Programming Assignment #3

CSCE 4510/5510 001

Spring 2018

Wireless Communication

100 Points

Objective:

Convince yourself that CDM/CDMA work by performing the spreading and dispreading operations in a noise free environment using Matlab.

Requirements:

1. Plot the given digital data for each user (the message bit stream to be transmitted)
2. Generate a 8x8 Walsh matrix and print the Walsh matrix. Use the following procedure to do it in MATLAB.
   Set the 1X1 Walsh Matrix W1=[1]
   For every higher order Walsh Matrix,
   $$W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & -W_N \end{bmatrix}$$
   Remember the r^{th} row will be referred to as Walsh Code $(r-1)$
3. Using the given digital data for each user, spread each of the user's digital data using the specified Walsh code for each user
4. Combine each of the user's spread digital data together and plot the combined signal
5. Decode/recover each user's signal by dispreading each user's signal using the specified Walsh code for each user. Plot the recovered digital data for each user
6. Compute the bit error for each user and print the bit error.

Procedure:

1. Digital data:
   - **a.** User 1: 0 1 1 0 1 0 1 0 0 1
   - **b.** User 2: 1 1 1 0 0 0 1 1 1 1
   - **c.** User 3: 1 1 0 0 1 0 1 0 0 1
   - **d.** User 4: 0 1 0 0 1 1 0 1 1 1
2. Plot the user digital data
3. Generate an 8x8 Walsh matrix, and assign Walsh code 6, 3, 1, and 4 for each user respectively. Print the Walsh matrix.

4. Spread each of the user's data and combine them together as in Figure 9.11 (assuming fc = 0, don't multiple with carrier, just spread). Plot the result showing the combined signal.
5. Despread the combined digital data for each user by their appropriate Walsh code. At this point you will determine the result of the despreading operation is a 0 or 1
6. Plot the recovered digital data for each user as a result of dispreading from the combined digital data
7. Compute the bit error and print the bit error, if any.
8. Make sure you do **NOT** use any functions or Simulink toolbox from Matlab. Do not copy functions or code from other sources for CDM/CDMA modulation technique
9. Upload all the plots (label all the axes and caption the plot) along with the Matlab code to Blackboard.

Instructions: Comment your Matlab code and make sure it's working. Please create a zip archive of your assignment folder (code and labelled plots) and upload the zip file. Not following the above instructions could result up to 20% deduction from your program assignment score.