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A MULTI-USER RESOURCE ALLOCATION OF SPECTRUM SENSING ALGORITHMS USING COGNITIVE RADIO APPLICATIONS

[1]Mrs.R.Suganthi,[2]P.Divya,[3]K.Lakshmi, [4]N.Pavithra
[1]Associate Professor,[2,3,4]B.E,ECE,Panimalar Institute of Technology,Chennai.

Abstract*— In the existing ad hoc network, common channel is present to broadcast control channels between the nodes. This cannot be achieved in cognitive radio ad hoc network where different channels are acquired by different cognitive users based on the spatial and temporal usage of the primary users. While minimizing the broadcast delay, broadcasting of control signals to all the nodes of the cognitive radio ad hoc network with high success rate is difficult. Broadcast collision occurs, when a multiple copies of broadcast message in multi hop cognitive radio ad hoc network is received by a node. This survey helps to understand various schemes used for broadcasting the control information with high success rate and low broadcast delay by eliminating the broadcast collision in multi hop cognitive radio ad hoc network. To reduce the interference of primary nodes and achieve the maximum rate in secondary node, analyses spectrum sharing in cognitive radio networks and perform the selection of relays models .The trade-off is also characterized between the secondary rate and the interference on the primary. To consider a spectrum-sharing analysis and to achieve an above mentioned aspects, they taken an Alternating Relay Protocol to investigate the performance and clustering (frame work). "In these paper Rayleigh fading is used to select the relay thus rate of transfer decrease per second. In Order to increase the rates of frequency by proposing with an algorithm of frequency selective fading, data loss is comparatively reduced". Finally to address the rate loss due to half- duplex relaying in the secondary and propose an alternating relay protocol and investigate its performance.

***Key words* — cognitive radio ad hoc network, energy efficiency, resource allocation, locate aware strategy.**

I. INTRODUCTION:

Cognitive radios, or secondary users, are spectrum agile devices that can sense the spectrum, identify the underutilized bands, and opportunistically share those bands with the original users (primary users) such that they do not cause harmful interference on those primary users [1]. Hence, more users can share the spectrum efficiently and provide more utilization to the underused bands. However, when a secondary user is severely interfering with the primary users, it should abandon this primary band and try to exploit another underused one. Cognitive radios can operate with a primary network using either overlay, or underlay spectrum sharing [2]. In spectrum overlay, secondary users are allowed to access the original bands that are totally free of primary operation. Therefore, the interference caused on primary users is almost negligible, and robust sensing is demanded of secondary users. In spectrum underlay, secondary users can share the same spectrum band simultaneously with the primary users, as long as the interference caused on the primary users is small enough to guarantee minimum primary QOS. The secondary users do not have to apply sophisticated sensing mechanisms. Rather than, efficient resource allocation procedure is needed so that the spectrum can be shared with high utilization. In this paper study the problem of power allocation for primary and secondary users in a spectrum underlay system. Most of the existing work separates the power allocation for the secondary network from the primary network.

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In [3] and [4] the authors study the power allocation for secondary users under maximum tolerable interference on the primary users, also minimum QOS constraint on each secondary user. They address two scenarios, the first is the maximization of the secondary network throughputin case all the secondary users can be maintained under given constraints. The second is the maximization of the number can be admitted secondary users under the minimum QOS constraints when not all of them can be maintained. The second scenario is also statement in [5] where a lower complexity and more efficient algorithm is suggested. In [6] the authors combine the power allocation and access control for secondary users in one problem aiming at maximizing the overall secondary throughput. In this work we consider an underused primary network and research the overall network throughput in the presence of cognitive radios. Our aim is to jointly allocate power to both primary and secondary users in order to the overall network throughput is maximized, as protecting the QOS of the original users by keeping their signal-to-interference and-noise-ratio (SINR) above a minimum level. Then the power allocation for maximum sum throughput in multiuser wireless networks is a non-convex problem, study an iterative algorithm that is proved to converge to an optimal value (not necessarily the global) of the total sum throughput. We study the efficiency of the solutions to which suggested algorithm converges via numerical simulations, and show that the network can reach better utilization by incorporating secondary users operation. Also, we find the throughput and power prices paid by primary users in order to have the secondary operation and achieve higher utilization. Our results show that eventhough the primary users may lose throughput due to the secondary operation, their total transmit power is notably reduced. The rest of this paper is arranged as follows. In Section II we state the underlay network model. In Section III we state the problem formulation. We introduce the proposed algorithm and recognized its convergence in Section IV. Simulation results are presented in Section V and the work is determined in Section VI.

A. Cognitive radios has the following challenges:

Challenge 1- The spectrum-awareness designing efficient routing solutions for CRNs requires a tight coupling between the routing module(s) and the spectrum management functionalities such that the routing module(s) can be simultaneously aware of the surrounding physical environment to take more accurate decisions.

Challenge 2 - Setting up of ‘‘quality” routes in dynamicvariable environment and minimize end to end delay. The ‘‘route quality” has to be re-defined such that the timely delivery is secured with lower delay less packets loss.

Challenge 3 – Increasing utilization of available spectrum the routing and spectrum management algorithms should conform maximum utilization of existing spectrum and accommodate higher traffic.

II. II.LITERATURE REVIEW:

[1]” Resource Allocation for Interlink and Underlay CRs under Probability-of-Interference Constraints”,by Antonio G. Marques, *Member*, IEEE. Efficient design of cognitive radios (CRs) calls for secondary users establishing adaptive resource allocation schemes that utilize knowledge of the channel state information (CSI), as at the same time terminal interference to the primary system. This paper introduces theoretical resource allocation algorithms for both interlink and underlay cognitive radio paradigms. The algorithms are proposed to maximize the weighted sum-rate of orthogonally transmitting secondary users under average-power and probabilistic interference conditions. The terminals are formulated either as short- or as long-term conditions, and guarantee that the probability of secondary transmissions interrupting with primary receivers stays below a certain pre-specified level. When the subsequence optimization problem is non-convex, it exhibits zero-duality gap and therefore, due to a favorable structure in the dual domain, it can be solved efficiently. The optimal schemes leverage CSI of the primary and secondary networks, among the Lagrange multipliers related with the conditions. Analysis and simulated tests confirm the merits of the different algorithms in: i) accommodating time-varying settings through theoritical approximation iterations; and ii) coping with defective CSI.

[2].“Multi-user Resource Allocation Optimization Using Bandwidth-Power in Cognitive Radio Networks”, by YahiaTachwali, Member, IEEE,MARCH 2013. In this paper, the drawback of resource allocation optimization is designed for a single-cell multiuser cognitive radio network in the presence of primary user networks. The spectral approach of the cognitive radio(CR) network is based on Orthogonal Frequency Division Multiple Access (OFDMA). A joint bandwidth and power allocation is performed to users' rate requirements are satisfied, and the stability of primary user communication is preserved. In this work, two different challenges are addressed. The first is the combination of primary user activity in the action of resource allocation technique, and the second is the minimal hardware capabilities of cognitive terminals compared to those obtainable at the cognitive base station. To address these drawback, a different resource allocation framework is proposed based on the bandwidth-power product minimization, which is an effective metric in weighing the spectral resource dispersion in a cognitive radio environment. The reference takes into regard the challenges aforementioned. The results show significant improvement in spectral efficiency by using our core compared to classical power adaptive optimization using iterative waterfilling scheme.

III. Problem Formulation

Existing solutions to solve the problem involve WIMAX protocol which does not solve all the problems like malicious node, cooperation between nodes, interference, minimize end to enddelay, packet loss and maximum throughput maximization in wireless sensor networks as a whole. WIMAX is a table-driven routing scheme for ad hoc mobile networks based on the Bellman–Ford algorithm. The main role of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are basically even if a link is present; else, an odd number is used. The number is accomplished by the destination, and the emitter needs to send out the next update with this number. Routing information is delivered between nodes by sending full dumps rarely and smaller incremental updates more frequently. WIMAX requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth even when the network is constant. When the topology of the network changes, a new sequence number is needed before the network re-converges; result, WIMAX is not suitable for highly dynamic or large scale networks. As in all distance-vector protocols, this does not dismay traffic in regions of the network that are not concerned by the topology change.

IV. Routing and Resource Allocation Strategy

We proposed a design for routing and resource allocation in a joint fashion for cognitive radio mesh networks. We also enhance the proposed methodology to be applied in Wireless Sensor networks random and mesh networks using Long Term Evaluation (LTE) protocol. This methodology using LONG TERM EVALUATION(LTE) end to delay drastically and gained the maximum throughput. The main aim in this work is to find the best routing and resource allocation strategies show that minimize the average end-to-end delay of multiple data connections in the cognitive radio based wireless mesh network. Due to the primary nodes activity, the spectrum resources existing to the cognitive mesh nodes are varying in both space and time. Thus, any successful routing strategy will have to work closely with the resource allocation strategy to make sure that any selected route will have enough resources existing to guarantee the required Quality of Services (QOS). Because ofthis strong interdependence between the routing and resource allocation strategies, we propose to consider the routing and resource allocation strategies in a joint fashion instead of separating the two problems. Before presenting joint design strategy we need first to evaluate the effect of the routing and resource allocation decisions on the network performance. This is established by relying on queuing theory to model the different concepts of the cognitive mesh network and to form a basis for our routing and resource allocation protocol design.

V. Recursive Algorithm

Priority mechanisms are used to enhance the network utilization, as meeting the requirements of each type of traffic. The user may accomplish different types of traffic flows by using loss priority efficacy and when buffer overflow occurs, packets from low priority can be selectively deleted by network elements. Priority Mechanism can be divided into two types time priority and space priority. Time Priority can control the transmission flows of buffered packets. Space priority controls the retrieve to the buffer. Chipalkatti at all [6] studied the performance of time priority mechanism

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including Minimum Laxity Threshold (MLT) and Queue Length Threshold (QLT) under varied traffic of real time and non-real time traffic. Space Priority mechanisms have been studied primarily are Push out mechanism and Partial Buffer Sharing mechanism. In both this mechanisms each source track every packet with priority level directing high priority and low priority. In push out mechanism, high priority packet may enter the queue although it is full, by replacing the low priority packet in the queue. But if a low priority packet enters the queue when it is full, it will be deleted. In Partial buffer sharing mechanism both high priority confirmed low priority packets are accepted by the queue until it reaches the threshold level.

VI. Mesh Network Using Cognitive Nodes

A wireless mesh network is designed to carry out communication effectively. In this, the mesh node has the ability of cognitive sensing through which the available spectrum is identified dynamically. The selection of transmitting packets is based on frames which categories on basis of time. The cognitive node is selected on the basis of sensing capacity of node which is able to accept the request of all other nodes. The cognitive node sends the packet only if the available spectrum is constant. This is used to form a mesh network in which the nodes are described by each vertex. The cognitive nodes in the network has the same transmission range and the node has two edges. Based on primary spectrum the availability for secondary nodes is acquired. In mesh node for sensing of idle nodes during transmission is enforced using Recursive Algorithm. They sense based on space priority and sectional input buffer sharing.The nearest cognitive sensing node is selected based on distance if cognitive node is not near idle node. The cognitive node transfers the packets in the network by sensing the unutilized spectrum and allocate the channel for transmission.

VII. Connected Dominate Set (CDS)

In order to avoid the hidden terminal problem in which the invisible nodes can communicate with other nodes. Only the nodes near the cognitive nodes can communicate in mesh network. So the breaking of mesh is enforced. Then the nodes are disposed randomly so that any node can communicate with cognitive sensing nodes. So DARP protocol is utilized for routing. This protocol combines all the metrics such as delay, losses etc. In this the cumulative delay between the end nodes is calculated. The delay in each route is verified by combining the path delay and node delay.

A. Advantages:

1. First Come First Serve scheduling methods
2. Decentralized Pre-emptive Scheduling using content delivery Network
3. Decentralized Non- Pre-emptive Scheduling using content delivery Network
4. Space Priority Mechanisms using recursive Algorithm

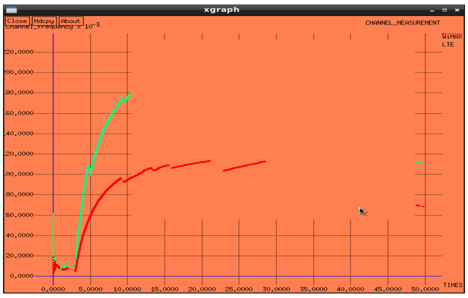

Fig 1: Channel measurement

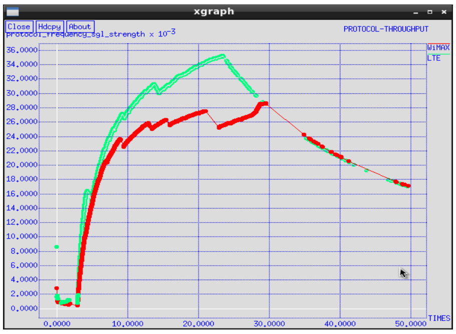

Fig 2: Protocol frequency

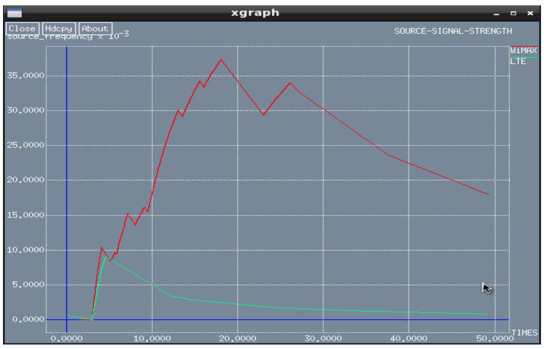

Fig 3: Source signal strength

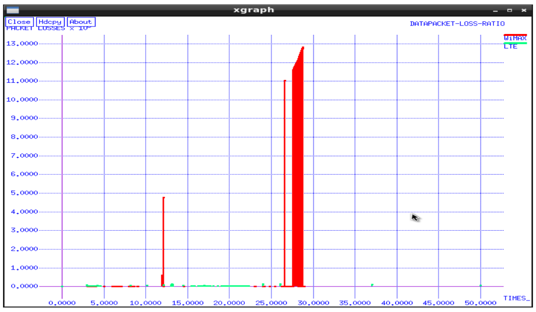

Fig4 : Data packet loss ratio

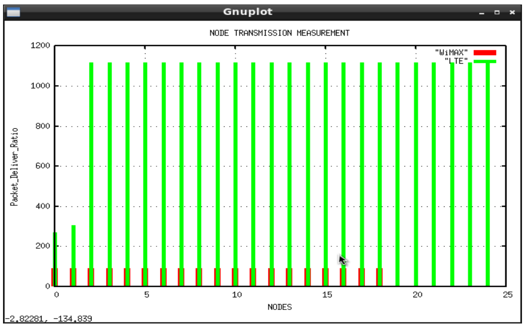

Fig 5: Node transmission measurement

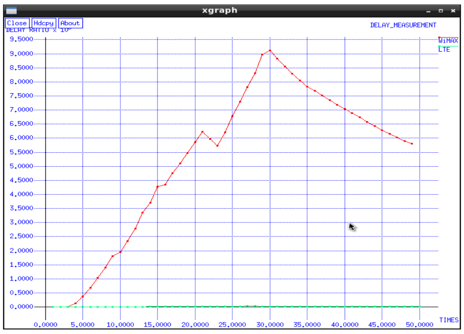

Fig6: Delay measuremen**t**

Fig7: Throughput measurement

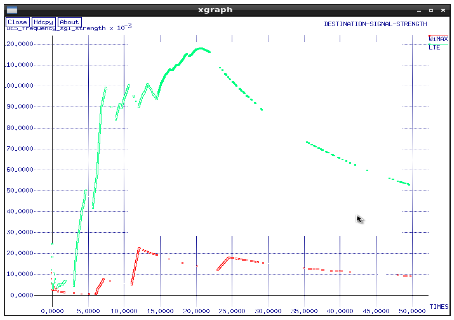

Fig 8: Destination signal strength

VIII. CONCLUSION

An auction-based power allocation scheme is proposed to solve power competition of multiple SUs. These aforementioned works are based on the maximum data rate design subject to an overall power constraint. A novel adaptive power and channel allocation algorithm has been proposed to achieve the proposed resource allocation strategy based on the Long Term Evolution. Proposed algorithm avoids unnecessary spectrum sensing and hence minimize the energy consumption, at the price of more optimization computation. This provides a tradeoff between sensing energy consumption and signal processing power consumption. When the number of channels is high, it is believed that the proposed algorithm is more promising.

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