

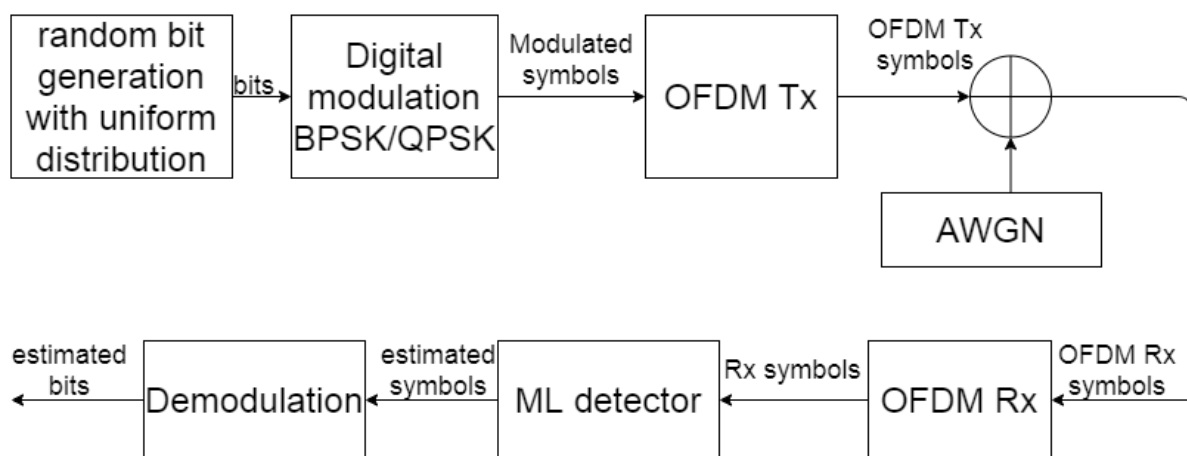
EE5802: DSP Lab

Assignment 4

Problem:

Bit error rate(BER) performance evaluation of OFDM with BPSK and QPSK.

Technical details:



- For each value of E_b/N_0 ,
 - Number of iterations = 1000
 - IFFT/FFT size = 256
 - Length of CP = 32
- In each iteration perform 256 point IFFT/FFT. Use your own IDFT/DFT function written in previous assignment.
- Use the system model as $y = x + n$, where $n \sim CN(0, N_0)$
- The receiver must decode y based on the ML detection or minimum distance decoder. Then use the decoded output bits to check if the decoder was able to correctly identify the transmitted bits in this iteration. Use a counter to count the number of decoded bits that are in error for each value of E_b/N_0 .

- Find BER for each E_b/N_0 as below

$$BER(E_b/N_0) = \frac{\text{no. of bits in error}}{\text{Total no. of bits transmtted}}$$

- Plot BER using 'semilogy' Matlab command.

Submission Details:

- Write Matlab code to implement above communication system.
- Write a single 'assign04_rollnumber.m' file and write all functions for digital Modulation, OFDM Tx, OFDM Rx and ML detection. Use proper comments in codes to explain which part of code is for what purpose.
- Upload assign04_rollnumber.m and all BER plot in a single figure in 'assign04_rollnumber.fig' format. '.fig' is matlab figure format file. Use 'legends' also in figure and do 'grid on'. Your figure should contain 4 plots i.e. simulated BER of BPSK with OFDM, simulated BER of QPSK with OFDM and theoretical BER as given below.
- Submit all files in a single zip file with your id, Example: EE20MTECH11010_A4.zip.

Notes:

- Compare your simulated BER with theoretical formula as given below.

- $BER \text{ of BPSK} = BER \text{ of QPSK} = Q \sqrt{2 * (E_b/N_0)_{lin}}$