RESEARCH ARTICLE OPEN ACCESS

Compression of Single User BPSK an Multi User 2-PSK Transreceiver System

[1]Pramod Kumar
Faculty of Electrical Engineering Department,
UIET, Baba Saheb Bhim Rao Amedker University, Lucknow
Uttar Pradesh, India

Abstract:

The typical three path propagation and anti jamming capability associated with DSSS were carried out through the combination of Lab VIEW and MATLAB 7.8. At the transmitter, the NRZ data stream is first mapped into BPSK symbols and then spread-out using different PN code like Hadamard code, Gold or Kasami sequences. And we see that single user is not total utilization band. Direct Sequence Spread Spectrum (DSSS) techniques are used same bandwidth Number of user to increase, and we see that better performance. That we can say Direct Sequence Spread Spectrum techniques is reused to bandwidth. And we can say that in this techniques power loss is low, anti jamming capability is less and system is more reliable. Furthermore, BPSK-Spreading transceiver should be analyzed for their performance, multipath scenario and interference whether under AWGN channel which show that these has been overcome effectively and attain more robust performance, when using direct sequence spread spectrum.

Keywords- **MATLAB 7.8 Simulink, Lab VIEW 8.5, etc.**

1. Theory:

The wireless transmission environment in which DSSS yield desirable performance is based on Lab VIEW. The data is voltage levels of an NRZ bit stream which makes excursion between +1 and -1 at the rate f_b. The chipping waveform make excursion between +1 and -1 at the rate f_c and changed the characteristics according to data stream. Spreading consists of multiplying the input data by a pseudo-random or pseudo-noise (PN) sequence, the bit rate of which is much higher than the data bit rate. This increases the data rate while adding redundancy to the system. The transmission link will be established under AWGN channel which add certain impairments into transmitted signal. When the signal is received, the spreading is removed from the desired signal by multiplying it by the same PN sequence that is exactly synchronized to the transmitted PN signal. When such a de-spreading operation is applied to the interferer's signals, ideally there is no further contribution to the user of interest's signal level. De-spreaded signal is synchronized with locally generated sinusoidal carrier, and passing through the integrated and dump filter

that performs BPSK de-symbol mapping. The proper visualization of BPSK-Spreading transceiver carried out with the help of Lab VIEW very efficiently. The simulation result show that developed system can outperform, which would give certain reference to analysis and design of the practical system.
Furthermore, BPSK-Spreading transceiver should be analyzed for their performance, multipath scenario and interference whether under AWGN channel through the combination of Lab VIEW and MATLAB. The model is totally digitized and uses random binary data which is BPSK modulated (real), spread by orthogonal codes.

2. Key Factor:

Objective of this paper we are worked in Direct Sequence Spread Spectrum techniques and used to software is MATLAB/Lab VIEW. Manly we work to reuse bandwidth and numbers of user is increase. Then we plot a graph single user vs multi user with & without Spreading.

3. Formulae for BPSK:

In a coherent binary PSK system, the pair of signals, $s_1(t)$ and $s_2(t)$ used to represent binary symbols 1 and 0 respectively, are defined by

$$s_1(t) = \sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t)$$

$$s_2(t) = \sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t + \pi)$$

$$= -\sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t)$$

Where $0 \le t < T_b$, and E_b is the transmitted signal energy per bit, and carrier frequency f_c is chosen to n_c/T_b for some fixed integer n_c.

3.1 BPSK Signal d (t):

In BPSK the $d(t)$ is a stream of binary digits with voltage levels which, as a matter of convenience we take to be at $+1V$ and $-1V$. When $d(t) = 1V$ we say it is at logic level 1 and when $d(t) = -1V$ we say it is at logic level 0. Hence BPSK is given by bipolar NRZ level as

$$S(t) = d(t)\sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t)$$

3.2 Error Rate of BPSK:

The bit error rate (BER) or Probability of error of BPSK in AWGN can be calculated as

$$P_e = Q\left(\sqrt{\frac{2E_b}{N_o}}\right) \text{ or } P_e = \frac{1}{2}erfc\left(\sqrt{\frac{E_b}{N_o}}\right)$$

Since there is only one bet per symbol, this is also the symbol error rate. The above expression shows that the probability of error depends only on the energy contents of the signal *i.e. E.* Also, as the energy increases, the value of complementary error function *erfc* decreases and the value of P_e reduce.

3.3 Bandwidth for BPSK:

Band width of BPSK signal will be

$$BW = Highest\ frequency - Lowest\ frequecy\ in\ the\ main\ lobe$$

$$BW = f_c + f_b - (f_c - f_b)$$

$$BW = 2f_b$$

Hence, the minimum bandwidth of BPSK signal is equal to twice of the highest frequency contained in baseband signal.

3.4 Feature of BPSK:

i. BPSK has a bandwidth is lower than that of a BFSK signal

ii. BPSK has the best performance of all the three digital modulation techniques in presence of noise. It yields the minimum value of probability of error.

iii. BPSK has very good noise immunity.

In the design of digital communication system the provision of reliable performance, exemplified by probability of error (or bit rate or signalling rate) and efficient utilization of channel bandwidth. If two or more bits are combine in same symbols, then signalling rate will be reduced and thus reduces the transmission channel bandwidth. Therefore we employ a bandwidth conserving modulation schemes for the transmission of binary data. It is the quadrature-carrier multiplexing system and known as quadrature phase shift keying simply QPSK.

4 SNR I/O:

The output signal-to-noise ratio as the instantaneous peak power Eb divided by the equivalent noise component is

$$(SNR)\,o = \frac{2Eb}{JTc}$$

The average signal power at the receiver input equal Eb/Tb. We define signal-to-noise ratio as given by,

$$(SNR)I = \frac{Eb/Tb}{J}$$

Eliminating *Eb/J* then we get output signal-to-noise ratio in terms of the input signal-to-noise ratio as given is

$$(SNR)\,o = \frac{2Tb}{Tc}\,(SNR)\,I$$

To express signal-to-noise ratio in decibels equivalent form given by

$$10 \log 10\ (SNR)\ o = 10 \log 10\ (SNR)\ I + 3 + 10 \log 10\ (PG),\ dB$$

Where,

$$PG = \frac{Tb}{Tc}$$

We may define the processing gain in other two way i.e.

- The bit rate of the binary data entering the transmitted input is given by

$$R_b = \frac{1}{Tb}$$

- The bandwidth of the PN sequence c(t), define in terms of the main lobe of its spectrum, is given by

$$\omega_c = \frac{1}{Tc}$$

R_b and $\boldsymbol{\omega_c}$ are baseband parameter. Hence we know the processing gain of equation is

$$\boldsymbol{PG = \frac{\omega_c}{Rb}}$$

5. System Model:

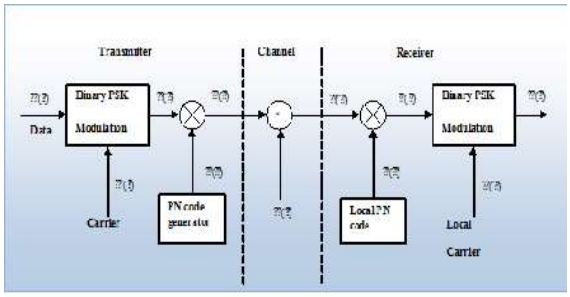


Fig. DSSS Transceiver System Model

6. Results:

Result we know that the BER performance for 2-PSK with and without spreading system is shown in below. From fig it is observer that 2-PSK spreading transceiver system is outperforms then simple binary-phase shift keying system. When single user is used then we see that, the simple 2-PSK system is performing better then the spreading system compared 14 errors with 88 errors. It demonstrated that spread-spectrum technique is not efficient way of utilizing Bandwidth when using separately.

Farther more we introduce the 2_{nd} user and see that, The error in simple 2-PSK system increasing by much-more amount for the same Bandwidth and same channel setting, where as for with spreading technique the error remain same, compared 616 errors with 88, it shows that spread spectrum technique is an efficient way of utilization of bandwidth when using with already used bandwidth, therefore it will increases the overall system capacity. Moreover, it can be demonstrated by further increase the number of user, as 3rd user, 4th user and 5thuser. In each case the error will remain same when spreading technique is used with PSK system.

So we can say that the number of user increase the same bandwidth and transmitted information same time. And we say that less power, anti jamming capability is neglected.

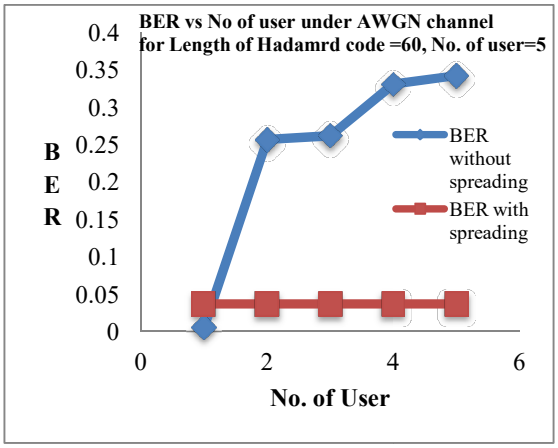
6.1 AWGN Channel:

[1] Without Spreading

S No.	No. of User	Initial Seed	BER	No. of Error	No. of Frame Compeered
1	1	631	0.005833	14	2400
2	2	501	0.2567	616	2400
3	3	498	0.2617	628	2400
4	4	500	0.3308	794	2400
5	5	600	0.3421	821	2400

[2] With Spreading

6.2 Output Graph of BER vs No of User under AWGN Channel:



S No.	No. of User	Initial Seed	BER	No. of Error	No. of Frame Compeered
1	1	631	0.03667	88	2400
2	2	501	0.03667	88	2400
3	3	498	0.03667	88	2400
4	4	500	0.03667	88	2400
5	5	600	0.03667	88	2400

7. Conclusion

Conclusion of our result low SNR value properties has been designed provide the quality performance, because of low transmitting power is required, which increases the efficiency of the overall system. Technique Spread Spectrum have also increases the No. of User for accessing the same channel, by which this technique increase the entire capacity of the channel, and the technique is commonly known as CDMA. Therefore we can say that reuse of the concepts of bandwidth. Shortly we say that a Spread Spectrum technique is a robust performance. In this techniques used any information sender to receiver transmitted that any unauthorized receiver can't detect the information, only the user detected it that is authorised for it, increase the channel capacity and require low transmitter power. We are worked in Spread Spectrum techniques and some small results to verified and plot the graph of one user vs five user shown in figure. We see that with spreading and without spreading table and show the graph. Software is use to MATLAB and Lab VIEW.

7.1 future scope work:

Our observation completing this topic worked in future-

1. Using different-different orthogonal codes, like Kasami sequence, Gold codes and PN code *etc* this technique is further analyzed.
2. Using different-different length of the Spreading code it can once more analyzed.
3. For short range communication *i.e.* Bluetooth (2.4 ISM band) unlicensed band applications it should also be analyzed.
4. In future work there is higher user to transmit the same bandwidth & show response.

References:

[1] Cook CE, Marsh HS *[1983]. "An introduction to spread spectrum". IEEE Communications Magazine; 21:8–16.*

[2] Hara S, Prasad S *[1997]. "Overview of multicarrier CDMA". IEEE Communications Magazine; 35:126–133.*

[3] Helard Metal *[2001]. "Multicarrier CDMA techniques for future wideband wireless networks". Annals of Telecommunications; 56:260–274.*

[4] Han SH, Lee JH *[2005]. "An overview of peak-to-average-power-ratio reduction technique for multi-*

carrier transmission". IEEE Wireless Communications; 12:55–65.

***[5] Adachi F** [1996]. "Coherent multi-code DS-CDMA mobile radio access". IEICE Transactions on Communications 1996; E79-B: 1316–1325.*

***[6] Hwang JK, Chiu YL** [2008]. "A high-rate low-PAPR multicarrier spread spectrum system using cyclic shift orthogonal keying". IEEE International Conference on Communications, China.*

***[7] Deng JH, Liao SM** [2009]. "A low complexity MSK-based M-ary cyclic shift keying transceiver for direct sequence spread spectrum system over multipath fading channels". IEEE International Conference on Advanced Communication Technology (ICACT), Korea.*

***[8] Alamouti S** [1998]. "A simple transmit diversity technique for wireless communications". IEEE Journal on Selected Areas in Communications 1998; 16:1451–1458.*

***[9]Peterson RL, Ziemer RE, Borth DE** [1995]. "Introduction to Spread Spectrum Communications". Prentice-Hall: Englewood Cliffs, NJ.*

***[10] Liu H** [2000]. "Signal Processing Application in CDMA Communications, Chapter 4". Artech-House: Boston.*