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SPECTRUM SHARING IN CRN USING ARP PROTOCOL-ANALYSIS OF HIGH DATA RATE

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ABSTRACT

In this paper the secondary user is allowed to share the spectrum with the primary user in cognitive radio network using MIMO system in which the spectral efficiency gain is more. When they share information with the common receiver, this method uses Successive interference Cancellation (SIC) technique to avoid the effect of detected primary signal transmitted through different nodes. It also analyse the SIC operation inaccuracy and Channel State Information (CSI) imperfection between primary user and secondary user. This also achieves high data rate compare to existing by changing the channel into frequency selective fading channel and applying relay based protocol, which helps to attain high SNR in communication.

Key words: SNR, ARP, Frequency Selective fading channel.

INTRODUCTION

Cognitive radio network

It is highly reliable wireless technology to satisfy the electromagnetic spectrum resource in availability. In CRN the unlicensed secondary user may coexist with the primary user which is licensed for the particular spectrum.

Alternative relaying protocol

Relays are used in between the source and destination. Different types of relays function is used for different type of relaying protocol. All these relays are estimated by their CSI which is very useful for complete transmission of data. Based on the type of relay function and type of decoding some relay protocol can attain the full channel state

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estimation in the destination side where the receiver uses partial Channel State Information at Receiver (CSIR) technique.

Decode and forward protocol

The main purpose of the relay is to receive the signal, decode and forward to the destination. This processing is called Hard-Decision. In this protocol the relay also amplifies the received signal and maintains the transmitted power in fixed average rate. There are different types of relays, compress and forward or quantize and forward. This protocol helps us to find the source of the received signal and it forwards to the destination.

Co-operative relaying

To extend the coverage area of our communication relays are used between the transmitter and receiver where the communication is called cooperative communication by the presence of relays.

System design

There are multiple primary nodes and secondary system with M antennas. There are two networks, network A and Network B which are licensed and have their own spectrum. When network B is trying to communicate with network A then network B is unlicensed for network A at that point the transmitter power of network B(secondary user) get reduced due to interference and thus we hereby tried to improvise the SNR of the secondary user. When spectral resources originally licensed primary user in order to share the spectrum for the secondary user the transmitter power is strictly limited by the predefined tolerable interference at the primary receiver. Hence these secondary user network in time division multiple access (TDMA) have equal time slot of transmission frame allocated to each secondary user.

Frequecy selective fading

In wireless communication the transmitter signal will have multipath because of reflection which is caused by the objects like building, trees, etc. This leads to interference in the transmitted signal and loss of data. Hence the channel spectral response is not flat it attains dips or fades sue to interference in the signal. This problem can be overcome by two ways using CDMA and OFDMA. In CDMA wide bandwidth using code division multiplexing technique. The dips in the spectrum can lead to small loss of signal power better than the complete loss. In OFDMA method the bandwidth carrier is split into many small carriers the original signal is fixed through wide bandwidth. So any nulls won't occur to all carrier frequencies. This results in loss of few carriers rather than the entire signal. The lost carrier signal also can be recovered using forward error correction method. Hence wideband spectrum is widely used in current spectrum scarcity. Where the large number of coherence band can be used by the receiver as well as the transmitter. The interference is maintained by two assumptions. First is, it needs to be within its allowable power constraints. Second is, it should not be more that predefined temperature value Q. These two conditions help to avoid interference on primary user receiver. The transmitter power of the secondary user is given by –

$$Pi = \begin{cases} P, & \varphi_i \leq \frac{Q}{P} \\ \frac{Q}{\varphi_i}, & \text{Otherwise} \end{cases}$$

Here P is the interference power level caused by secondary user on primary interference. We assume MAC secondary in the presence of broadcast or MAC primary. To find corresponding throughput for secondary user, transmission strategy is constructed which will develop upper bound with respective throughput received.

$$R_{mac} = \log\det\,(I + H(S)\,Q_s H^{\dagger}(S) + G_s Q_p G_s^{\dagger}) - \log\det\,(I + G_s Q_p G_s^{\dagger})$$

The secondary throughput is obtained by averaging over channel realization.

$$R_{mac} = E\,[R_{mac}]$$

Clustering

Clustering is a framework of our signal. We are using fixed clustering and gain clustering.

Block diagram

Source generation: The input signal is generated from transmitted side for sending the information.

OFDM-MIMO: The technique used for transmission mode process in MIMO is under frequency division multiplexing in order to get high throughput communication.

Modulation: The generated information signal is modulated using Binary Phase Shift Keying. In BPSK modulation the modulated bits are phase based which is in terms of 0's and 1's.

Source to relay: Relays are used in between transmitter and receiver to receive the signal and forward it to the destination without the delay. ARP protocol is used as relay protocol in this process.

Channel: Channel is used as medium of communication between source and destination. The fading channel we use is frequency selective fading channel which means the selected frequency which is generated in the input will be received in the destination without any loss.

Interference cancellation

AWGN is atmospheric interference which is present in all wireless communication. This AWGN will affect the characteristics of original information which leads to interference in the signal. To eliminate the loss the interference first we have to evaluate by error rate in signal where the basic interference is ISI.

Demodulation

The modulated signal is demodulated in the receiver side without changing the original information which is generated in the source.

Receiver

It refers the destination of the communication. The total error rate is evaluated and plotted as a graph between BER vs. SNR.

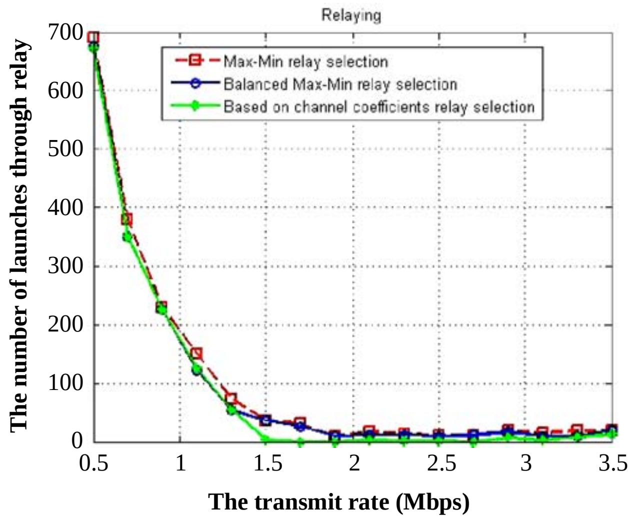
RESULTS AND DISCUSSION

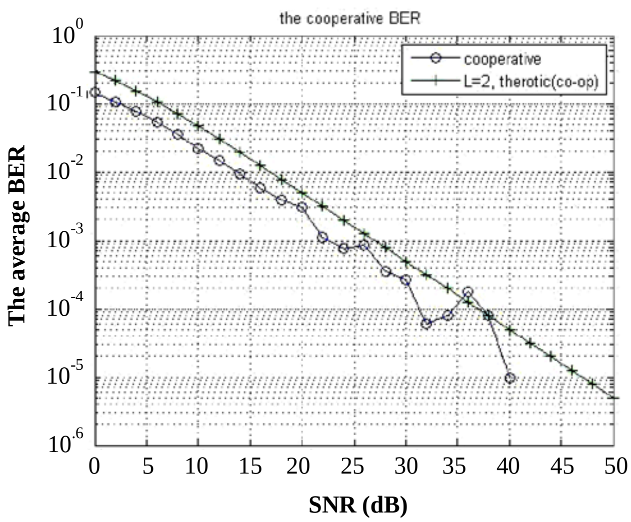
Relay selection

There are four relays being used at the distance of 1 m. Here the data is being shared between different relays so that the number of iteration per relay gets reduced and the information can be sent faster. This graph explains as the number of iteration reduces the data rate gets increase and the relay is selected based on three parameters: maximum and minimum power, balanced power and channel coefficients.

Co-operative BER Vs SNR

This graphs illustrates the high data rate of the secondary date rate of secondary user. The SNR of secondary user is achieved till 40dB. Theoretically we achieved 50dB





CONCLUSION

Since we are dealing CRN when the secondary user is communicating with the primary user interference occurs which cause drop in SNR of the secondary user. Here we have increased the SNR value by changing the channel and introducing relay system.

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