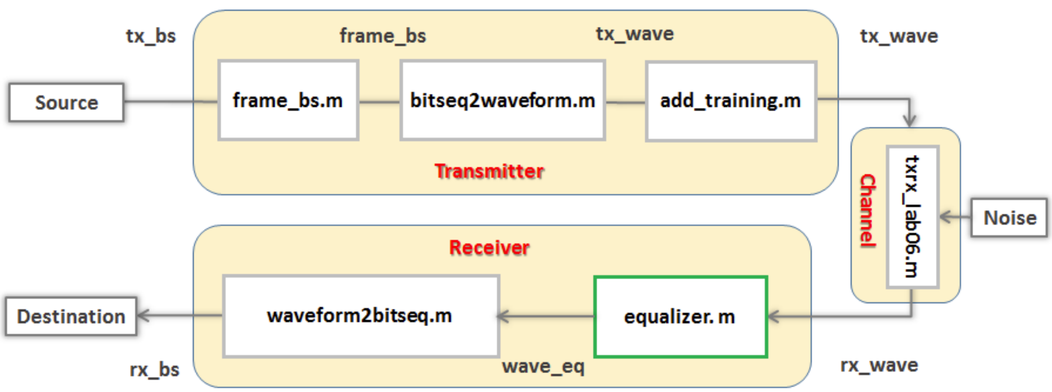
LAB 6 TASK 2 - EQUALIZATION (1 point possible)

In this task, you will implement the equalizer, which compensates for the effects of the channel based upon the parameters estimated in Task 1 of this lab. You will work on the block, **equalizer.m**, highlighted in green.




```
tx_bs = rand(1,1280)>0.5;       % generate a random bit sequence
SPB = 20;                       % bit time in samples

tx_wave = format_bitseq(tx_bs,SPB);     % create waveform
rx_wave = txrx_lab06(tx_wave);          % simulate channel
start_ind = find_start_lab06(rx_wave); % find start bit

% Place your code below that applies an equalizer to the rx_wave and
% stores the output as eq_wave.
% Assume that eq_wave(0) = 0.
eq_wave = zeros(size(rx_wave)); % initialize equalizer output


% plot eye diagrams - do not modify code below
% plot eye diagram without equalization
```

Unanswered

Run Code

Check Save *You have used 0 of 10 submissions*

INSTRUCTIONS

The initial code in the window above plots the eye diagram of the received waveform, which is not widely open. Your job is to implement the equalizer and compare the eye diagrams with and without equalization.

Step 1: Run the code as presented

Help

After you click on the **Run Code**, MATLAB will return two subplots in one figure. The upper subplot shows the eye diagram of the received waveform when the bit time is 20 samples per bit. The lower subplot is empty. Your task is to apply the equalizer to the received signal **rx_wave**.

Step 2: Apply the equalizer to the received waveform

To complete this task, you should write a program to implement the equalization of the received signal. Assume that the input **x(n)** and output **y(n)** of the channel are related by an equation similar to that introduced in the lecture video

$$y(n) = a * y(n-1) + (1-a) * x(n)$$

The difference between this equation and that introduced in the lecture is that the **k** is missing. (Equivalently, we have assumed **k = 1**.) This difference will not affect the operation of the equalizer significantly, since the effect of **k** is only to apply a scaling factor to the output, but not otherwise affect its shape.

To obtain the equalizer, invert the equation above to express **x(n)** in terms of **y(n)** and **y(n-1)**.

Apply this equalizer to the received waveform **rx_wave**. Name the equalized waveform **wave_eq**. Use the value of **a** that you estimated in Task 1. For the first equalizer output, **wave_eq(1)**, you will need to make an assumption about the value of **rx_wave(0)**, which is not observed. Assume that **rx_wave(0) = 0**.

Enter your code below the comment starting with "`%Place your code below that`".

Step 3: Submit your work

Once you have completed your work, click on the **Check** button to submit your answer. How do the two eye diagrams differ? Note that because the exponential step response is not a perfect model of the actual step response, you will not be able to recover the input exactly. However, you should still see that the eye diagram of the equalized waveform is significantly more open.