
BLG 354E Homework - 4

Due Date: 07.05.2017 22:00

Policy: Please do your homework on your own. The code and the report you submitted must be your own work. Cheating is highly discouraged for it could mean a zero or negative grade from the homework.

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1. (30 pt.) The impulse response of a continuous time system is:

$$h(t) = \delta(t - 2) - 0.2e^{-0.2(t-2)}[u(t - 2)]$$

- (a) Find the frequency response $H(jw)$ of the system.
- (b) Plot the magnitude squared response by hand and phase response of the system by Matlab.
- (c) Suppose that the input to the system is:

$$x(t) = 5 + 10\cos(0.2t) + u(t)$$

Use superposition to find the output $y(t)$ using frequency or impulse response method where it is the easiest.

2. (30 pt.) Find Fourier or inverse Fourier Transforms of the following:

(a) $\xrightarrow{F} \frac{\sin(10w)^2}{2w^2}$

(b) $\xrightarrow{F} \frac{1}{25+w^2}$

(c) $e^{-a(t-2)}u(t-2)\cos(w_0t) \xrightarrow{F}$

3. (40 pt.) The spectral-subtractive algorithm is historically one of the first algorithms proposed for noise reduction. Download the three files attached with this homework : *spectralSubtractionAlgorithm.pdf* which explains the algorithm, *specsub.m* which includes the m file for the algorithm and *sp04_babble_sn10.wav* which contains sample noisy sound.

- (a) Run the code with *sp04_babble_sn10.wav* file as the input. The algorithm produces a filtered signal. Play the input file and the saved output file. Comment on what you heard and the differences between the two speech signals.
- (b) Go over the m file and explain the code pieces marked with *????* in the m file. Put your comments into the m file, and resave it with your initials: i.e. *specsubXX.m*