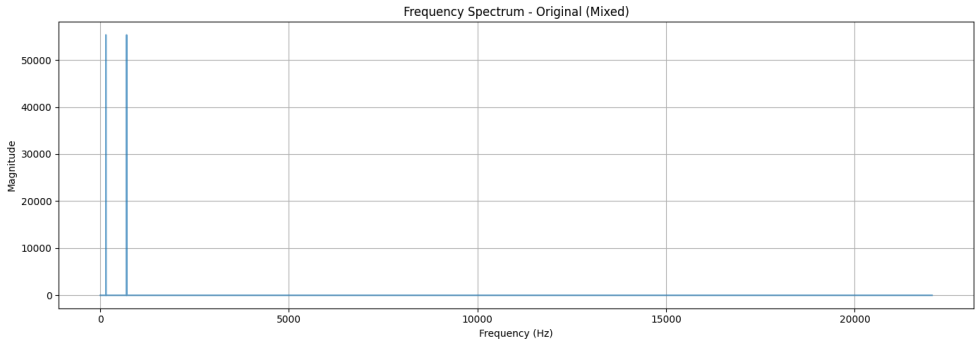

Figure 1: Main sound file freq

To separate this two frequency, I implement a filtering mechanism which runs with fourier transform logic. Function takes signal, low and high frequencies and took only this frequency interval.

After calculating the frequency intervals between 100-250 and 600-900, I took this results.

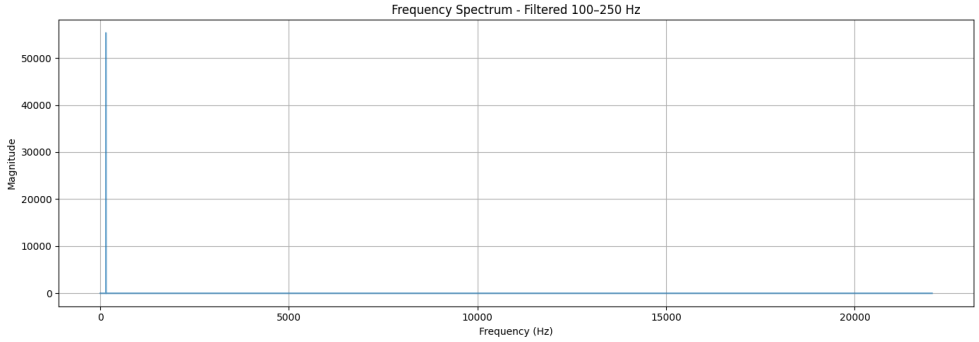

Figure 2: Frequency 100-250 Hz

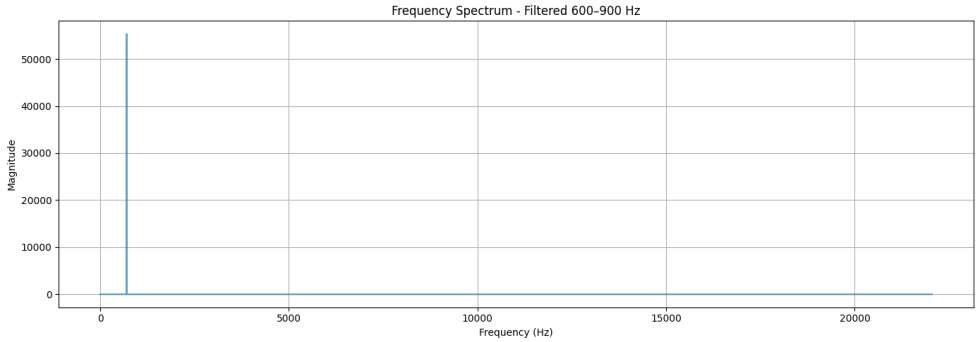

Figure 3: Frequency 600-900 Hz

2 Question 2

Second mission in this homework is that combining separated 2 sound files which I create in previous question. To make it, I implement a basic combining algorithm, after combining the sound, algorithm normalize it to arrange amplitude. After combining two sound file, I check if it is identical with the original one, and with a little disruption those are nearly identical.

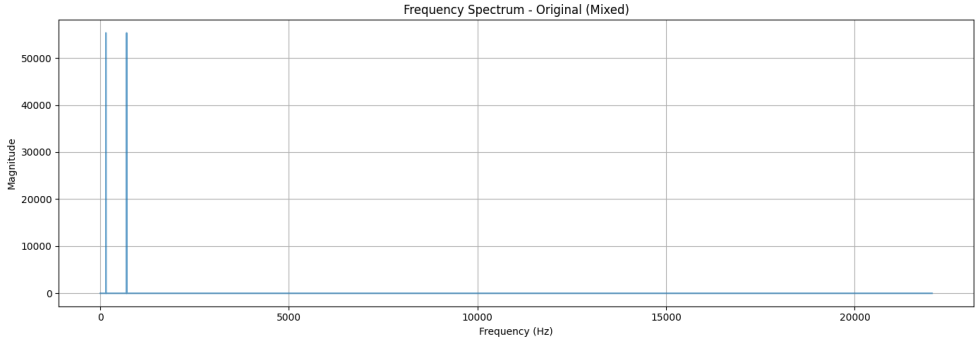

Figure 4: Original

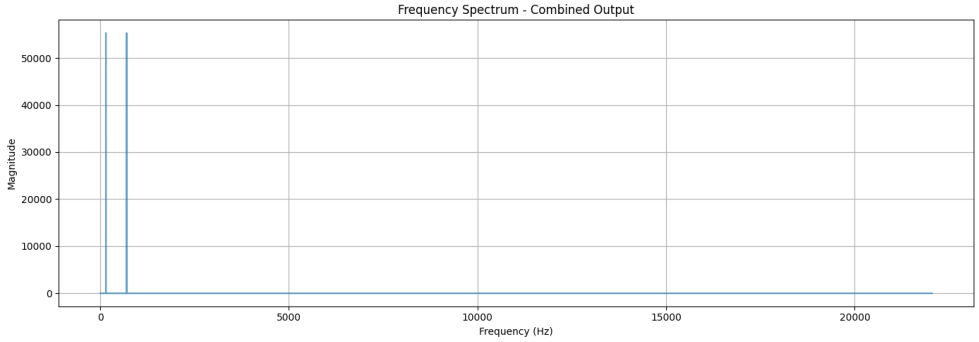

Figure 5: Combined

3 Question 3

The last part of the homework is classification of sounds according to Discrete Fourier Transform (DFT) values.

I implement DFT algorithm which given in the homework paper for three prototype signals, I select 8-point DFT for more reliable results. Outputs are like that:

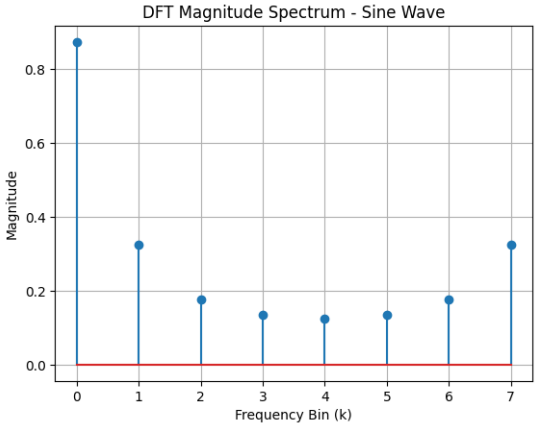

Figure 6: sine DFT output

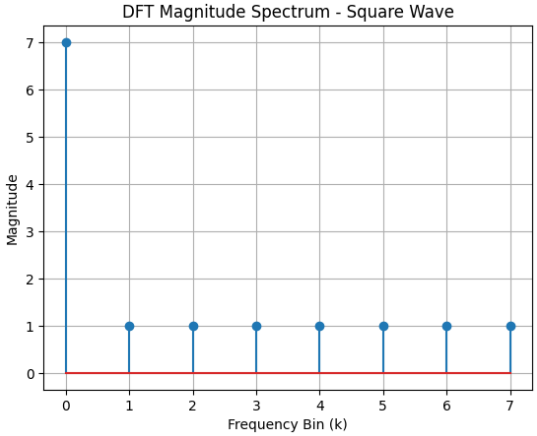

Figure 7: square DFT output

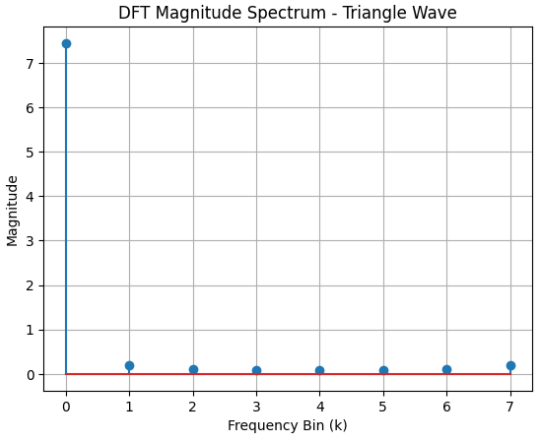

Figure 8: triangle DFT output

I compare all 12 sample audio files with this numerical information. I compare them using the Euclidean distance technique and for each prototype I calculate them and put them in the most optimal looking class and print it.

Sample #	**Classified As**
1	Sine
2	Sine
3	Sine
4	Sine
5	Square
6	Square
7	Square
8	Square
9	Triangle
10	Triangle
11	Triangle
12	Triangle

Table 1: Classification Results of 12 Test Signals

REFERENCES