Programming Assignment #5

CSCE 4510/5510 001

Spring 2018

Wireless Communication

100 Points

Instructions: Generate all the deliverables and create a zip archive of your assignment folder (code and labelled plots) and upload the zip file. Not following the above instructions could result up to 20% deduction from your program assignment score.

Objective:

Demonstrate quantization, channel encoding, TDM, demultiplexing, channel decoding, and interpolation of signals using Matlab.

Requirements:

1. Sample and quantize the given signals. Plot the given signals
2. Use hamming code for channel encoding and use TDM to perform multiplexing of the signals. Transmit the multiplexed signal
3. Receive the multiplexed signal, demultiplex, check for errors, and reconstruct the signals
4. Plot the reconstructed signals.

Procedure:

1. Plot $y_1=\sin(3000\pi t)$, $y_2=\cos(3000\pi t)$, and $y_3=\sin(3000\pi t) + \cos(3000\pi t)$ on three separate figures. Sample and quantize the signals with T_s = 0.3ms and for $0 \le t \le 3$ms. Where T_s is the sampling interval and the ADC has 256 quantization levels.
2. Use a suitable binary code to represent the quantized samples. How many bits are necessary to represent each sample?
3. Using hamming coding, convert each coded data bits to channel codes.
4. Use TDM to multiplex the signals into one transmission. Each signal is given a time slot of $T_s/3$. Assume that the samples are already available for multiplexing.
5. Transmit the multiplexed signal.
6. Flip a data bit of your choice.
7. Receive the multiplexed signal and de-multiplex the signal.
8. For each signal, using the hamming code, check for errors. If there are errors correct the errors

9. If there are no errors, retrieve the data from the code word for each signal.
10. Extract the data bits from the corrected coded bits.
11. Reverse your data coding scheme to get the quantized samples back.
12. Recover the analog signal from these quantized samples. Ideally, you'll need a low pass filter to recover, but for the purpose of this exercise just plot the quantized samples like you would plot an analog signal.
13. Plot the original and recovered analog signals on the same plot.
14. Make sure you do not use any functions or Simulink toolbox from Matlab. Do not copy functions or code from other sources for the above process.

Deliverables:

1. Upload all the plots (label all the axes and caption the plot) along with the commented Matlab code to Blackboard.
2. Submit a text file that describes the working and usage of the code.