The American University in Cairo

Department of Computer Science and Engineering

CSCE 3611 – Digital Signal Processing

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Released November 5th, and due by end of November 19th, 2018

Problem 1

1. Generate a ***1 sec*** digital signal from your microphone ***pronouncing your name*** and save it as an uncompressed audio file. You can use 'Audacity' or any other external software to generate the audio file.
2. Apply all-the-points DFT and plot its magnitude part.
3. Apply the inverse DFT. Compare it to the original audio by listening to both.

Problem 2

The exponential signal, x(t), where t is the time in seconds, is sampled at the rate of 20 samples per second, and a block of 100 samples is used to estimate its spectrum.

$$x(t)=\begin{cases} e^{-t} & t\geq 0 \\ 0 & t<0 \end{cases}$$

Compute the DFT of the finite-duration sequence. Compare the spectrum of the truncated discrete-time signal to the spectrum of the analog signal for the following cases:

1. Use all 100 samples to computer 100-point DFT
2. Use all 100 samples to compute 200-point DFT (by padding the sequence with 100 zeros)
3. Use 20 samples to compute 200-point DFT

Submission

Please make sure to submit the following

1. Source code of your programs (DFT and inverse DFT has to be your own implementation) [**3 pts**]
2. wav files for your audio signal generated in problem 1 above. [**1 pt**]
3. A report containing (relevant to problem 2)
   a) plot of the frequency spectrum of the analog signal x(t) (and show how did you calculate it before plotting) [**2 pts**]
   b) 3 frequency plots of the discrete signal x(n) for the 3 cases described. [**3 pts**]
   c) Explanation of why the discrete spectrum in the case of 20 samples is clearly different form the analog spectrum. How can you make it closer without changing the number of samples or the sampling rate? Plot the enhanced spectrum [**1 pt**]