Queue Balancing Dynamic Resource Allocation Management in CR networks

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ABSTRACT

In Future wireless communication and networking Cognitive radio is a powerful technology. It is a new communication paradigm in spectrum. When the spectrum is left unused by the licensed users it allows the unlicensed users to access the spectrum efficiently. However the secondary users vacate the current occupied channel the specific primary users for that channel to transmit data by that channel itself because the primary users have the priority to access the channel. To provide reliable transmission to the secondary users, spectrum hand off method is help the secondary user return the channel to the specific primary users and stop the secondary user's transmission and the remaining transmission of the secondary user at other free channel. The problem is allocating channels and transmission power in multihop CR networks. This research paper proposed a frequent feature selection method for CR networks. Good performance of this method comes from the use of the spectrum utilization. The proposed approach improves the data transmission accuracy and reduces the packet loss of the secondary user transmission.

Keywords - *cognitive radio (CR),Muihop networks.*

I. INTRODUCTION

The term cognitive radio is designed as a radio frequency transceiver to detect whether a particular segment of the radio spectrum is in use and out of the temporarily unused spectrum without interfering with the transmission of the authorized users. It reduces the spectrum shortage problem. Here the problem is distributed resource allocation [5],[6].In this research paper flow control(routing) is used to transmission of data between source to destination. The flow control used the common method resource directive decomposition [7].Commonly routing problems for networks are formulated as multi commodity flow problems. The routing of data flows depends on the link capacities. It is usually assumed fixed. However the link capacities of the wireless networks are not necessarily fixed. but it can adjusted by the allocation of resources. Adjusting the resource allocation changes the link capacities. The simultaneous optimization of routing and resource allocation only used to achieved overall optimal performance of the network.[7].This method converts multi commodity flow problems into a single commodity flow problem. In this -research paper proposed a queue balancing method. This method for the multi commodity flow problem.[8][9].

The multicommodity flow problem consists of several different commodities from their respective sources to their sinks through a common network so that the total flow going through each edge does not exceeds its capacity.[8].To protect primary users in CR networks each node has the power mask on every channel. Sometimes the status of channel in a licensed spectrum may change because of primary users activities is called spectrum dynamics.

Cognitive radios (CRs) intelligently exploit available side information about the

- Channel conditions
- Activity
- Code books
- Messages

Of other nodes with which share the spectrum.

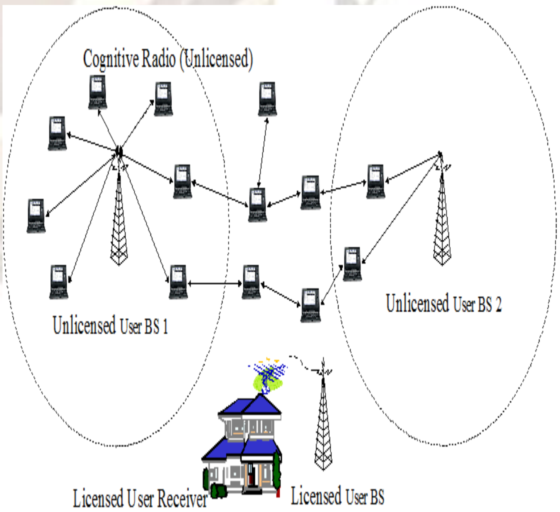

Fig .1 CR network in Spectrum

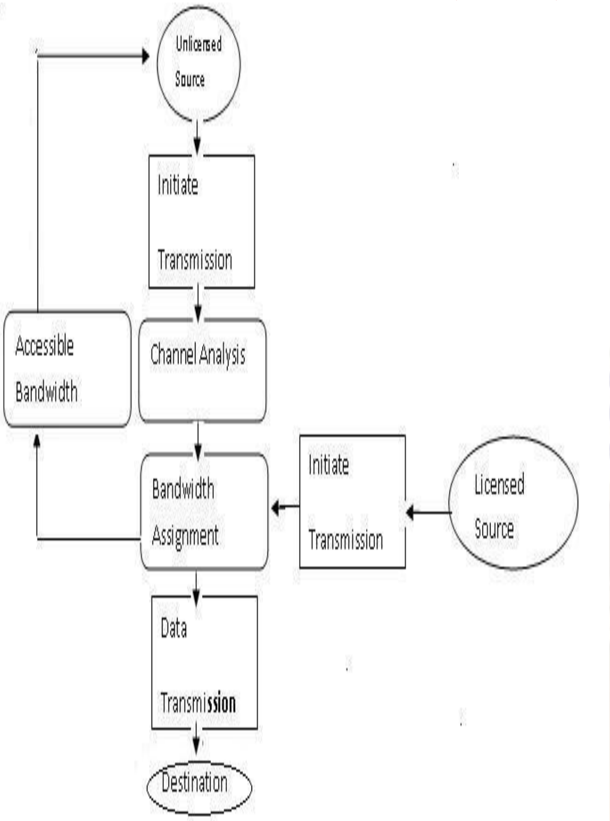

Fig.2 CR Network framework[1]

inactive, an important requirement of secondary users is the capability to sense their surrounding radio spectrum environment. Further, since primary users should be carefully protected from interference due to secondary users' operation, secondary users also need to sense the licensed spectrum before each transmission and can only transmit when the spectrum is idle. One efficient way of spectrum detection is the primary transmitter detection based on local observations of secondary users. If the information of the primary user signal is known to secondary users, they can use matched Alter detection to maximize the received signal-to-noise ratio (SNR) under stationary Gaussian noise. Dynamic spectrum access has become a promising approach to fully utilize the spectrum resource.

II. CR NETWORK CREATION

Cognitive radio (CR) network makes it possible for unlicensed/cognitive users or devices to opportunistically utilize the licensed spectrum when it is not occupied by licensed/primary users. It can overcome the drawback of the current static spectrum allocation policy. Using this module the user can reserve the path for their future data transmission. The Licensed (Reserved) users data transmissions are take into account seriously than unlicensed users data transmission. It consists of set of nodes V and a set of links L.Here

T(L)=Transmitter of link(L).
R(L)=Receiver of link(L).

In order to reduce the complexity of resource allocation several subcarriers are combined to be a channel. Specific minimum number of channels only required for wireless network.[5].For the flexibility of spectrum it can be divided into more channels. Assume that number of C channels are avillable.

III. UNLICENSED USER TRANSMISSION

The special functionality of Cognitive radio (CR) network allows the unlicensed users can makes data transmission through the reserved path, when the paths are not utilized by the licensed users. the path utilization is achieved by the Unlicensed user data transmission and this allow that the data transmission on On-Demand Resource provisioning mode.

Interference-Aware Transmission Model

To protect the communication of the primary nodes, the Transmit power of CR nodes should be restricted as

$$\sum_{T(L)=i} wlkPlk < Qik$$

Plk-Transmit power at link l on channel C. wlk-Binary indicator for channel allocation. i.e., means that channel is (not) allocated to link L .

IV. SPECTRUM DYNAMICS

For CR networks, each node has the power mask on every channel to protect primary users, and the status of channels in a licensed spectrum may change because of the primary users' activities, which is known as spectrum dynamics. The channel accessibility is superior for licensed users than the unlicensed users. From this view want make a better channel provisioning for unlicensed users data transmission.

In multi-hop Cognitive Radio Network (CRN), the CR nodes sense spectrum and get available frequency bands, named as Spectrum Opportunities (SOP) [2], then select one candidate from SOP via specific policy, which will not interfere with licensed nodes.[14]. One of the most challenging problems of cognitive radio is the interference which occurs when a cognitive radio accesses a licensed band but fails to notice the presence of the licensed user. To address this problem, the cognitive radio should be designed to co-exist with the licensed user without creating harmful interference. Recently, several interference mitigation techniques have been presented for cognitive radio systems. An orthogonal frequency division multiplexing (OFDM) was considered as a candidate for cognitive radio to avoid the interference by leaving a set of sub channels unused [3]. A power control rule was presented to allow cognitive radios to adjust their transmit powers in order to guarantee a quality of service to the primary system [4]. To avoid the interference to the licensed users, the transmit power of the cognitive radio should be limited based on the locations of the licensed users [4]. However, it is difficult to locate the licensed users for the cognitive radio in practice because the channels between the cognitive radio and the licensed users are usually unknown.[13]. In this research paper, present a power control approach in cognitive radio systems based on spectrum sensing side information in order to mitigate the interference to the primary user due to the presence of cognitive radios. This approach consists of two steps. Firstly, the shortest distance between a licensed receiver and a cognitive radio is derived from the spectrum sensing side information. Then, the transmit power of the cognitive radio is determined based on this shortest distance to guarantee a quality of service for the licensed user. Because the worst case is considered in this approach where the cognitive radio is the closest to the licensed user, the proposed power control approach can be applied to the licensed user in any location.

Power control based on spectrum sensing side information.

In this section present a power control approach in cognitive radio systems based on spectrum sensing side information to efficiently utilize the spectrum by allowing the cognitive radio to co-exist with the primary system. firstly propose an idea of determining the distance **d** between the primary transmitter and the cognitive radio from spectrum sensing. Then, we show that the transmit power of the cognitive radio can be controlled based on the distance **d** in order to guarantee a quality of service to the primary receiver.

Spectrum Sensing Side Information

In order to avoid the harmful interference to the primary (licensed) system, the cognitive radio needs to sense the availability of the spectrum. The goal of spectrum sensing is to decide between the following two hypotheses:

$$\mathbf{H0 : x(t) = n(t)\ 0< t \leq T}$$
$$\mathbf{H1 : x(t) = hs(t) + n(t)\ 0< t \leq T}$$

where T denotes the observation time, x(t) is the received signal at the cognitive radio, s(t) is the transmitted signal from the primary transmitter, n(t) is the zero-mean additive white Gaussian noise (AWGN) with the variance σ2 and h denotes the Rayleigh fading channel coefficient. The instantaneous SNR is defined as γ _ |hs(t)|2/σ2.for this channel allocation proposed a algorithm.

Distributed Spectrum Allocation Algorithm:
1. Let the available bandwidth options be: {b1, b2, ..., bn},
with b1 < b2 < . . . < bn.
2. I := min{i|bi _ B/N};
3. for i = I, . . . , 1 do
4 .Δf = bi;Δt := min{Tmax, Tx Duration(bi, qLen)}
5: if Δt == Tmax or i == 1 then
6: Find the best placement of the Δf×Δt block in the
local spectrum allocation table that minimizes the finishing time and is compatible with the existing allocations and prohibited bands.
7: if the block can be placed in the local spectrum allocation table then
8: return the allocation (t,Δt, f,Δf).
9: end if
10: end if
11: end for.

This algorithm is used to allocate a channel in CR Network.

V.POWER MASK

The power mask model is considered as a general case of the channel availability model. With the queue-balancing flow control method, our proposed distributed resource-allocation scheme can deal with spectrum. For cognitive radio, the power mask for each channel and can adapt itself to account for the spectrum dynamics according to the spectrum condition and the current link transmission requirement. The flow control, power allocation, and channel allocation are considered jointly to balance the queue sizes. The proposed distributed scheme is also suitable for asynchronous scenarios in which not all the network nodes have to execute the scheme at the same time. With the help of this module the Unlicensed user can make better data transmission by either switching to the free channels or reducing the data rate.

Queue balancing flow control is proposed to pushes data from source to destination. the queue size of the source is always larger than that of the destination for each session.The link capacities change with dynamic resource allocations affected by primary activities and different queue sizes of the nodes. Additional coordination of nodes is needed because of the complex wireless environment, especially caused by primary users moving in and out of channels.

Queue balancing worked in a distributed way .In this research paper this scheme in two parts
1.Node level resource allocation.
2.Network level resource allocation.

Node level resource allocation

By using the queue-balancing flow control, the problem can be transformed to a resource-allocation problem for each link. Specifically, we need to allocate the channel and power resource for each link so as to maximize the decrease of potential functions in each time slot.In this research paper consider three types of resource allocation, ranging from small-scale to larger-scale adjustments.

• Adjust the data rate over a link for each session according to the queue sizes at transmitters and receivers.

• Allocate the power of the links transmitting from the same nodes. The power adjustment changes the link capacities, but does not affect other links because of interference-free channel allocation.

• Change the channel allocation to achieve better performance. To avoid the interference between links, nearby nodes need to be coordinated for channel allocation.

Network level resource allocation

Based on the above analysis, we propose a node-based distributed algorithm for joint flow control, channel allocation, and power control in CR networks.

Step 1) Update the queue sizes at each node.

Step 2) Send the control information needed for resource
Allocation.

Step 3) Determine the resource allocation and exchange
INFO and REQ, if necessary.

Step 4) Adjust the channel allocation strategy and determine the corresponding power and data rate for each session. Send OCCUPY for new channel occupation.

VI.EXPERIMENTAL RESULT

From the experiment the channel is allocated to a secondary users in efficient way without interfere a primary users activity using the queue balancing and flow control method. Normally when the secondary user connection is lost because primary user occupy that specific channel.at that time packet loss in secondary user side is not controlled. In this paper that is rectified (packet loss is controlled) .

VII.ISSUES AND CHALLENGES

Spectrum management is considered as a significant yet intricate task that needs to be carried out precisely and efficiently. It reduces spectrum shortage problem in future.

The queue balancing and flow control of the same would be highly beneficial. Primary users decisions are often made based on channel allocation . This practice leads to unwanted packet loss, errors which affects the quality of service provided to users. Networking have the potential to generate a knowledge-rich environment which can help to significantly improve the quality of CR networks.

VIII.CONCLUSION

This paper proposed an efficient frequent feature selection method for Spectrum management. Good performance of this method comes from the use of the queue balancing and the relevant flow control. The power mask reflects the importance of the channel allocation as well as their interactions..The proposed work can be further enhanced and expanded for the CR networks We intend to extend our work applying various classification methods to improve spectrum utilization more efficiently.

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