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COMPARISON OF PN SEQUENCE AND GOLD SEQUENCE ON THE BASIS OF BIT ERROR RATE CALCULATION

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ABSTRACT
There are many multiple access scheme available today, but spread spectrum modulation technique is different from the other conventional communication system. Spread spectrum modulation utilizes the good correlation property and large linear period of Pseudo-random sequence. Out of several techniques to implement direct sequence spread Spectrum (DSSS), one technique PN (pseudo noise) sequence/ code which is referred as the high rate digital code is generated on MATLAB. This generated m-sequence is then converted into polar format. Finally, in this paper we examine bit error rate of PN sequence, GOLD sequence in respect of modulation order.

Keywords – Bit Error Rate, MATLAB, PN sequence, Spread spectrum communication, Pseudo-noise.

I. INTRODUCTION

In this paper the effect of modulation index on bit error rate has been plotted for different modulation schemes. Spread Spectrum is a method of transmission in which the data sequence occupies a bandwidth in excess of the minimum bandwidth necessary to send it [1]. Spread spectrum techniques are used in many military communication systems to provide some combination of ranging capabilities, anti-jam protection, low probability of detection and interception, and multiple-access capability [4]. The spread spectrum communication has many advantages like strong anti-interference ability, low bit error rate, good hiding, low intercept, high confidentiality, etc [2].

Spread spectrum communication has two characteristics first one is the bandwidth of the signal transmission is much larger than the bandwidth of the original information signal and the second is that the transmission signal bandwidth is decided by the spreading codes (and the spreading codes are usually the pseudo-random code) [1]. There are several techniques by which spread spectrum can be implemented. One technique is called direct-sequence and the other technique is a PN (pseudo-noise) code which exhibits random-like properties which are necessary for providing good spectral characteristics and security [5]. A long PN code is frequently used for uplink channelization in the CDMA mobile communications [3]. Pseudo-random sequences with good correlation property, large linear complexity, and balance statistics are widely used in modern communication [6].

Spread spectrum data transmission system using orthogonal codes has some difficulties mainly its autocorrelation property is often poor so a new method by which data are modulated onto PN codes generated from PN generators having the same feedback logic and different initial phases are generally used [7]

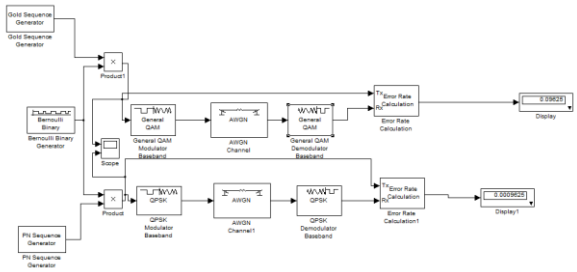

Figure 1. Circuit simulation model of cdma using QPSK and QAM technique [3]

In a Direct Sequence Spread Spectrum (DSSS) system, random binary data having bit rate of rb bits per sec is Exclusive Ored by a pseudorandom binary waveform, which is at much higher rate and it provides the frequency spreading operation. This pseudorandom binary source outputs symbols called chips at a constant chip rate rC chips per sec .Each bit in the pseudorandom binary sequence is known as a chip and the inverse of its period as chip rate. The chip rate is always higher than the bit rate, and the ratio of the chip rate to the bit rate is known as the processing gain [8]

This paper have five section which include in section I introduction to spread spectrum scheme, section II include the simulation model description, section III will have coding algorithm and section IV and V will have analysis and conclusion drawn from the work.

II. MODEL DESCRIPTION

To generate the DSSMA model MATLAB v 12.0 is used. The model is generated with the help of communication toolbox and mathematical toolbox. A random signal generator is picked from the library browser and modulated with the respect to PN sequence and Gold sequence. The digitized signal is then modulated through the BPSK and QAM modulator.

As on the basis of noise distribution spectrum there are so many kinds of channels, here in the analysis of system I have used AWGN channel which introduce noise on the basis of channel property. The properties like SNR can be varied by the operator. The output is demodulated through respective demodulator and error rate is calculated and displayed through the display units with taking input from error calculating sink. All the blocks used in the process has been shown in figure 1.

III.CODING ALGORITHM

For generation of DS-SSMA scheme various step in the coding has been used which are described here:

- To generate the PN sequence firstly an input variable order of polynomial is initialized and two primitive polynomials corresponding to same order is identified.
- The identified polynomials are used for tapping connection of the input shift register and these register are initialized with some non zero values.
- The pn sequence is generated using shift operation and new value to be entered in register has been calculated using tapping connection inputs.
- The sequence generated so has been converted in polar format and data rates can be set using samples per symbol.
- A random data source generates the binary signal, on this data the noise sequence has been distributed and bandwidth will increase.
- The output sequence is transmitted through AWGN channel with PSK and QPSK technique.
- BER TOOL is used to simulate the different transmitted and received signal with changing modulation order.[5]

IV ANALYSIS AND RESULTS

From figure2 and figure3 it can be viewed that the output data bandwidth is increased and the behavior of the output signal is just like a noise which is very much different pattern than the input signal, and as the order of generator poly increase the randomness also increase.

On observing the figure4 it can be concluded that the BER in case of PSK is higher than the QAM and effect of modulation order is very much dominant in both type of modulation. As the order of modulation increases the number of bit error also increases.

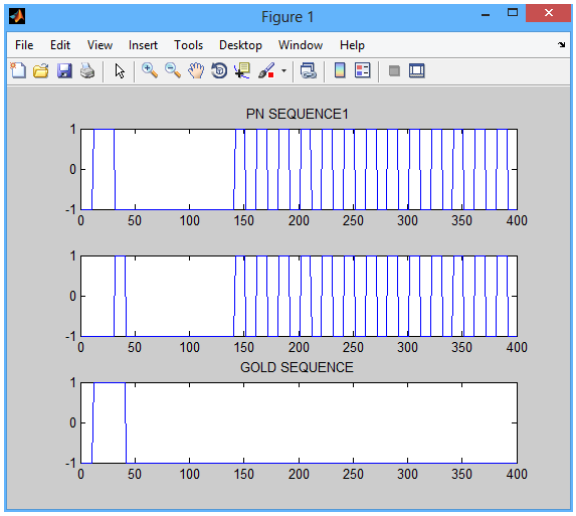

Fig2: PN sequence1, sequence2, GOLD sequence of polynomial degree 14

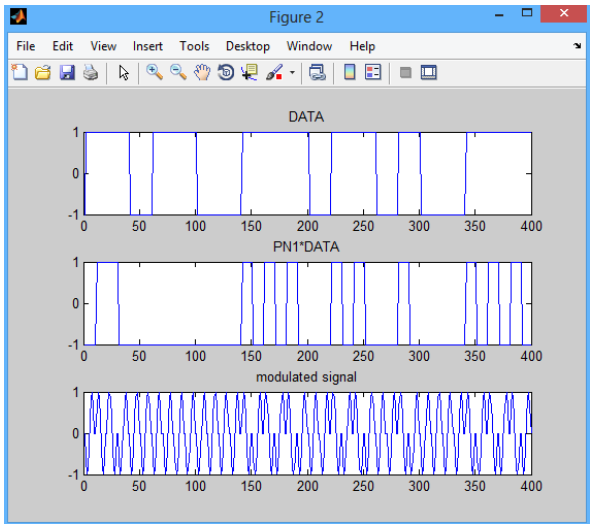

Fig4: random data input, distribution of pseudo noise on data, modulated PSK signal

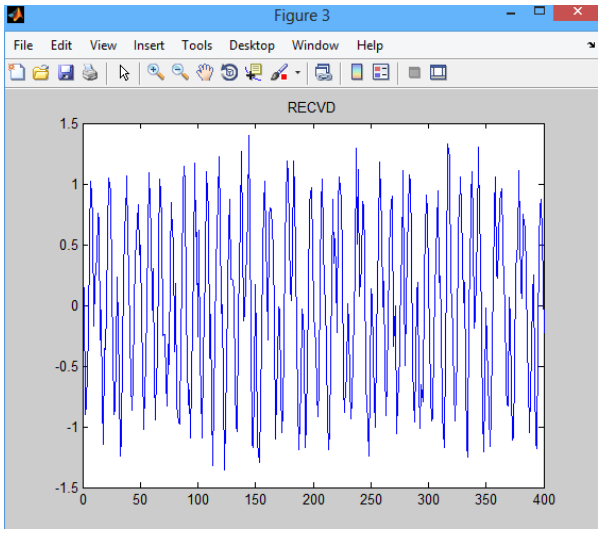

Fig5: output received signal at receiver end

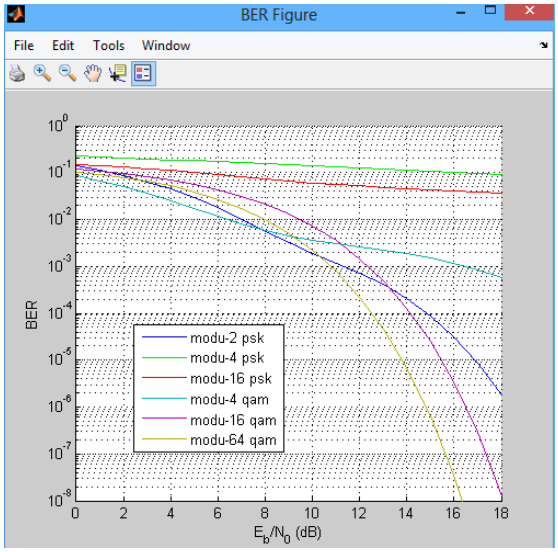

Fig6: random data input, distribution of pseudo noise on data, modulated PSK signal

V. CONCLUSIONS

The system developed shall provide a PN sequence (msequence) which is widely used in varied application areas like military applications, telecommunications etc. An attempt has been made in this work to generate m-sequence and then find autocorrelation of that series. Algorithm has been developed in MATLAB and the code written works efficiently helps to analyze the system performance in terms of BER. The BER results of the designed system shows that output results are satisfactory but not fully efficient as the length of the PN sequence generator is less but as the order increase the capability of the system also increases. The comparison of simulated & measured values proves that sequences have excellent autocorrelation property. At the same time, for some basic character of m sequence such as autocorrelation and cross correlation simulation also give the code integer. The code is simple and efficient, and has strong skills

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