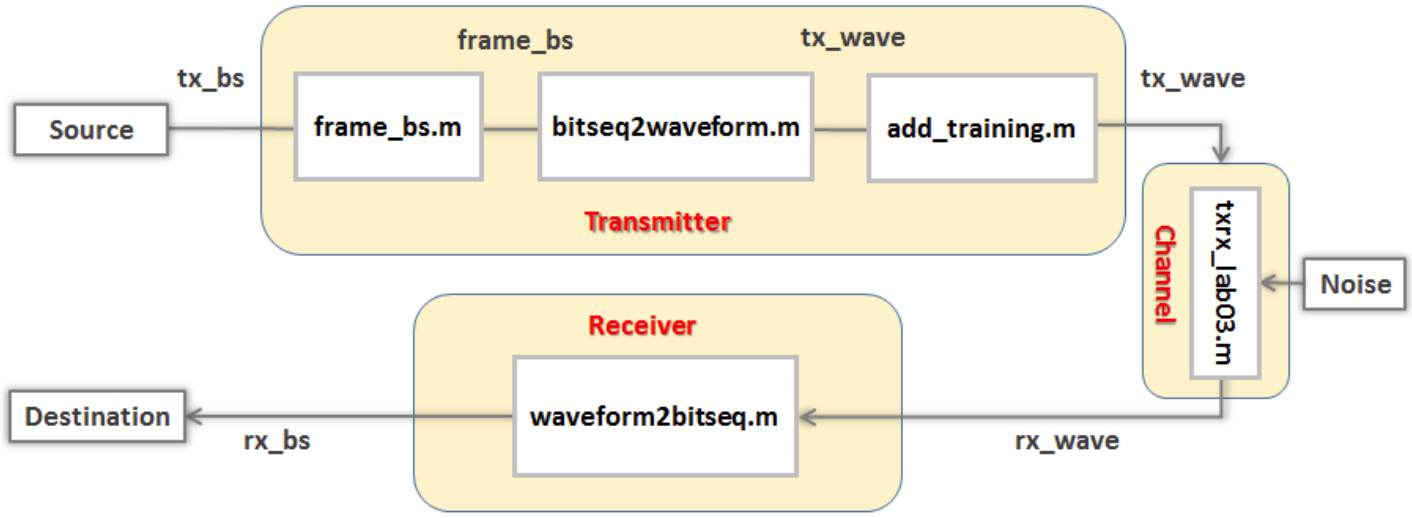
LAB 4 - PERFORMANCE EVALUATION (1 point possible)

In this task, you will evaluate the performance of a communication system operating at various bit rates. To adjust the bit rate, you will change the bit time in samples per bit (SPB).




```
tx_bs=rand(1,1280)>0.5; % generate sequence of 1280 random bits

SPBlist = 1:15;             % list of bit times to test
num_SPB = length(SPBlist);  % number of bit times to test
BER = zeros(1,num_SPB);     % initialize bit error rate array

for i = 1:num_SPB,         %generate the SPB list
    SPB = SPBlist(i);
    tx_wave = format_bitseq(tx_bs,SPB);  % create waveform following protocol
    rx_wave = txrx_lab03(tx_wave);       % simulate channel
    rx_bs = waveform2bitseq_lab04(rx_wave,SPB);  % decode received waveform
    BER(i) = compute_BER(tx_bs,rx_bs);  % compute the BER
end

figure(1);
```

Unanswered

Run Code

Check Save *You have used 0 of 10 submissions*

Help

INSTRUCTIONS

Let's first look at how the code works. It first defines a random 1280-bit sequence, and a list of 15 bit times in samples per bit. The **`for`** loop simulates the communication channel you built in the previous labs for each of the 15 bit times. The function **`format_bitseq`** combines the functions **`frame_bs`** and **`bitseq2waveform`**, which you have written, with the function **`add_training`** to encapsulate a given bit sequence into a frame and add the training sequence. The resulting waveform is transmitted over the channel, and the bit stream is estimated by the function **`waveform2bitseq`**, which you also wrote. The function **`compute_BER`** calculates the BER of the recovered bit sequence by comparing the input bit sequence **`tx_bs`** with the decoded bit sequence **`rx_bs`**. The BER is defined as the ratio between the total number of bits received in error and the total number of bits in **`tx_bs`**. Here the MATLAB variable **BER** is a 15 element vector containing the BER at each of the 15 bit times contained in the variable **`SPBList`**.

Step 1: Modify the code to compute the bit rate and plot results

If you run the MATLAB code as presented you will see an empty plot. To complete this task, you should add code under the comments starting with

```
% Place your code below that
```

This code should

1. Compute the bit rate in units of Mbps (mega-bits per second) for each bit time in **SPBList** assuming that samples are transmitted at a rate of 500 samples per second. Store these values in a 1x15 vector called **bitrate**.
2. Plot the bit error rate and the bit rate as a function of the bit time in samples on the same graph. The bit error rate graph should be plotted first using the color red. The bit rate should be plotted second using the color blue. For more on how to generate multiple plots on the in the same graph in MATLAB, please review the videos Line Plots (/courses/HKUSTx/ELEC1200.1x/3T2014/jump_to_id/3ccb91e06d15423da7f2bf7ca82fa9ec) and Multiple Plots (/courses/HKUSTx/ELEC1200.1x/3T2014/jump_to_id/323f8adb3bf94250b0de9e45b5fc73a3)**.**

Step 2: Submit your work

Once you have completed your work, click on the **Check** button to submit your answer. Based on the graphs, how do the BER and the bit rate change when the bit time is increased? Are these changes desireable or not?