Experiment No. 1

Amplitude Modulation (AM) and Demodulation

Write a MATLAB program (without using communication toolbox inbuilt functions like 'comm.AMModulator', 'ammod' etc.) to demonstrate AM modulation and demodulation technique in each of the following three schemes.

a. Conventional AM technique

b. Double Sideband Suppressed Carrier (DSB SC) modulation technique

c. Single Sideband Suppressed Carrier (SSB SC) modulation technique

In your report include

- Time domain plots of:
    1. Message Signal
    2. Carrier Signal
    3. Modulated signal
    4. Demodulated Signal
- Frequency domain plots of:
    1. Modulated Signal
    2. Demodulated Signal

in each of the above three schemes.

Experiment No. 2

Frequency Modulation (FM) and Demodulation

Write a MATLAB program (without using communication toolbox inbuilt functions like 'comm.FMModulator, fmmod' etc) to demonstrate Frequency Modulation (FM) and demodulation technique. Use envelope detection method presented in the video attached for demodulation.

In your report include

- Time domain plots of:
    1. Message Signal
    2. Modulated signal
    3. Demodulated Signal
- Frequency domain plots of:
    1. Message Signal
    2. Modulated Signal
    3. Demodulated Signal

Experiment No. 3

Bit error rate of Binary Phase Shift Keying (BPSK) in Additive White Gaussian Noise (AWGN)

Write a MATLAB program (without using communication toolbox inbuilt functions like 'comm.BPSKModulator') to perform BPSK Modulation and demodulation technique in AWGN.

Find out the error probability and plot Bit Error Rate (BER) vs. Signal to Noise Ratio (SNR) curves for simulated values. Compare this with the theoretical values obtained using the equation based on Q-function.

(For your reference, an example code for 8PSK can be found in *Introduction to communication systems* by Upamanyu Madhow, page no.: 321, code fragment: 6.3.1)

Experiment No. 4

Bit error rate of Quadrature Phase Shift Keying (QPSK) (with and without Gray labelling) in Additive White Gaussian Noise (AWGN)

Write a MATLAB program (without using communication toolbox inbuilt functions like 'comm.QPSKModulator') to perform QPSK Modulation and demodulation technique in AWGN.

Find out the error probability and plot Bit Error Rate (BER) vs. Signal to Noise Ratio (SNR) curve for simulated values in the following two cases:

a. QPSK without Gray labelling (Figure 1a).

b. QPSK with Gray labelling (Figure 1b).

Compare them with the plots obtained by plotting theoretical values computed using the equations based on Q-function.

Gray labelling is an ordering of symbols where there is a one bit difference between successive symbols while other labellings can have a difference of more than one bit between successive symbols as shown in the figure below.

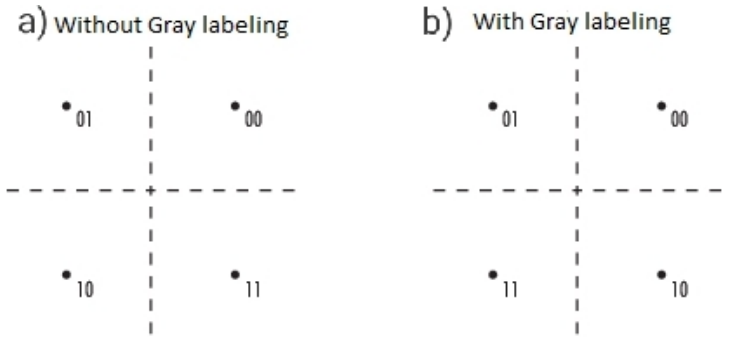

Figure 1: Constellation diagram for QPSK a)Without gray labelling b)With gray labelling

(For your reference, an example code for 8PSK can be found in *Introduction to communication systems* by Upamanyu Madhow, page no.: 321, code fragment: 6.3.1)

Experiment No. 5

Bit error rate of 16 bit Quadrature Amplitude Modulation (16- QAM) with and without Gray labelling

Write a MATLAB program (without using communication toolbox inbuilt functions like 'qammod') to perform 16 bit QAM and demodulation with and without Gray labelling. Come up with own constellation diagram for both the cases.

Find out the error probability and plot Bit Error Rate (BER) vs. Signal to Noise Ratio (SNR) curves for simulated values in following two cases

1. 16-QAM without gray labelling.
2. 16-QAM with gray labelling.

Compare them by plotting theoretical values computed using the equation based on Q-function.