Multiuser Detection for CDMA System with Optimization of Detector using ANN

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Abstract: *Code division multiple Access is a widely used channel access method by radio technologies. This method is useful as many receivers can send data simultaneously over a single communication channel. Various multi detection methods are used for the purpose. The noise is the major problem of these systems that decrease the efficiency of the system. After this Decorrelating detector were used but the major drawback of using the tradiational detector was that the background noise and the interference of other users was still faced in the matched filtration. Also the computational cost was high. So in this paper an hybrid approach is presented that is used for decreasing the BER of the system. In this approach the traditional MMSE is upgraded. .A hybrid approach is given in which a detector is combined with the MMSE detector to give the better results. This approach is considered to better than the traditional approaches as the efficiency of the system is increased. Along with this the soft computing technique like ANN is used. By using a soft computing algorithm the system is trained for various multi detection purposes from the results obtained it is concluded that the proposed technique is better and efficient than the traditional approaches as the BER system is decreased.*

Keywords: CDMA ; MMSE; ANN;BER; noise

1. Introduction

In radio communication Code division multiple accesses (CDMA) is a widely used method for the channel access. This method is widely used as in this several transmitter can be used send data simultaneously over a single communication channel. The main benefit of this method is that various users can use a band of frequencies. This can cause the problem of the interference if the same frequencies band is used by several users so for this the spread spectrum technologies are used. Various multi detection method are used for the minimizing the interference effect that occur in these signals.

Multi user detection is the method that is used for the demodulation of the interfering digital streams of the information. This is used in are such as wireless communications, satellite communication, digital television etc. Multi user detection can be used for the joint detection of the interfering signals. This method is widely used for reducing the inference in various systems that used orthogonal multiplexing systems like TDMA, OFDMA, and CDMA etc. The interference usually originates from the channel distortion and also from out of cell interferences. The multiuser detection can increase spectral efficiency, receiver sensitivity, and the number of users the system can sustain by exploiting the structure of the interfering signal. So in this paper the hybrid approach is proposed for the resolving the problem of the traditional system by using MMSE multi user detection method.

2. Problem Formulation

Code division multiple Access is a widely used channel access method by radio technologies. This method is useful as many receivers can send data simultaneously over a single communication channel. Multiuser detection deals with demodulation of the mutually interfering digital streams of information that occur in areas such as wireless communications, high-speed data transmission, DSL, satellite communication, digital television, and magnetic recording. There are two types of multiuser detection techniques linear detection techniques and non linear detection techniques .In these techniques firstly the information of the system is need to be gathered that decrease the system efficiency. As the information is to be collected in the starting it also increases the BER parameter of the system. After this Decorrelating detector , MMSe ete were used which were considered to more efficient than the perviouis system , But the problem of linear detection of background noise and the interference of other users was still faced in the matched filtration. Also the computational cost was high. So there is need to upgrade the existing system so that the problem of the traditional method is solved and also the problem of the increasing BER in the system need to be reduced to make system more efficient

3. Proposed Work

The main problem of the MIMO system is considered and a new approach is proposed in this work. From studying the literature it is concluded that the MMSE detector is the efficient among all other detector till date. So in this work a new approach is to be proposed in which the MMSE detector is upgraded. A hybrid approach is given in which a detector is combined with the MMSE detector to give the better results. This approach is considered to better than the traditional approaches as the efficiency of the system is increased. Along with this the soft computing technique like ANN or fuzzy logics is also used. By using a soft computing algorithm the system is trained for various multi detection purposes. As the system is trained the results obtained is more efficient. So in this proposes work firstly the existing method is upgrade by combing it with other detector by doing this the advantages of the two detectors are combined

Paper ID: ART2016248

and the results obtained are quite efficient. Secondly the use of soft computing technique will help to train the system so that the multiuser can work on it .This method is considered to be better than traditional method as efficiency if the system is increased and the BER of the system is also reduced. The main of aim of proposed work is to

- To Upgrade the present MMSE approach with Intelligent system to reduce the BER in the Detectors
- Using soft computing technique for designing MUD system for increasing number of Multiuser detection
- To improve the BER parameter of the system to increase the system efficiency
- Design and implementation using MATLAB soft ware

4. Artificial Neural Network (ANN)

A neural network is a system of programs and data structures that approximates the operation of the human brain. A neural network usually involves a large number of processors operating in parallel, each with its own small sphere of knowledge and access to data in its local memory. In more useful terms neural systems are non-straight measurable information displaying devices. They can be utilized to model complex connections in the middle of inputs and yields or to discover examples in data. An simulated neural system (ANN) is a computational structure that is made out of various single processors joined through an arrangement of connections, which have some weight connected with them.

5. Methodology

The steps given below will describe the working of the proposed algorithm:

1) In this initially the signal is generated. This signal is send to the receiver by the transmitter. After signal generation the SNR values of the signal is calculated.
2) Next step after the generation of the gold sequence is to generate the noise, in order to represent the channel the noise is generated.
3) In this step the ANN parameters are initialized. in this work the ANN system is used that will help in increasing the system efficiency .
4) Apply butterworth filter in order to refine the signals.
5) Next step is to train ANN for getting predicted output, now receive the signal at the receiver end and apply the detector on the signal received
6) In this step the MEM detector is used for the detection of the signal obtained from the ANN system .now the MUD detection is done using the ANN.
7) After detection of the signal with help of the detector, final step is to do the calculation of the parameter to check the performance of the system designed. BER calculation is done to evaluate the performance of the system and finally the comparison between the old and the proposed approach is done
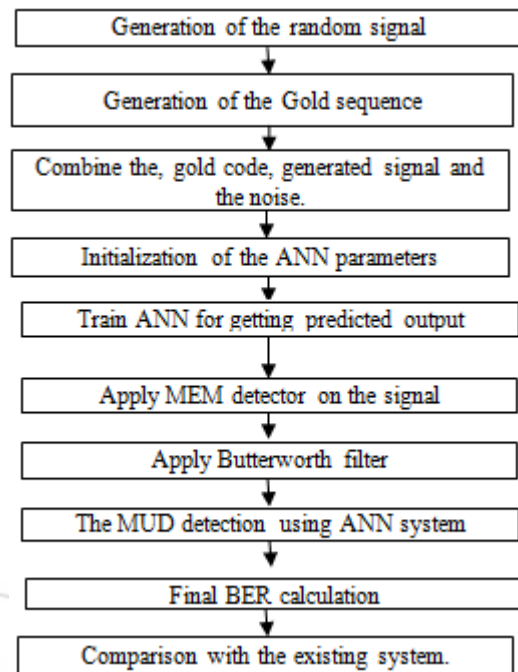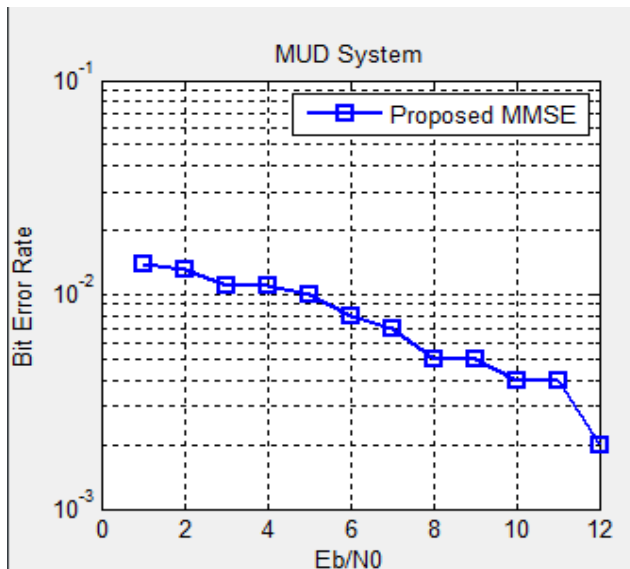

Figure 1: Flow diagram of proposed work
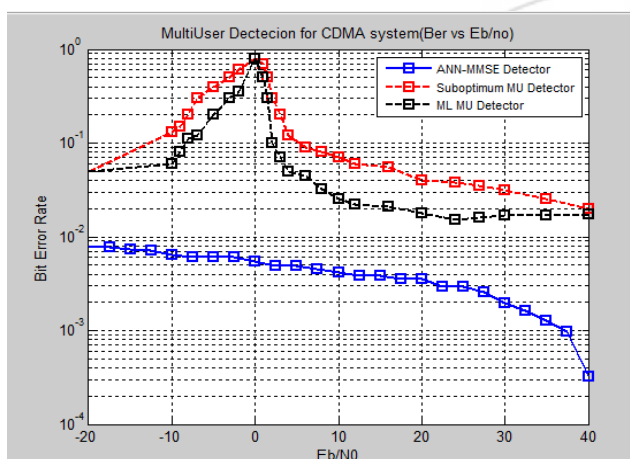
6. Results and Discussion

In this section there is discussion about the results of the proposed methodology. A hybrid approach is presented in this paper for increasing the efficiency of the system.
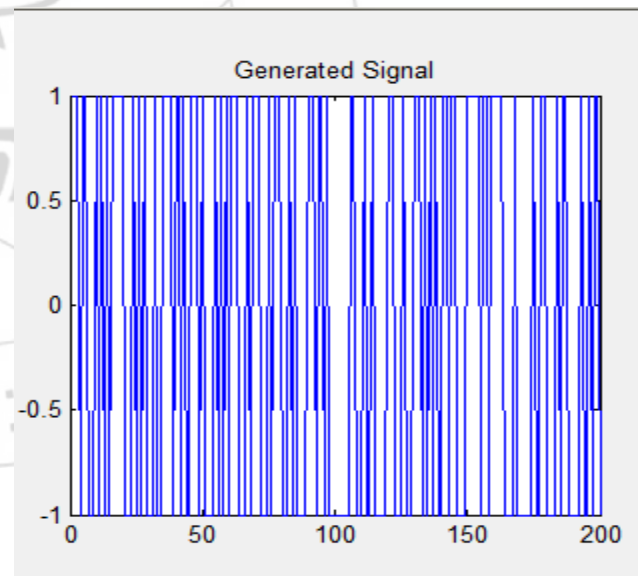
Figure 2: Random signal generated

Figure 3: calculation of the BER of the proposed work

Figure 4: This graph represents the comparison on the basis of the BER of the proposed and traditional approach.

The figures given above are obtained by applying the proposed approach to increase the performance of the system. The figure 3 represent the random signal generated that is send to the receiver end.

The figure 4 represents the BER of the proposed MMSE system.

The figure 5 represents the comparison on the basis of the BER by using ANN- MMSR detector Suboptimum MU detector and MLMU detector.

7. Conclusion and Future Scope

Code Division Multiple Access (CDMA) is a widely used technique for multiple access communication in wireless systems. CDMA is a form of multiplexing, which allows numerous signals to occupy a single transmission channel, optimizing the use of available bandwidth. In this work a hybrid approach is given in which a detector is combined with the MMSE detector to give the better results. This approach is considered to better than the traditional approaches as the efficiency of the system is increased. Along with this the soft computing technique like used. By using a soft computing algorithm the system is trained for various multi detection purposes.

From the results obtained it is concluded that this approach is better and efficient t than the traditional used method. The BER of the propose work is less as compared to the other approaches .From results it is concluded that this method is best and efficient than the traditional method. As a future scope further enhancement can be done in this method by using some other detector. Along with this other trending soft computing technique can be used that will increase the efficiency of the system.

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