**3 Haziran 2019**

**ELE 361 HABERLEŞME SİSTEMLERİNE GİRİŞ**

**Matlab Project**

**Frequency Demodulation**

Save the FMSignal.mat file to your computer. It contains a time series , named **u**. This is an FM signal. Sampling rate is Fs=40000 samples/sec. That is, there is a time interval of 1/40000 sec between each sample. This FM signal is formed by modulating a carrier signal by a message signal m. Message m is a binary signal consisting of +1’s and -1’s. These are called “bits”. Each bit duration is 0.032 sec (i.e. 1280 samples).

You will submit a single Matlab .m file in this homework. No need for a Microsoft Word file.

Every item requested below should be in your .m file. When runned, it should display the requested plots and other answers.

1. Load “FMSignal.mat” file using the **load** command .
2. Using the **plotfft** function that I provided, plot the fft of the **u** signal. Identify the carrier frequency of the FM signal with your eyes. Using **Disp** veya **fprintf** commands, display the carrier frequency on the command window.
3. Take the derivative of the FM signal. Plot the derivative using the **plot** command. For the derivative **diff** command can be used.
4. Pass the resulting derivative from an envelope detector. You have to write a small matlab code fort he ebvelope detector. You can optimize it using trial and error. The code should mathematically perform the function of the envelope detector circuit shown in the class. No need to implement the circuit %100, it just needs to catch the envelope of the derivative signal.
5. Eliminate the DC offset of the envelope.
6. Divide the resulting signal to chunks of 1280 samples. Take the average of every chunk. Form a binary series by replacing the average with 1 if the average is >1, replace it by 0 if it is <1. Display the binary series by using **fprintf** command.
7. This binary series is a coded version of a secret message by using the “Varicode” standard. Plase check this web site for information on varicode: <https://en.00wikipedia.org/wiki/Varicode>
8. Determine the corresponding text message by hand. I don’t want an automatic Varicode decoder. Using the information on web site decode the binary message by hand. Display the result on the command window using the **disp** command.

You are not allowed to use existing codes on the Internet. You can only use the standard **four operations and round, reshape, repmat, diff, numel, size, zeros, ones, exp, sign** commands.

Due date: June 28th Friday at 18:00. E-mail the .m file to [tobbele361lab@gmail.com](mailto:tobbele361lab@gmail.com) e-mail address. Save your code as NameLastname.m.