EE321 Communication Engineering Term Project

BASK Communication Simulation

Due date: 12/5

The purpose of this project is to simulate Binary ASK and check its performance using MATLAB. You need to make a BASK communication system for coherent and non-coherent detection. In this project, you modulate a message using ASK, transmit a modulated signal through a channel and detect it. With the received signal, you make a decision on what the original message is. You are also asked to calculate several numerical values. The main goal of this project is to plot the requested signals and values to be identical to the figures given in this document.

You need to modulate a given message sequence consisting of 10000 messages by using 2 symbols {0,1}. The carrier frequency of the modulated signal is given in the skeleton code, $2\pi f_c = w_c = 10\pi$.

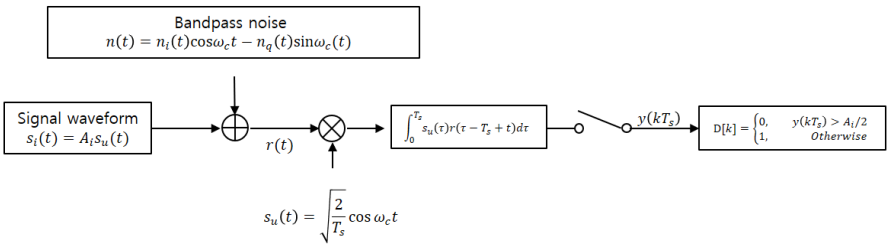


Figure 1: The structure of correlator-detector with coherent detection

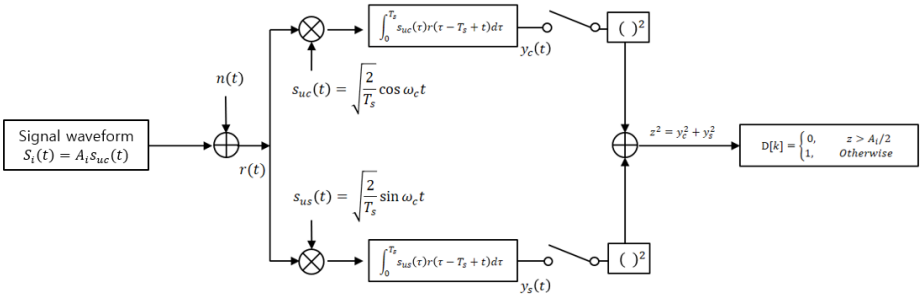


Figure 2: The structure of envelope-detector with non-coherent detection

BASK_coherent

Plot 1. The received signal

- The received signal without noise
- The received signal with noise

Plot 2. The correlator output

- The correlator output without noise
- The correlator output with noise

In Plot 1 and Plot 2, you need to plot the result for the **last 4 symbol times** when SNR=10dB. In other words, you need to get the result of 160 samples for the last 4 messages which is '2 2 1 2'.

Plot 3. The correlator output samples

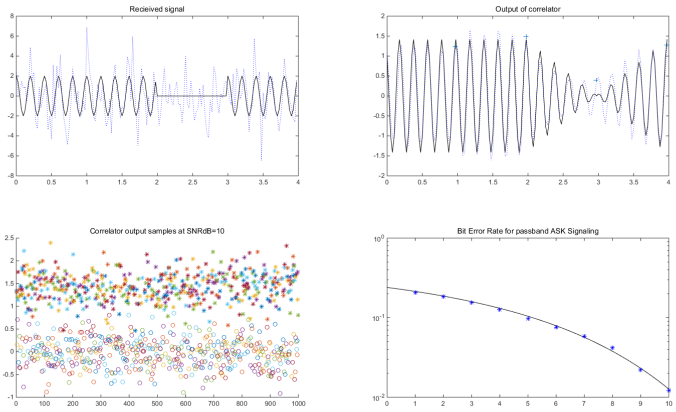
- The correlator output with noise for each message

In this figure, you need to plot the result for the **first 1000 messages** when SNR=10dB.

Plot 4. Bit Error Rate for passband ASK signaling

- The theoretical error probability
- The number of errors divided by the number of total messages

You need to calculate the theoretical error probability for coherent detection. In the skeleton code, **SNRdbs** is for the simulation result(star) and **SNRdbt** is for the theoretical result(line) of BER.



BASK_noncoherent

Plot 1. The received signal

- The received signal without noise
- The received signal with noise

Plot 2. The envelope detector output

- The square-law device output without noise
- The envelope detector output with noise

In Plot 1 and Plot 2, you need to plot the result for the **last 4 symbol times** when SNR=10dB. In other words, you need to get the result of 160 samples for the last 4 messages which is '2 2 1 2'.

Plot 3. The envelope detector output samples

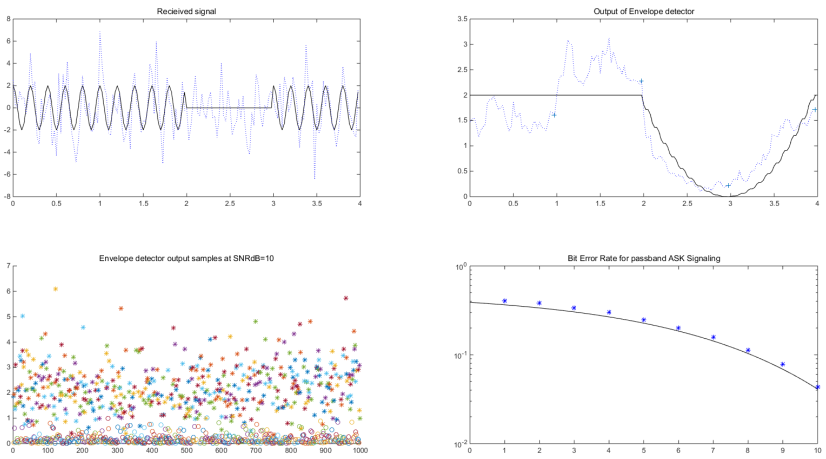
- The envelope detector output with noise for each message

In this figure, you need to plot the result for the **first 1000 messages** when SNR=10dB.

Plot 4. Bit Error Rate for passband ASK signaling

- The theoretical error probability
- The number of errors divided by the number of total messages

The theoretical error probability for non-coherent detection is $\frac{e^{-\frac{\text{SNR}}{4}}}{2}$.
In the skeleton code, **SNRdbs** is for the simulation result(star) and **SNRdbt** is for the theoretical result(line) of BER.



Notice

- Result figures should be the same as the given figures in the PDF.
- TAs will check the codes by using arbitrary generated messages and noise signals.
- If you want to change the skeleton codes, you **must** make comments in the codes to avoid the confusion of variables.
- Submit your MATLAB code and result figures in **.zip** file named as **ID_yourname.zip**
  ex) 20190000_권정현.zip
- MATLAB file names should be **coherent_ID.mat** and **noncoherent_ID.mat**
  ex) coherent_20190000.mat