EEL205 Assignment (programming assignment)

September 27, 2017

Question 1

Consider a discrete signal

$$x[n] = \sum_{i=1}^{10} \frac{1}{2^i} \cos\left(\frac{2\pi f_0}{N} n\right)$$

Compute its Fourier transform by making appropriate changes to the program provided and show magnitude plot of the Fourier transform.

Question 2

1. Generate samples of a signal using following code in Scilab

```
clear;
TotalDuration=10
samplingrate=500
samplinginterval=1/samplingrate
t=0:1/samplingrate:TotalDuration
N=length(t)//number of samples to be taken from a sound signal
signal=2*cos((40*%pi)*t)+0.5*cos((80*%pi)*t)+0.7*sin(200*%pi*t)-grand(1,N,'nor',0,1)
//sound wave signal with noise which is generated from normal distribution with zero mean
and unit standard deviation.
```

2. Plot signal's variation with time.
3. Compute discrete time Fourier series of this signal using fft command (make appropriate changes to the program provided) and show the magnitude plot.
4. What can you conclude about the frequency content of this signal?
5. Use inverse Fourier transform (ifft) to recover a signal that contains only three significant frequencies?

Equivalent code in MatLab to generate signal samples for Question 2

```
clear all;
TotalDuration=10
samplingrate=500
samplinginterval=1/samplingrate
t=0:1/samplingrate:TotalDuration
N=length(t)%number of samples to be taken from a sound signal
signal=2*cos((40*pi)*t)+0.5*cos((80*pi)*t)+0.7*sin(200*pi*t)-randn(1,N)
%sound wave signal with noise which is generated from normal distribution with zero mean
%and unit standard deviation.
```