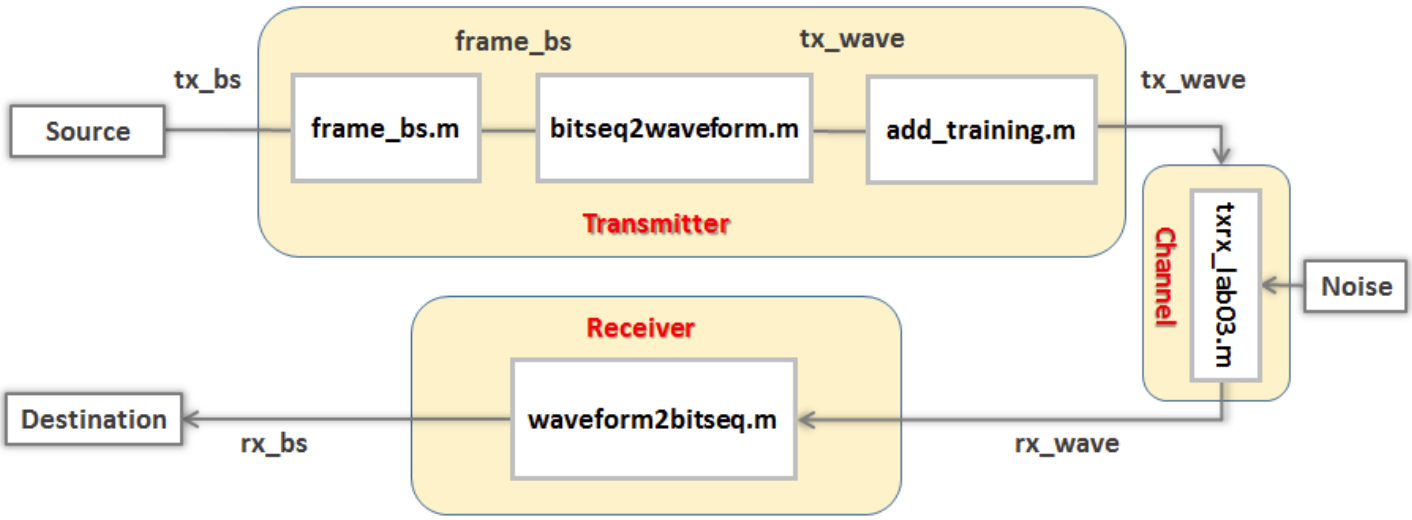
LAB 3 - TASK 2 FIND THE THRESHOLD (1 point possible)

In this task, you will simulate the transmission of the frame signal and estimate the threshold value for detecting the bit sequence.



The window below contains the MATLAB code to simulate the transmission of a framed signal through the channel. Your task here is to plot the transmitted waveform `tx_wave` and the received waveform `rx_wave`, and estimate the threshold value by inspecting the received training sequence from the plot of `rx_wave`.

```
tx_bs = rand(1,1280) > 0.5; % generate random bit sequence
SPB=5;                      % bit time in samples

% transmitter %
tx_bs_frame = frame_bs(tx_bs);              % add start and stop bit and generate framed block
tx_wave = bitseq2waveform(tx_bs_frame,SPB); % create a samples waveform with SPB samples per bit
tx_wave = add_training(tx_wave);            % add a training sequence

%channel
rx_wave=txrx_lab03(tx_wave,15); % simulate channel with distance=15 cm

n=[1:3000];
```

```
figure(1);
%---your code here to generate plot of tx_wave---
plot(n, tx_wave(n));
```

Unanswered

Help

```
n=[1:3000];
figure(1);
plot(n,tx_wave(n));
grid on;                % create grid
title('Channel Input');  % create plot title
xlabel('sample index');  % label X axis
ylabel('amplitude');     % label Y axis
figure(2);
plot(n,rx_wave(n));
grid on;                % create grid
title('Channel Output'); % create plot title
xlabel('sample index');  % label X axis
ylabel('amplitude');     % label Y axis
```

Run Code

Hide Answer *You have used 0 of 10 submissions*

INSTRUCTIONS

Let's first look at how the code works. The generation of the input bit sequence and the setting of the SPB are similar to previous tasks. The function **`frame_bs.m`**, which you wrote the code for in Task 1 of this lab, encapsulates the given bit sequence into a frame. You wrote the code for **`bitseq2waveform.m`**, which transforms the framed bit sequence to the transmitted waveform in the previous lab. The function **`add_training(tx_wave)`** adds the training sequence to the transmitted waveform.

Step 1: Run the code

Click on the **Run Code** button to execute the MATLAB code in the window. You will see two empty figures generated. Your task is to use the MATLAB plot function to fill in these figures with plots of the transmitted and received waveforms. If you want to know how to generate plots in MATLAB, please see the videos Line Plots (/courses/HKUSTx/ELEC1200.1x/3T2014/jump_to_id/3ccb91e06d15423da7f2bf7ca82fa9ec) and Stem Plots (/courses/HKUSTx/ELEC1200.1x/3T2014/jump_to_id/cd7dd69efc7841a0bf5fa3cdf94195ee).

Step 2: Plot the transmitted and received waveforms

In this step, you will use **`plot`** function to plot the first **3000** samples of **`tx_wave`** and **`rx_wave`**. Figure 1 should contain a graph of the first 3000 points of the transmitted waveform **`tx_wave`**. Figure 2 should contain a graph of the first 3000 samples of the received waveform **`rx_wave`**. Plot the waveforms as a function of sample index. For convenience, follow the MATLAB convention and index the first sample by 1.

Replace the comment line

```
%---your code here to generate plot of tx_wave---
```

with the **plot** command that plots the first 3000 samples of **tx_wave**. The code following the comment adds a title, and x and y axis labels to the plot for you. Then replace the line

Help

```
%---your code here to generate plot of rx_wave---
```

with the commands required to plot the first 3000 samples of **rx_wave** and label the plot with the title "Channel Output", and the X and Y axes with "sample index" and "amplitude" respectively.

Step 3: Calculate the threshold value of the received waveform

Identify the received training sequence from the generated plot of **rx_wave**. Estimate the minimum and maximum values of the received signal by inspection. Calculate the threshold value as the **average** between the minimum and maximum values of the received signal.

Step 4: Submit your work

Click on the **Check** button to submit your work on the MATLAB coding, and **answer the question** below regarding the value of the estimated threshold.

LAB 3 TASK 2 - QUESTION 1 (1 point possible)

What is the threshold value for detecting bits from `rx_wave`?

Please key in the numerical value of your answer to two significant digits in the box provided below. The answer is correct if it is within 0.02 of the expected answer.

Answer: 0.37

EXPLANATION

The threshold should be the average value of the minimum and maximum of the training sequence.

Hide Answer *You have used 0 of 3 submissions*

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