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(APPROVED BY AICTE, NEW DELHI)

Department of Electronics and Communication Engineering

Course Activity Report on

PSD For Polar and Bipolar Line Codes
Nyquist Ideal Condition For Zero ISI

in

Digital Communication

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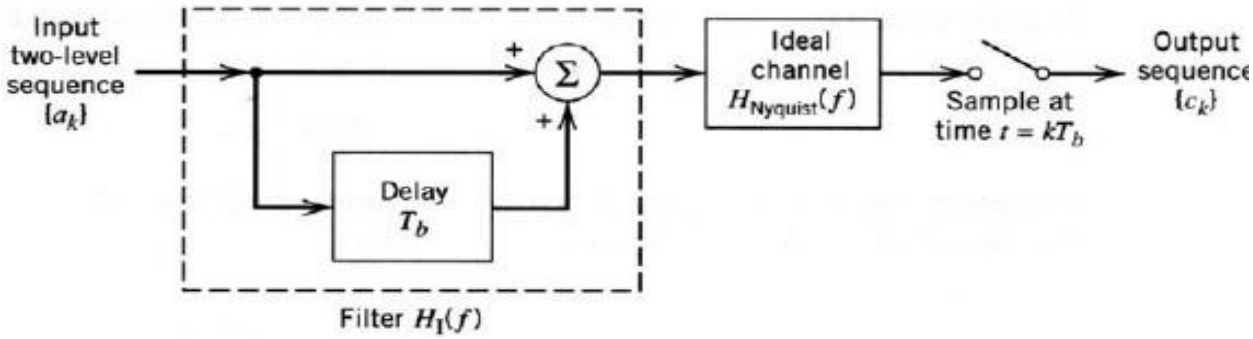
Introduction to Duo binary signaling scheme :

The Duo-binary scheme of signaling is a part of correlative coding where the inter symbol interference (ISI) is added in a controlled manner. The system has an input binary sequence which is processed through certain blocks and transmitted. This output sequence obtained is then processed at the receiver end to get back the original transmitted binary message signal.



BLOCK DIAGRAM OF DUOBINARY SIGNALING SCHEME

The code follows the simple algorithm as that of the actual process done by Duo binary signaling scheme. The input binary sequence is entered by the user then every bit in the sequence is delayed by Tb (bit duration) and added to the present bit. Then this output is passed through the ideal channel and then sampled with kTb interval and the sequence obtained is the Duo binary sequence (Ck). This sequence is processed at the receiver end by subtracting it with the previous bit and the obtained sequence is same as that of the input binary sequence (bk).

$$\begin{aligned} H_I(f) &= H_{Nyquist}(f)[1 + \exp(-j2\pi fT_b)] \\ &= H_{Nyquist}(f)[\exp(j\pi fT_b) + \exp(-j\pi fT_b)]\exp(-j\pi fT_b) \\ &= 2H_{Nyquist}(f)\cos(\pi fT_b)\exp(-j\pi fT_b) \end{aligned}$$

The equations mentioned above are the equations of Duo binary scheme where we can observe a product by exponential term which shows a shift in time domain which implies that there is a presence if ISI as mentioned earlier.

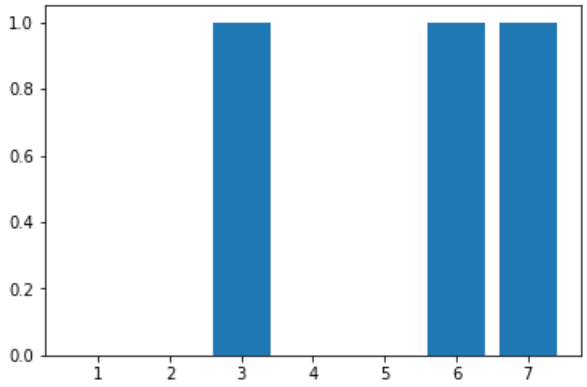
The ISI is introduced in DUO binary is controlled. The equation also gives the magnitude and phase plot for the Duo binary signaling scheme.
The code designed is for the magnitude plot and for obtaining the output as well as recovered signal through Duo binary signaling scheme.

OUTPUTS :

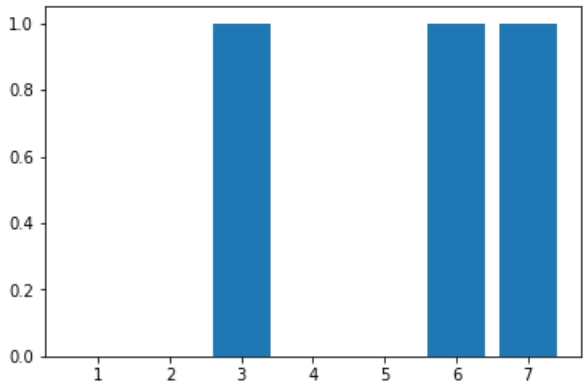
1. **Duo binary signaling scheme :**

Enter the input binary sequence :[0,0,1,0,0,1,1]
bk : [0, 0, 1, 0, 0, 1, 1]
Tb : [1, 2, 3, 4, 5, 6, 7]

bkp : [-1, -1, 1, -1, -1, 1, 1]
ck : [-1, -2, 0, 0, -2, 0, 2]

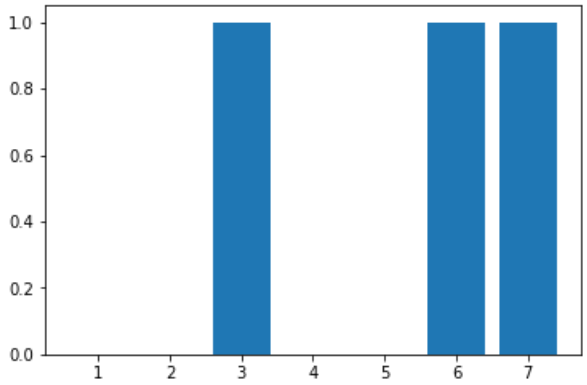


Do you want to change the ck value?? (y/n)
n
bkr : [-1, -1, 1, -1, -1, 1, 1]
bkf : [0, 0, 1, 0, 0, 1, 1]

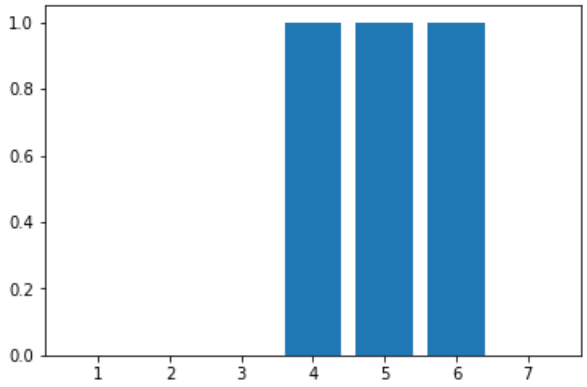


2. Duo binary signaling scheme with error propagation :

Enter the input binary sequence :[0,0,1,0,0,1,1]
bk : [0, 0, 1, 0, 0, 1, 1]
Tb : [1, 2, 3, 4, 5, 6, 7]

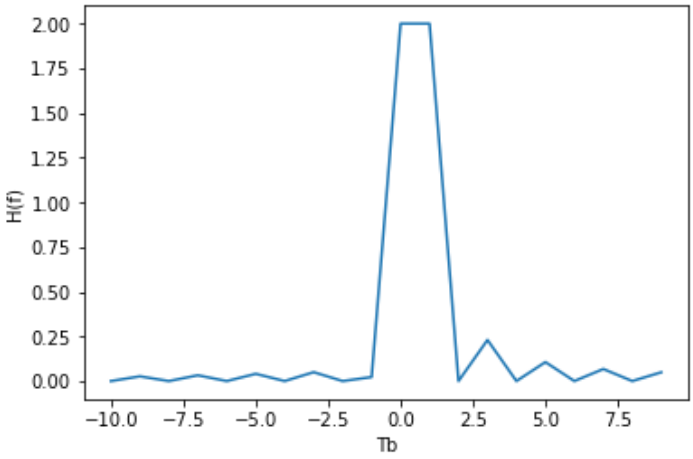


bkp : [-1, -1, 1, -1, -1, 1, 1]
ck : [-1, -2, 0, 0, -2, 0, 2]
Do you want to change the ck value?? (y/n)
y
Enter the bit to be changed
2
Enter the new value at bit 2
-2



bkr : [-1, -1, -1, 1, -3, 3, -1]
bkf : [0, 0, 0, 1, 1, 1, 0]

3. **Magnitude plot of Duo binary signaling scheme :**



Conclusion : The Duo binary signaling scheme is efficient method for introducing the ISI to any binary sequence but it lacks perfection when it comes to any sudden bit changes in the transmitting signal which leads to the loss of further bits. This and the magnitude plot at the Tb=0 there is DC spike o amplitude 2 which makes the system less efficient. This becomes a reason for us to move to a method that removes these problems that is Pre-coder and then Modified Duo binary signaling scheme.