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Implementation of DSSS system of image using MATLAB

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ABSTRACT

In direct sequence spread spectrum systems, pseudo sequence random (PN) are used to spreading data bits. There are various type of PN sequences are available with good correlation properties, on mostly are generating pn by Linear Feedback Shift Register (LFSR).Will examine in this paper we describe spreading binary random and spreading the image As well as studying probability bit error rate of DSSS system with change of the channel (Add white Gaussian noise channel, Rayleigh fading channel, Rician fading channel). Our study will be performed using MATLAB. Terms of completed my articles in building system developed to security transmitter and receiver the information of theft against communication digital system talk as well as the increase of data rate information. Was this design a way process of his used in applications military and have a major role also in the most applications requiring protect high for many information binary data and image. So, that the system designed as fits practice and prevent the overlap the outside after it has become send signals in communication system exhibition penetration and Intentional attacks or other breaches.

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1. INTRODUCTION

In digital communication used Direct sequence spread spectrum the scope of large a modulation technique to spread digital signals over a massive -scale of bandwidth [1]. The information signal to be transmitter will hit with a chipping code a high data rate sequence resulting security of the data conferred to a spreading ratio. The chipping code enables the signal to resist from interference and can get the recovery of original data even with damaged data bits during transmission. DSSS differs with other techniques system of spread spectrum [2]. The performance of DSSS systems are efficient and more reliable compared to FHSS in terms of the power consumer and cost. Military applications incorporate spread spectrum strategies specially for the wider bandwidth usage to provide protection to the signal [3-8]. The dsss as shown in Figure 1 and Figure 2.

Through the studies previous, which we will look it now, such as AndreyTikhomirov et al. [9]. In this work, the direct serial spread spectrum system immunity analysis and the interference immunity analysis of the direct spread spectrum systems were analyzed in order to discover the best structure for the terrestrial mobile communication receiver taking into account the energy consumption restrictions. Yangjie Wei et al. [10] This work evaluates and identifies the PN of the DSSS signal and its knowledge of benefits and drawbacks of the PN. In addition, so is his knowledge noise level. Mohanad Abdulhamid et al. [11]. In this work, the MATLAB Simulink was implemented and designed to show a way to synchronize the code clock on the receiver with the code clock on the transmitter. Hikmat Najem. [12] This work study design direct sequence spread spectrum using Matlab and FPGA.And the study the transmitter, AWGN noisy channel. Harshali Mane et al. [13] This work deals with the design of direct sequence spread spectrum

transmission (DSSS) using compression methods. These proposed methods are evaluated using DSSS signals using binary phase shift modulation-under Rayleigh channel fading and AWGN noise. C.Kumar et al. [14] these two systems are designed with Matlab simulink. Likewise, the signal-to-noise ratio was obtained, and the bit error rate for these systems. Karmjeet Singh et al. [15] They simulated MATLAB to compute the signal error rate through a comparison of energy to noise in DSSS and the implementation of multi-carrier code segmentation via Rayleigh transmission using QPSK and BPSK modulation systems. S. Shinly Swarna Sugi et al. [16] The study spread spectrum modulation techniques and performance of direct Sequence Spread Spectrum (DSSS).

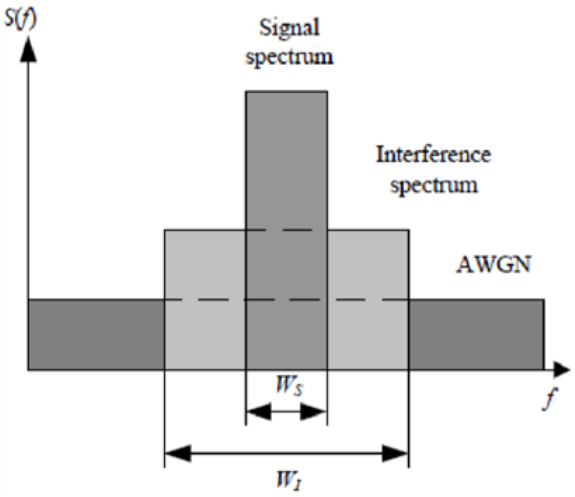


Figure 1. Spectrum after de-Spreading

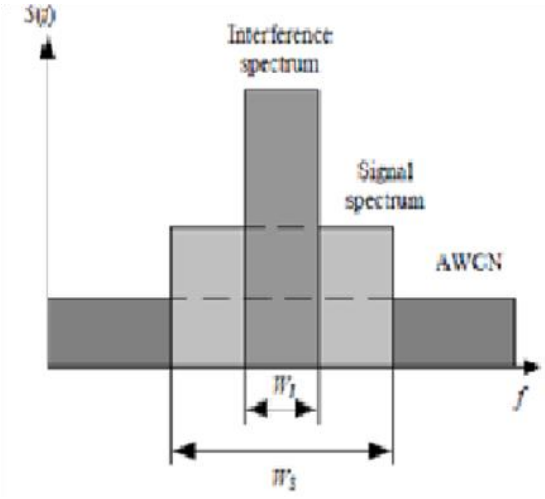


Figure 2. Spectrum in radio channel

To look at the reality now, communication systems need a very large protection of information from the constant and exposed attacks of communications networks. Looking at previous studies, we find that you have not built a practical system in fact, so we have solved this problem, we have sent a high data rate of the image with a few fault lines and a change channel, as all previous studies did not do this.

2. PROBABILITY OF ERROR

In an AWGN channel, the probability of error in the digital communication system [4, 17-20]. It is calculated in DS spread spectrum system As for binary PSK By law we will mention (1).

$$P_B = Q\left(\sqrt{\frac{2E_b/N_O}{1+(\frac{E_b}{N_O})(\frac{I}{S})/G_p}}\right) \quad (1)$$

3. PSEUDO RANDOM SEQUENCE

A pseudo random sequence it is a random signal whose characteristics must be like properties of the noise And also properties are studied autocorrelation. And so it is random but deterministic and after N elements is Repeats [21-24]. The choice is made according pseudo random to the application to be designed, whenever the longer it becomes and the more complex the system is better as in (2). And also depends on the characteristics autocorrelation and cross correlation [25-27]. As shown in the following Figure 3.

$$R(\tau = 1) = \frac{1}{15}(7-8) = -\frac{1}{15} \quad (2)$$

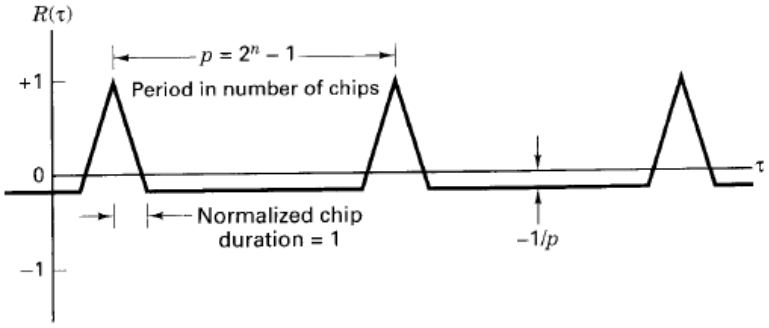


Figure 3. PN autocorrelation

4. IMPLEMENTATION OF PROPOSE DS/SS SYSTEM USING MATLAB SIMULINK

4.1. DSSS of the binary random with AWGN

Will be in the case the implementation of a system of direct sequence spread spectrum with matlab simulation by using communication toolbox and the Dsp toolbox. Data source is the binary random from the communications toolbox. Setting block of the signal integers (0 and 1) at data duration bit (Tb = 1msec) or a data rate 1 Kb/sec.and the PN Sequence generator by linear feedback shift register. The chip duration bit (Tc=0.03125msec) and chip rate of the pn sequence 32 Kb/sec. All you mentioned above see in the Figure 5. Been link circuit was stages transmitter and receiver was used binary shift keying (Bpsk) as a modulation and AWGN as a channel And the processing gain of the system equal 15.05 db. The Probability of error equal (0.001). As shown in the following Figure 4.

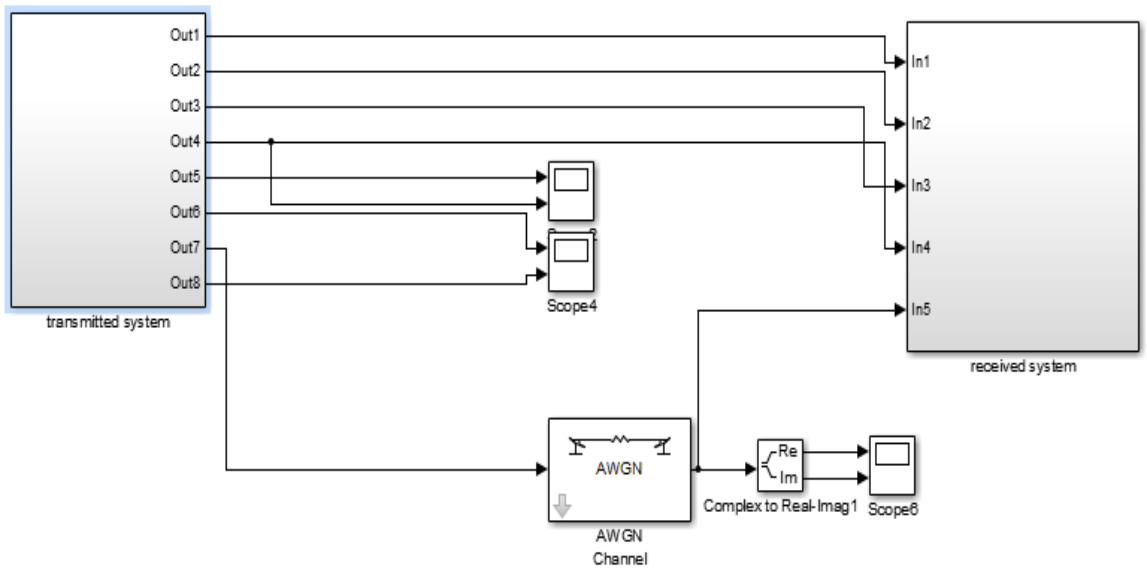
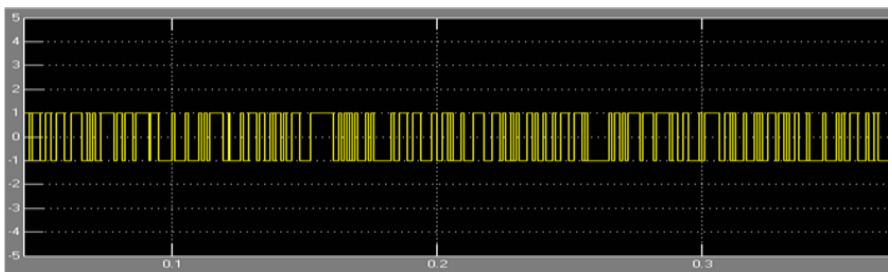
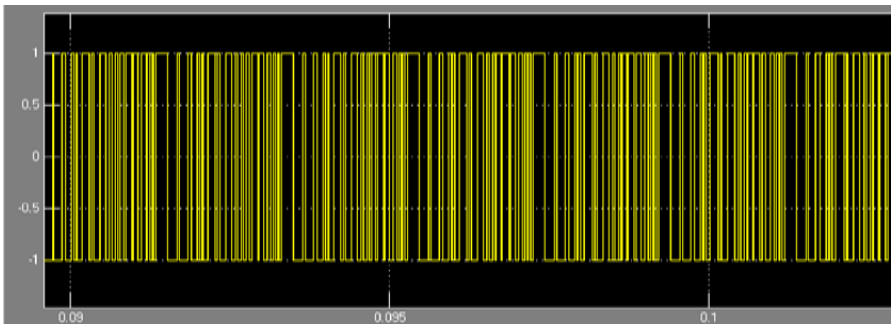


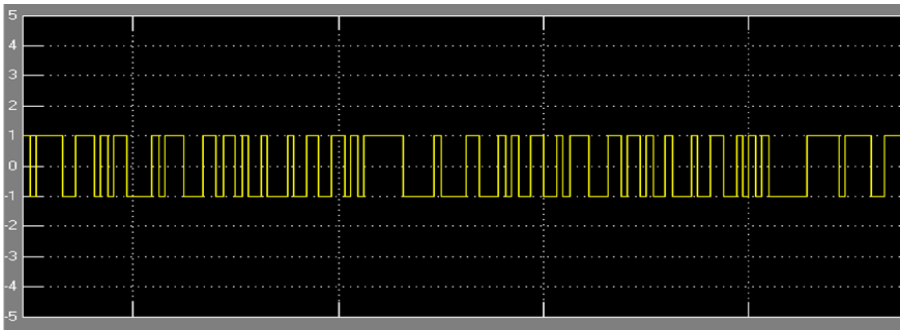
Figure 4. Circuit Model of Direct Sequence Spread Spectrum (DSSS) system in the matlab Simulink



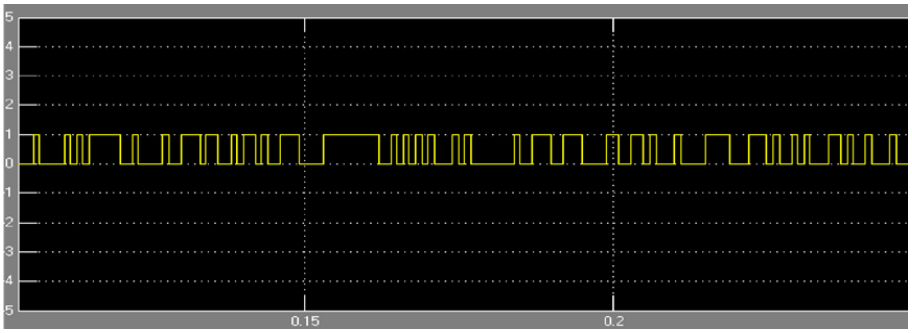
(a) Original signal



(b) PN signal



(c) Spreading signal



(d) Received signal

Figure 5. Matlab simulink

4.2. DSSS of the binary random with (Rayleigh fading channel)

In this case, we have changed channel and we will consider changing the characteristics of the signal in this change and will use the values below in addition to the study of the proportion of error.

a) Data duration bit time Tb = 1msec or a Data rate 1 Kb/sec
b) Chip rate of the pseudo random sequence 32 Kb/sec
c) Processing gain 15.05 dB
d) Maximum Doppler shift (Hz) =0.5 HZ
e) Probability of error equal (0.2).

We have implemented this system where we have sent the signal multiplied by pseudo random to produce large bandwith. Then the signal was modulating by (Bpsk) after then has been changed channel to Rayleigh fading channel. As shown and explained previously and all values are adjusted as shown in the above values. The implementation of systems and signals for each case in the system will be are shown in Figure 6 and Figure 7. The output of the channel is applied to the receiver side. At the recipient position, signal is demodulated by using the same code sequence and the second process is to recover the binary data. The liquidator consists of number of city block to do this operation. This design was done according to the parameters shown in. The receiver side blocks are demodulator, Unipolar to Bipolar Converter, Integrate and Dump and Signe and Bipolar to Unipolar Converter, error calculator. As shown in the Figure 6.

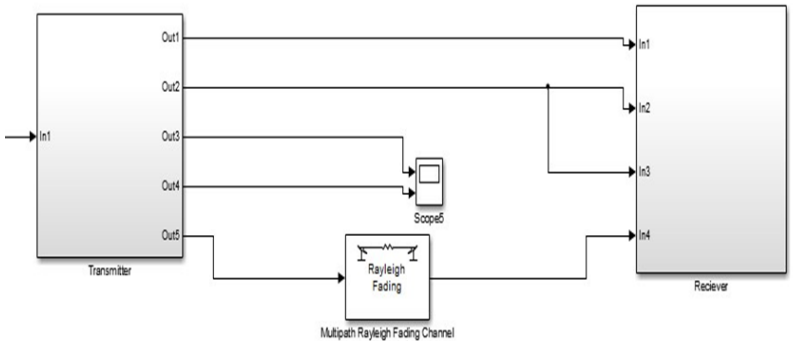
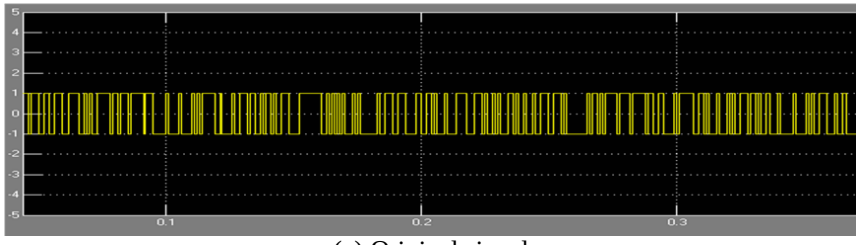
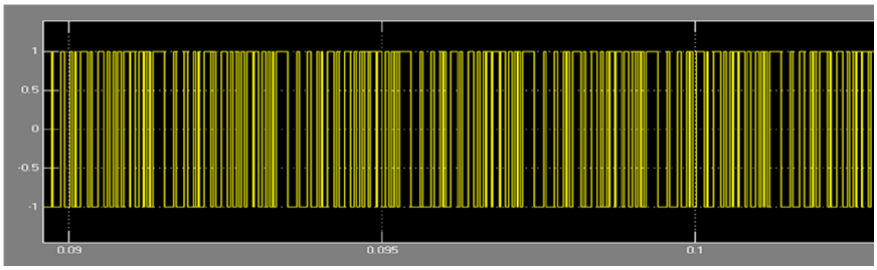


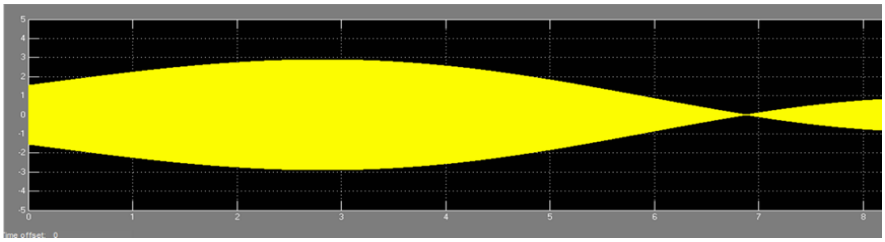
Figure 6. Circuit Model of Direct Sequence Spread Spectrum (DSSS) system in the matlab Simulink at Rayleigh channel



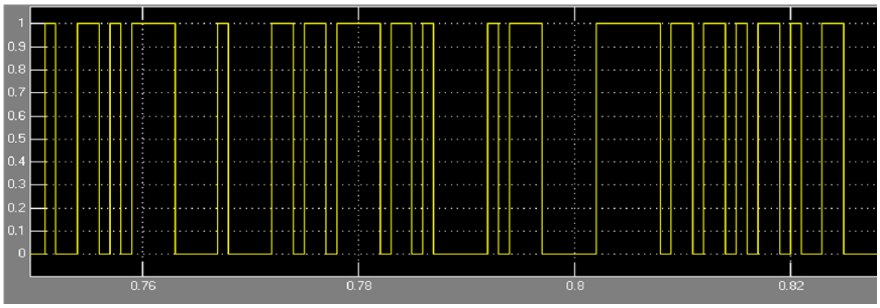
(a) Original signal



(b) PN signal



(c) Spreading signal



(d) Received signal

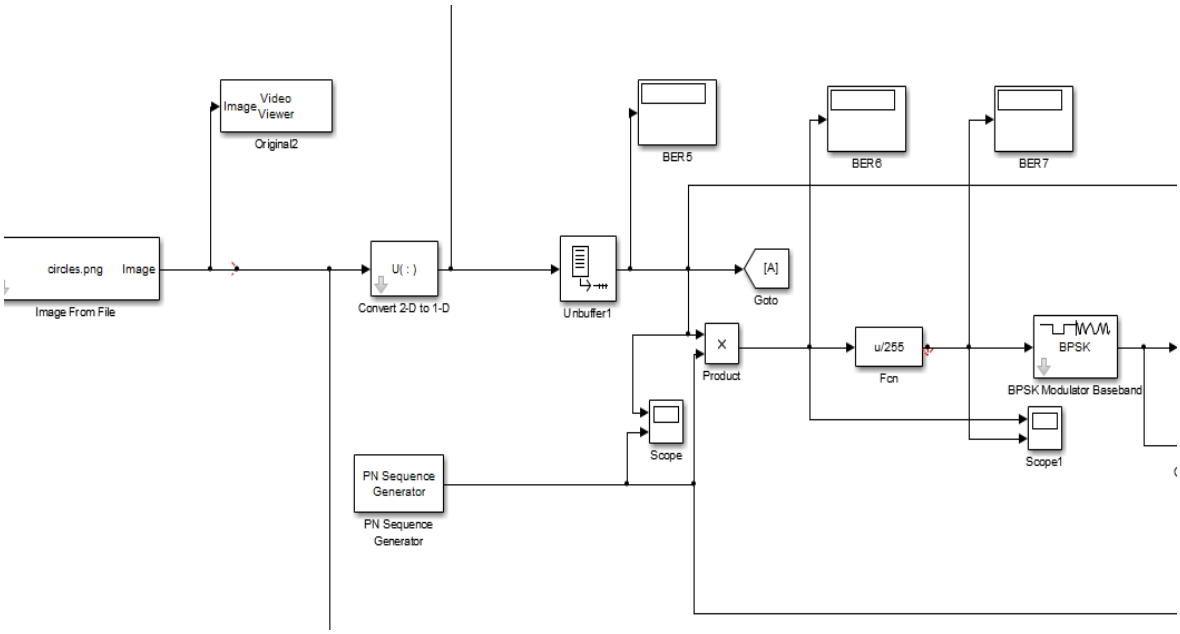
Figure 7. Matlab simulink

4.3. DSSS of binary image

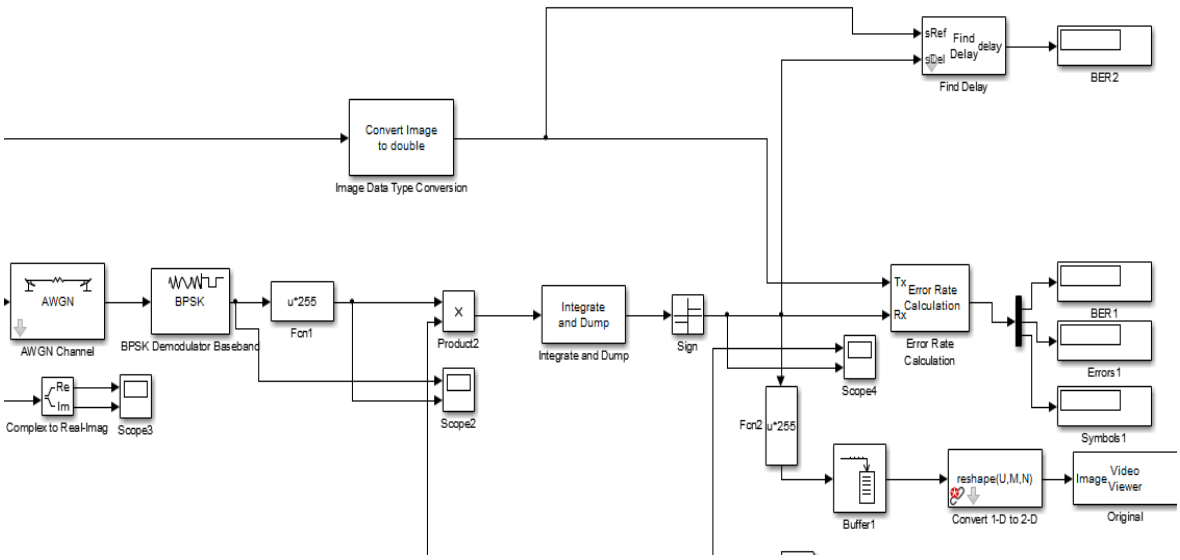
In this case, we have changed the input signal ie we have inserted a picture of the system with a note of the response of the system to the image in addition to that note the percentage of error the values below are the input values and results of the system.

a) Data duration bit time Tb = 0.1msec or a Data rate 10 Kb/sec
b) Chip rate of the pn sequence 32 Kb/sec
c) Processing gain 10 dB
d) Probability of error equal (0.01019)

The image transmission has been done with high data rate. And modulation of image M array psk (8 psk) through AWGN. The image was received and errors were corrected in the system the implementation of systems and signals for each case in the system will be are shown in Figure 8 and Figure 9.

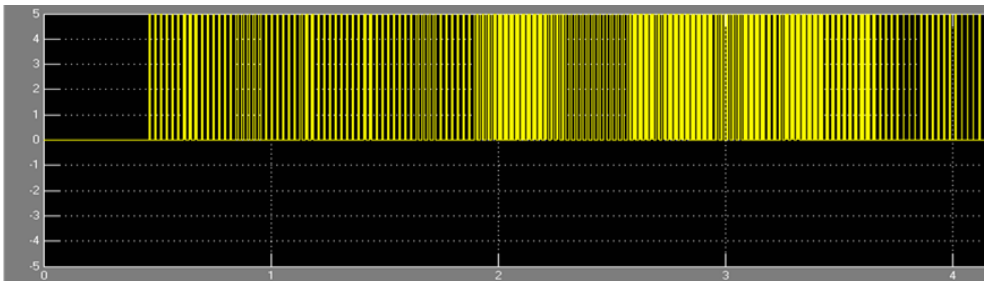


(a) Transmitter system

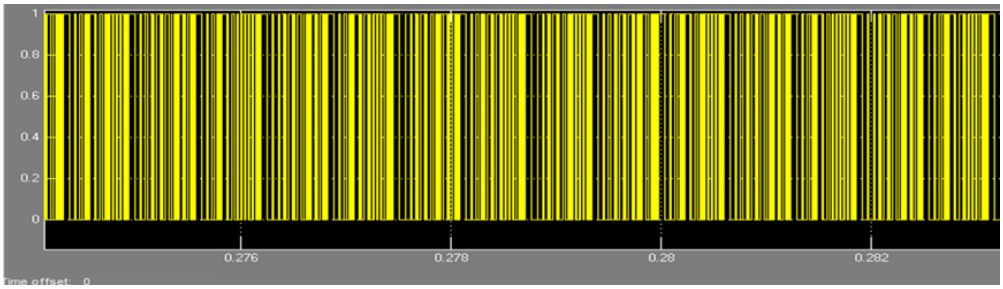


(b) Receiver system

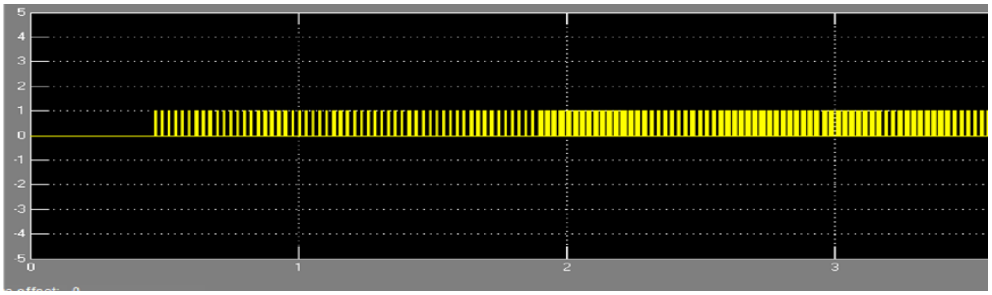
Figure 8. Circuit model of direct sequence spread spectrum (DSSS) system in the matlab simulink of image binary



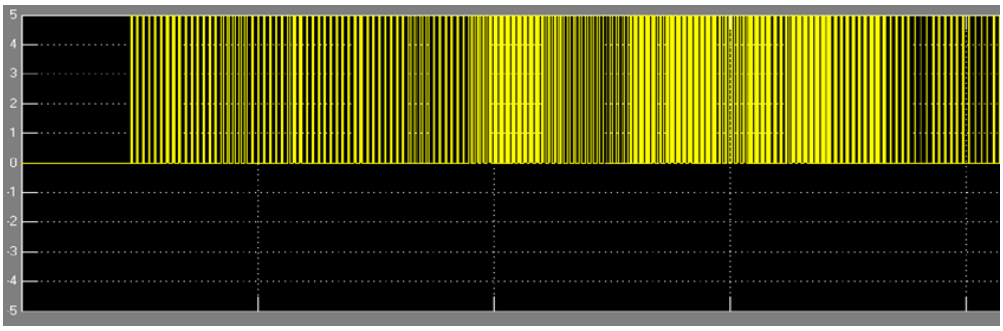
(a) Original signal



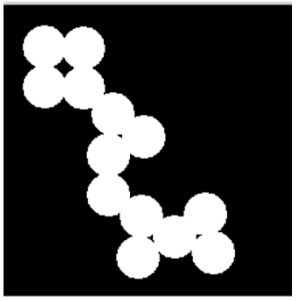
(b) PN signal



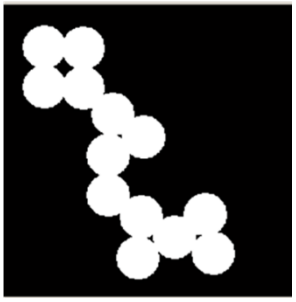
(c) Spreading signal



(d) Received signal



(e) Image transmitted



(f) Image Received

Figure 9. Matlab simulink

5. RESULTS AND DISCUSSION

In our study, we have studied many cases of dsss. We showed the behavior of the system in these cases in addition to that in these cases we have changed both the entry signal and change channel as well as knowledge of the proportion of error for each case. We will remind you the details of each case briefly from the results below:

5.1. Dsss of the binary random with AWGN

In this case we have inserted a random signal the time value Tb = 1msec or a Data rate 1 Kb/sec. the chip rate of the pn sequence 32 Kb/sec. And the processing gain of the system equal 15.05 db. She was and Probability of error equal (0.001). In these case, accurate results were obtained approximating the previous works, so that the error rate was small and the more we increase it SNR or Eb/No from (-10 db to 10 db). These results were close to previous studies. Where he studied both Andrey Tikhomirov et al and Harshali Mane et al dsss accurate pictures, but they did not study the effect as shown in Figure 5. So that it shows the signal sent and also the code signal and spreading code Likewise, the signal received to know whether the system received this signal with the same signal that was sent. It showed us that the results were good enough to implement this system in practice in the communication system.

5.2. Dsss of the binary random with Rayleigh fading channel

Have changed multipath. The signal was inserted in time Data time Tb = 1msec or a Data rate 1 Kb/sec Chip rate of the pn sequence 32 Kb/sec and Processing gain 15.05 dB and Maximum Doppler shift (Hz) =0.5 HZ. We note the increase in the proportion of error (0.2). Therefore, to reduce this error must design ofdm as for equalizer in the received. After observing the above error rate, we find that we have sent the signal with a small error rate, as shown.7. As these signals, represent the signal sent and the signal after what dsss in order to protect the informationUnlike previous studies, there are negatives and positives in both their work and our work as that Karmjeet Singh et al and Yangjie Wei et al. As shown in previous studies their study was limited and the error rate was almost equal to what we did, but we changed processing gain we got a better signal as shown in the Figure 7(d).

5.3. Dsss of the binary image

Here we have changed the input signal from a random signal, we have replaced the image, and the dimensions of the image as well as the rest of the information related to the image as follows:

a) a-256*250 binary image
b) b- Data duration bit time Tb = 0.1msec or a Data rate 10 Kb/sec.
c) c- Chip rate of the pn sequence 100 Kb/sec.

The image was received correctly and clearly as well as in large accuracy and a small error rate was the Probability of error equal (0.01019**).** In this case, we have designed and implemented image transmission in an advanced protection system in digital communications, particularly in practice, and for image transmission since previous studies worked on a theoretical system that only sends binary data not pictures.

All previous studies that have been mentioned previously. Whereas, these studies have developed and designed systems for communication and information protection for theoretical signals and are not actually present as signals (random integer, Bernoulli Binary). As for our system, he sent the pictures as shown in the results above and in the Figure 9(a-f). whereas; these figures represent the transmitted signal of the image and the code signal spread that protects the signal from penetration. Add to that the sign after the operation dsss and the picture sent and received. The result of the received image was clear, not subject to interference and penetration in the transmission system and channel and receiver system. These results are few error rates and as shown above. We have implemented this system accurately and a few errors as well as studying the properties of the system change both the input signal and channel. The results were known and the idea was implemented in practice and accuracy and the results were good.

6. CONCLUSION

This paper presented a simple efficient transmission and reception of random binary and image through DSSS. Simulation results of BER performance for the system in binary DSSS and image DSSS. Where we have changed both SNR and Eb/No to know the error rate of the received signals. In my study of my articles, we designed a system for the protection of information in digital communications, especially a related system that transmits the image of high data rate with few errors. This study did not reach all of the previous studies.As well as the study the system to climate channel. Future scope the implementation of send video dsss. As well as the study system the existence of synchronization (code tracking of dsss the image signal).

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