Cognitive Relay Networks using Primary User Interference for efficiency

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Abstract——*Actually interference occurs from Secondary Users to Primary Users with some efficiency, relations beginning from Primary Transmitters to Secondary Users. Consider both the interference which occurs from Secondary Users to Primary receivers and primary Transmitters to Secondary Users with using opportunistic relay based on primary user interference. In proposed system we have to use the closed form expressions for obtaining outage probability at that time more various fading channels has been occurred to verify these from various simulation techniques. Asymptotic expressions and multiplicity order are also derived. Proposed system considers Primary transmitter and primary receiver and secondary relays on outage presentation of secondary system. When the numbers of relays are large then we have to achieve better outage performance. In this paper the survey made on concept of cognitive two-way relaying with opportunistic relay section have been almost exact so that able to focus taking place addressing the network placement development.*

Keywords*: Physical layer network coding(PNC),Cognitive Two Way Relay Network, Outage Performance, Opportunistic Relay Selection.*

I. INTRODUCTION

The wireless communications completely rise in applications and customers over the many years. The demand low cost but high speed data services, such as wireless Internet access with loaded video content has determined the wireless communications with higher quality and higher speed wireless communication services. At every time the flexibility of the wireless communications, whenever the consumer requests are increases then radio spectrum demand is also increased. The definition of cognitive radio considers a high level of responsiveness to utilize the intelligence in the choice of the radio spectrum band, space interface, or protocol to higher-level tasks of preparing, learning, and growing new upper layer protocols. Here many unlicensed users are considered as a secondary users, they allowed to use the licensed band of the primary user for protecting the data with the use of spectrum underlay and interweave methods. Currently some underlay spectrum sharing protocols are under consideration the underlay paradigm allows Cognitive (secondary) users to utilize the licensed spectrum if the interference caused to primary users is below a given interference threshold. Owing to the constraint on the transmit power, the piece of cognitive relay protocols is deficiently corrupted in fading environments. Here some methods are proposed to improve the performance of secondary network is to use cooperative Communication with multiple relays. As we understand that the cooperative communication is the approach to improve the channel capacity and achieve higher range growing in fading environments. Besides, owning to the range or multiplicity techniques, the cooperative cognitive relay can diminish the signal fading which arises from multipath propagation and improve the outage performance of wireless networks. Due to bidirectional nature of communication networks, a promising relay technique, two-way relaying, has attracted much attention. Two-way relay network which has higher spectral efficiency as compared to the traditional one-way relaying. It is thus natural to incorporate two-way relaying into cognitive networks to further enhance the spectrum utilization. We have to introduced analog network coding into the cognitive relay network where two secondary user transceivers exchange their information with the assistance of a relay under IP constraint. The physical-layer network coding based cognitive two-way relay network where two secondary transceiver nodes who are located on two different primary user coverage areas, exchange their information with the assistance of a relay in underlay spectrum sharing environment.

Here two way relaying which was used for three time slots, outage probability is an important performance measurement for cognitive relay systems, and also is verified two way relaying which is more efficient than the one way relaying. In this paper we have to make the work of outage performance for physical network coding and cognitive two way relay network with using IP constraint for primary users. This has to give an exact relation between the practical channel fading and outage performance of cognitive relay network in orderly. The outage performance of based on the Nakagami-m fading channels is analysed, and so this model has been studied in many wireless communication systems and can confine the physical channel phenomenon which is more accurate than the Rayleigh and Rician models. Here we have to find the tight upper bound which is based on the cognitive two way relay network for the outage probability of the physical network coding and various key system parameters are also investigated, such as temperature of the interference and channel loss strictly based on the outage probability of the system.

II COGNITIVE RELAY NETWORKS

The advantages obtained from the cooperative relays to improve the established cognitive radio's performance have led to the research of how cooperative relays can be brought into the cognitive radio picture.. Several distributed transmit power allocation schemes for cooperative relay assisted cognitive radio employing the underlay approach relays re-adjust their power so that they can meet all interference and power constraints to allow a low power transmission. Hence, there is no interference to the primary users The performance of a cognitive radio network has been analyzed in terms of information theoretic metrics (i.e, channel capacity and achievable rates).Three different cognitive radio approaches for single/multiple cognitive user(s) as follows:

- Interference mitigating approach: Here two users can send the data at a time though the equal time or frequency slots. If the primary user is not available then secondary user will ask the permission to channel and transmit. However, if a primary is sensed, the secondary user can decide on equal transmission. This Information help to moderate the interference moderate approach explains that a secondary user can act as a relay to work with the primary user when it does not transmit. In this way, a secondary relay actually improves up the primary transmission.

- Interference avoiding approach: This approach determines the unused spectrum parts in either time or frequency slots. Then it adapts its signals according to access the spectrum slot avoiding interference with primary users. A number of interference avoiding method are in an ad-hoc cognitive radio environment using multi-hop relays. The interference based methods are as follows avoidance by using media access control (MAC) protocol.

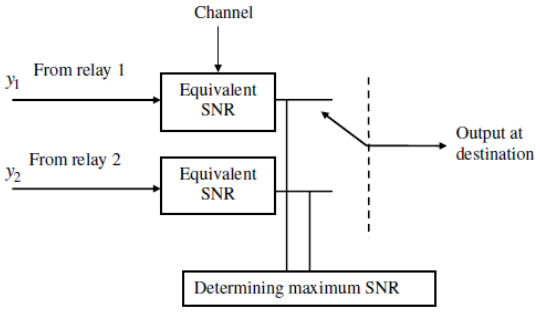

Fig 1 Cognitive Relay Networks

- Interference tolerant approach (i.e, underlay approach) is also called as interference reduction method (limiting the transmission power of the transmitter of the cognitive radio).Here signal process is used for cancelling the interference. The cooperative transmission has a secondary user which acts as a relay for a secondary source and even for a primary source. The primary user can reduce its transmission power and other secondary users can increase the transmission power.

III SYSTEM ARCHITECTURE:

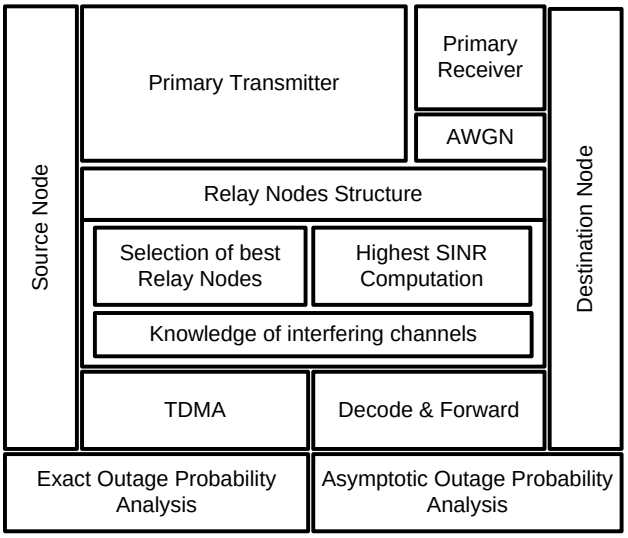

Figure 2 System Architecture of Proposed Model

In the system architecture, we are analyzing the outage performance and here we have to consider the primary transmitter for sending data and receiver for accepting data, we are making use of decode and forward and Time division multiple access principle, we have to select the relay or connection depends on the maximum value of signal to noise ratio, connection from source to destination. finally we get the exact outage probability as shown in figure 2.

IV PERFORMANCE METRICS

The metrics which are used to obtain the outage probability of proposed system. Here using signal to noise ratio method which is one of the performance measure metrics is used in wireless communication system that is called as Signal to noise ratio. Average signal to noise ratio is appropriate metric for wireless communication system which is affected by loss occurrence. In $p_\gamma\,\gamma(\gamma)$ is the pdf of γ

$$\bar{\gamma} \underline{\Delta} \int_0^\infty \gamma p_\gamma(\gamma) d_\gamma$$

Average Signal to noise ratio is also useful for a cooperative relay network to conflict with loss/following effects.

Outage probability: Outage probability is a performance measurement metric for a wireless diversity system affected by loss. It is defined as the immediate error probability exceeding a Particular value (or the probability of the output SNR,) at the destination The Outage probability is denoted by P_{out} and mathematically

$$p_{out} \int_0^{\infty} p_{\gamma}(\gamma) d\gamma$$

The outage probability can be defined as the cdf . Here we have to consider slow independent and identically dispersed Rayleigh fading channel, outage probability can be expressed as the probability that the shared information of the channel falls below a particular speed at a given Signal to noise ratio. Mathematically, *Pout*= Pr [$\gamma < \gamma_{th}$].

V ISSUES AND CHALLENGES

A wireless network means the group of wireless devices communicating through a common wireless channel. The simplest wireless network consists of a single user channel. A wireless network contains many number of base nodes, every node transmitting its information to a collection of end of the nodes.

A wireless network can have a supporting infrastructure, or an ad hoc structure, where nodes self-configure into a network and control is decentralized among the nodes. The multiuser channels are multiple accesses and relay channels. These channels transmit, respectively, to the uplink and downlink of a satellite system or one base station in a cellular system. In these networks, communication occurs between a group of nodes transmitting to or receiving from a single node. In an ad hoc wireless network, here every node can provide as a base node, end of the node and/or relay sending data for other users. Applications of cognitive radio, primary and secondary users accessing the same range form a wireless network. Primary and secondary users can have different transmit/ receive constraints suitable to interference limitations at the primary receivers, as well as possibly different transmit/receive capabilities. In cognitive radio networks the primary users can be cellular or ad hoc, whereas the secondary users are generally ad hoc and fall into the paradigms of underlay, interweave or overlay. Hence, these two secondary users forms a two-tier wireless network. Piece restrictions of wireless networks are thus of direct significant to the piece restrictions of cognitive radio networks. In particular, the fundamental ability restricts of ad hoc networks which not only states how much information can be transmitted by secondary users but also dictates the information exchange possible between two sensible nodes to collaboratively evaluate spectral vacancy. The broad range of performance metrics applicable to wireless networks, including their capacity. We then formally define mutual information and capacity for single-user channels as well as for general wireless networks. In the underlay spectrum sharing protocol, Secondary Users are allowed to use the licensed spectrum of Primary Users as long as the interference from Secondary Users to Primary Users does not exceed the interference power constraints at the Primary Receivers. More works on Cognitive Relay Network which focuses on the study of primary user's interference power constraints. However, the potential interference from the Primary Transmitters to secondary receiver is usually not taken into consideration or has been simply translated into the noise term of the Secondary User. This assumption is unreasonable because the interference is differ from the noise by its arithmetical properties The cognitive radio which has following two challenges: include the primary user detection and the transmission opportunity exploitation. Detection of a primary user means that the detection of spectrum hole. A spectrum hole is an unoccupied spectrum band which is licensed to the primary user. In the literature, spectrum hole detection is also called as the 'spectrum sensing'. The cognitive users can exploit the opportunity of transmission, either we have to use the overlay or underlay approaches for improving their performance. Regardless of the approach employed by the cognitive radio, the inherited vanishing phenomena of the wireless channels restricts the service reliability and coverage of the wireless communication services

VI CONCLUSION

In this paper, we have to obtain the outage probability of the secondary user by using cooperative relay network and also we have to analyse the outage probability. Here in this we have to more concentrate on secondary users based on primary user interference. Next we have to suggest the new organization of the outage probability and also analyses the effectiveness of the transmit power of primary transmitter. When the network operation is changing then we analyses the cognitive system outage performance.

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