ITU Computer and Informatics Faculty

BLG 354E Signals and Systems for Computer Engineering -2020 Spring

Homework-5

Due 26.06.2020 23:59

- No late submissions will be accepted.
- In Case of Cheating and Plagiarism Strong disciplinary action will be taken.
- You are asked to upload .py files and .pdf file (report) in your zip file. Give a brief explanation of your code in your report.
- Use comment outs on the necessary lines in your code.
- Put your name and number at the top of your code.
- The code you typed must WORK (as the manner of syntax). Otherwise, you will get zero points for that homework. Your code will not be fixed or debugged to work.

1. Two 16-bit sampled (@44100Hz) mono audio records (music) were provided for homework #3. You had written a Python code for implementation of Radix-2 Decimation in Frequency (DIF) type Fast Fourier Transform in homework #4. You have also applied 256-point Radix 2 DIF-FFT code on one of the audio records at three spots of the song (e.g. at 10^{th}, 20^{th} and 30^{th} second of the record) in homework #4. There is an additional requirement in homework #5 based on the previous homeworks.

a. Draw three graphs that shows variation of the Fourier convolution between the 256-point length audio record samples at three spots (from homework #4) and the overall audio record by shifting the 256-point length window.
b. Draw additional graphs by zooming in ±200 convolutional values range around the window location where 256-point sample is convolved with itself (for each of three graphs). Mark the maximum convolution value point.
c. Can you propose a feasible improvement on this method (FFT convolution) for recognition or similarity comparison of longer audio samples in 100milliseconds range? (explanation only, block diagram or algorithm can be added if necessary. Any method that is used for the same purpose in the scientific literature can also be given)

Please includes comment lines in the code. Plots (graphs) and explanations must be included in the report file.