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MIMO-ENERGY EFFICIENT AND SPECTRUM ANALYSIS USING CONGNITIVE RADIO TECHNOLOGY

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Abstract - *Every day more devices are embraced by the world to connect everything, everywhere and everybody. This type of interconnection gives the connected devices a huge volume of data traffic. The newly hyped "Fifth Generation (5 G)" paradigm is expected to provide the impetus needed to carry the achieving burden. Therefore the energy efficient resources and allocation of resources to every users are attained by MIMO-Cognitive radio technology. This can be attained by using a new mechanism called Parametric method.*

Key Words: **Cognitive radio technology, MIMO, Parametric method.**

1.INTRODUCTION

It is found that a large number of people are attracted to a better internet access which results in a boundary-less global information world. This increasing demand for high-speed data can be met by using new spectrum bands[1]. But achieving this is a very impossible task because the spectrum is a rare resource. Hence the radio spectrums are congested and only a limited new spectrum band can be used. Despite this fact he Federal Communications Commission (FCC) has reported that a significant amount of radio spectrum is underutilized during the day[2]. This in turn called for many research activities to improve the usage of high radio spectrum and so the Cognitive Radio technology has been proposed.

Cognitive Radio (CR) technology helps us to utilize the radio spectrum in an efficient way and there by helps to exploit the licensed spectrum. Therefore in a CR network which the secondary network will share the spectrum that is used by the primary network. Here the secondary network is authorized of adapting its operating parameters to coexist with the primary network.[3] Before the CR technology was implemented it was found that secondary transmitters were only able to the spectrums which was not used by the primary receivers. But after the introduction of CR technology the secondary transmitters can use the same spectrum used by primary receivers unless it cause any outage or damage to the primary network operation and thus the interference is kept below the threshold value.

In the past 802.11 systems only a single Radio Frequency (RF) chain was used in a Wi-Fi. But in case of multiple antennas they use the same hardware to process the radio signal. Therefore we can use only one antenna to transmit or receive at a time because the radio signals have to go through the single RF chain. Therefore we go for MIMO which uses a separate RF chain for each antenna and allowing multiple RF chains [4]. The reason we use MIMO in wireless communications because it will increase the data throughput and link range without the usage of any additional bandwidth and increase transmit power. MIMO plays a important role in the development of wireless industry because it delivers profound gains in range, throughput and reliability. As a result of this most of the manufacturers like WLAN, WMAN and mobile phone equipment make use of the MIMO technology [5].

MIMO-Multiple Input Multiple Output is used in multiplying the capacity of a radio link using multiple transmit and receive antenna to exploit multipath propagation. In modern technology MIMO can be practically used for sending and receiving more than one data signal simultaneously over the same radio channel. The antenna at each end of the communication circuit are combined to minimize error and optimize data speed [6]. The communication in MIMO takes place in two formats:

1. Spatial Diversity
2. Spatial Multiplexing

SPATIAL DIVERSITY: In this the same information is sent across independent fading channels to combat fading. When multiple copies of same data are sent across the independent fading channels, the amount of fad for each copy of data will be different. This will reduce the channel interference.

SPATIAL MULTIPLEXING: In this each spatial channel carries independent information by increasing the data rate of the system. This is compared with Orthogonal Frequency Division Multiplexing (OFDM) where different frequency sub channels carry different parts of modulated data [7].

2. LITERATURE SURVEY

Jiao et al. (2016) focused on energy consumption because of spectrum sensing. This paper present an adaptive spectrum sensing time interval strategy, in which SUs can adjust the next spectrum sensing time interval according to the current spectrum sensing results(namely, channel status). In order to find an optimal spectrum sensing time interval, this paper introduced the Markov model. Then establish a Markov model-based mathematical modelling for analysing the relationship between spectrum sensing time interval and prior spectrum sensing results. Finally, numerical results demonstrate that the proposed strategy with dynamic adaptive spectrum sensing time interval exceeded listen before talk (LBT) strategy which is widely used for traditional wireless sensor networks.

Kumar et al. (2015) introduced a framework and an innovative approach to eliminate the malicious behaviours of the secondary users. It is found that spectrum sensing alone cannot prevent the malicious behaviour without any information on user's reputation. Based on the evaluation of malicious behaviour resistance methods, joint spectrum sensing and malicious nodes detection approach for optimal prevention from sensing falsification is being proposed.

Daewon Jung described the improving the energy efficiency of IEEE 802.11 DCF-based cognitive networks while retaining high throughput performance. To accomplish allow a sender to determine the transmission order and transmit burst packets until the current frame ends. In this cognitive network, available transmission time for SUs is very limited and energy resources easily.

3. EXSISTING SYSTEM

The existing system used is "EXHAUSTIVE SEARCH ALGORITHM". In case of discrete problems there is no efficient solution method is known, it might be necessary to test each possibility sequentially to determine if that it is the solution. But they have a serious disadvantage where this algorithm can be used only in a limited constraint environment. When the system problem size (user need) is increased in a rapid manner the algorithm would be changed to be quickly intractable manner.

The major problems identified are in a particular multiple analog RF chains whch are expense and power consuming are required both at the receiving and transmitting side. On the other hand antenna connecting to RF chains are less expensive and so we make use of more number of antennas than the RF chains. That is the reason why we go for MIMO.

4. PROPOSED SYSTEM

The major problem of using the existing system is that they can be available only for a limited constraint environment and so we go for cognitive radio technology. In this proposed system, we are developing a working model of communication between nearby devices using Cognitive Radio Technology. This can be achieved by using a software called Matlab. Cognitive radio could be a variety of wireless communication within which a transceiver will showing intelligence observe and get into the communication channels that area unit in use and not in useand move into unused channels while avoiding occupied ones. This optimizes the use of available radio-frequency spectra while interference is minimized to other user. In order to perform this

advanced numerical calculation Matlab is used. This Matlab supports the developing applications with Graphical User Interface (GUI) features. It includes GUIDE (GUI Development Environment) for diagrammatically coming up with GUIs. It also has a tightly integrated graph-plotting features.

5. PARAMETRIC METHOD

Multipath propagation is a propagation where a receiving antenna receives the radio signals from different paths or a radio signal uses multiple path from source to destination in a wireless transmission. This is due to the reflections and refractions that occur during transmission through the atmosphere. So this multipath propagation has to be exploited because when data is transmitted through the many nodes and channels it has to be taken care that it does not pass through already used channels. If it passes through that already used channels then the data is lost. So we make use of a mechanism called "Priority Checking". In which we can find which channel is used based on the priority that is when there is many unused channels it gives priority only to the channel that is not used first. This parametric method is used in the military applications where the walkie-talkie which is used can only be available within a limited bandwidth that is 5GHZ-6GHZ where it can use only 5 or 6 GHZ. But by priority checking it automatically selects any frequency which is available within that given range that is 5.1 GHZ, 5.25 GHZ, 5.5 GHZ etc.

6. RESULTS AND DISCUSSION

In the Matlab program we have assigned five primary users and as we run the program in the command window five question occur ie,.Do you want to enter the first primary user? and you can give yes or no.If yes is given it denotes that the channel is in use. If no is given it denotes that the channel is not in use This can be done by using the priority checking in the parametric method where it checks which channel is not used first and based on that it allows the additional user to use that channel.

In the command window we have assigned five primary users and the channel which is used and unused is denoted by yes or no. Based on this the output shows which channel is used and unused. Those channels which are used is represented by higher frequency range and those channels which are not used is represented by lower frequency range.

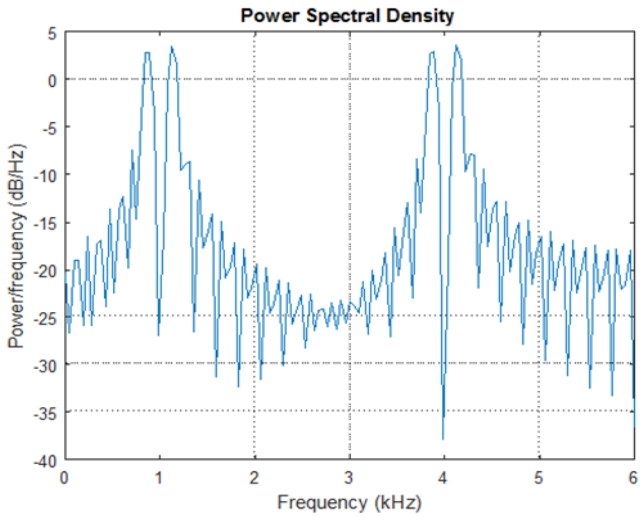

FIG 1

From this figure 1 we can understand that five users is assigned. Where first and fourth user uses the channel while the others are not using the channel.

In the command window there is a question which is asked ie,. Do you want to enter a secondary user Y/N? if you give yes then by parametric method the channel which is not in use is first is prioritized by priority checking and that is used by the secondary user. In this user 2 is not using the channel and it is used by the secondary user.

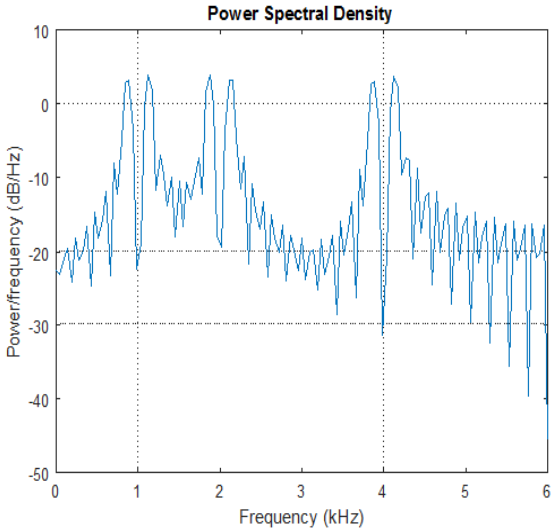

FIG 2

From fig 2 we can find that a secondary user wants to use the channel and so by priority checking it checks which user is not using any channel first and sees whether it is not in use. In fig 1 user 2 was not in use and so that is occupied by the secondary user in fig 2.

7. CONCLUSION

From this paper we can get an energy efficient and reliable data by using the Cognitive Radio technology. Also from this paper we can understand than the communication between the devices does not occur within a limited constraint but indeed used over a wide range of spectrum. If we send data through the network there will be lots of packet loss and noise but by using cognitive radio there will not be any packet loss and this is solved by retransmission. In MIMO we make use of the multiple antenna and so the trouble caused by the multipath propagation is eliminated. Thus the data rate and the throughput is high.

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