Communications Lab
Experiment 3
Lab Report

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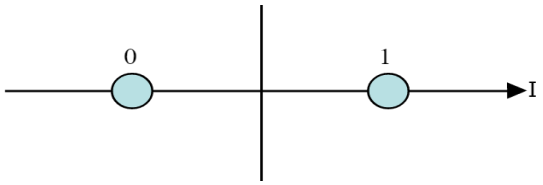
BPSK Modulation & Demodulation:

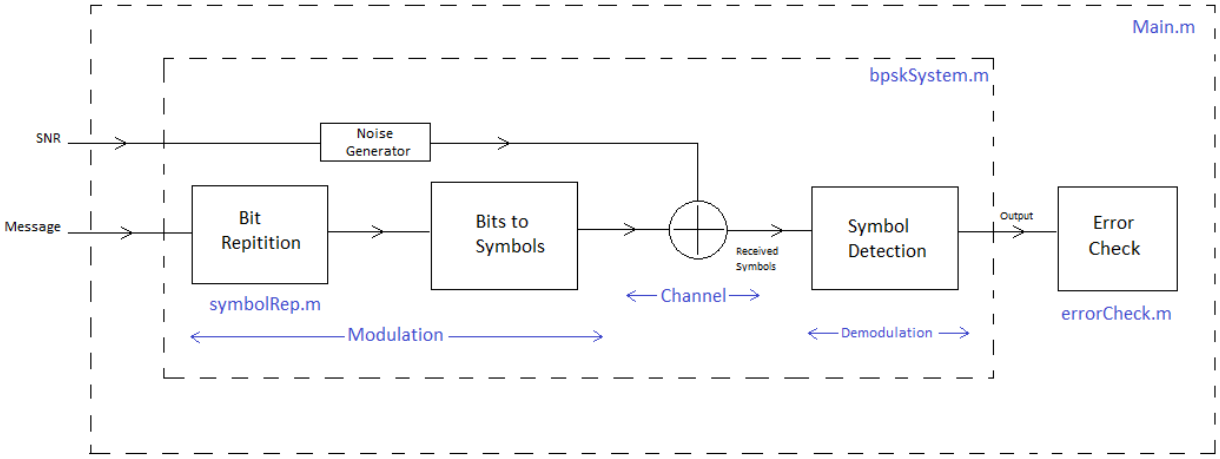
BPSK stands for Binary Phase Shift Keying. BPSK is a binary modulation scheme as it has only 2 symbols, one corresponds to 0 phase and the other corresponds to π phase.



BPSK simulation:

The simulation contains 4 scripts Main.m, bpskSystem.m, symbolRep.m, errorCheck.m

Simulation scheme:



The simulation scheme gives us a working knowledge of the simulation process and the function of each of the four scripts.

Step 1: Generating message bits. I have taken 50 random bits in my message.

message_bits = [1 0 1 1 0 1 1 0 1 0 1 0 1 1 1 0 1 0 1 0 0 1 0 0 0 0 1 0 1 0 1 0 1 0 1 1 0 1 0 1 0 1 0 1 1 0];

Step 2: Modulation.

It is a 2 step process.

1. Repeating the message bits. In the above case each bit is repeated 1000000 times.
2. Converting these bits to BPSK symbols.
   0 → -1 & 1 → 1, for this we simply do $symbols = 2bits - 1$

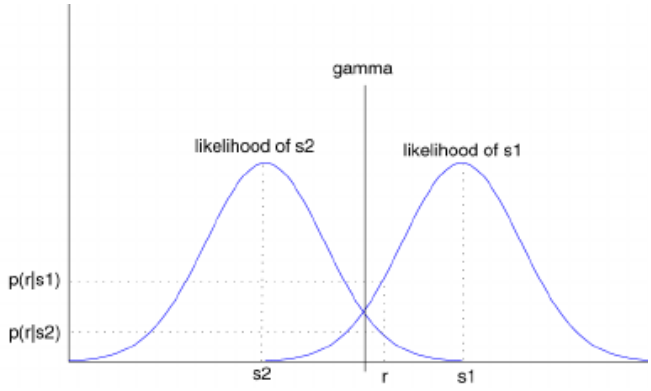
Step 3: Addition of noise.

For this we first generate noise using the randn() function of matlab and scale it by σ.
(*Note this SNR is on linear scale not DB)

$$\sigma = \sqrt{\frac{1}{2SNR}}$$

Step 4: Demodulation.

For demodulation we simply check the amplitude of the received signal if it is greater than 0 it is detected as 1 otherwise as -1. The above detection rule is derived from the ML decision boundary for BPSK.



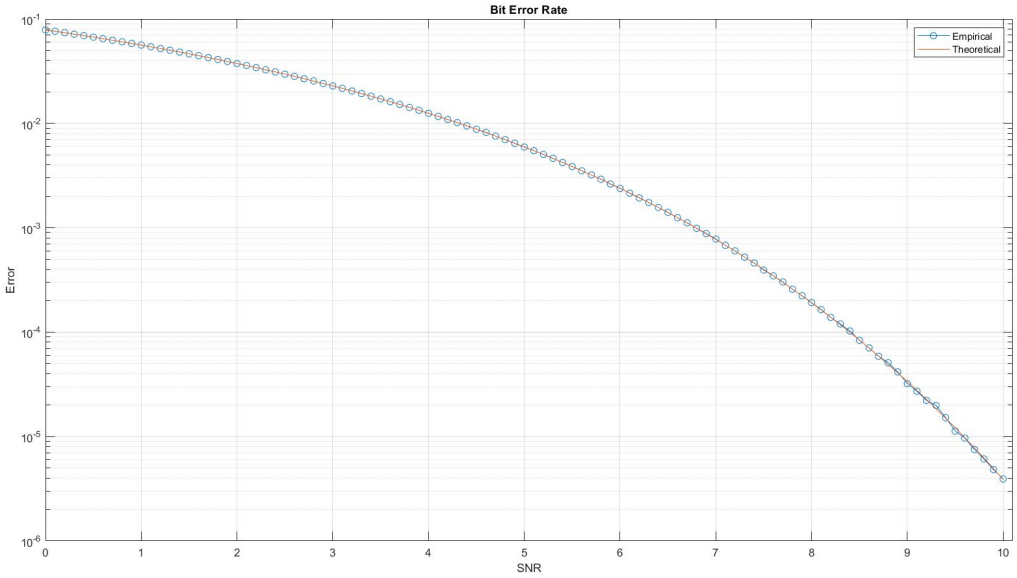
Step 5: Error Check.

In this step we compare all the received bits with the repeated message bits and count how many are falsely detected.

Finally,

$$Bit\ Error\ Rate = \frac{no.\ of\ false\ detection}{Total\ no.\ of\ bits\ received}$$

We repeat the above procedure for different values of SNR in the Range of 0 to 10 (DB)
And check the bit error rate for each SNR.



This image is attached with the submission BER.jpg