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Appropriate Channel Selection for Dynamic Resource Allocation with Priority Scheduling Approach in Multi-hop Cognitive Radio Networks

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Abstract: Today's wireless communication systems required groundbreaking solution to meet scarcity of radio spectrum. Cognitive radio (CR) is an emerging technology which provides futuristic solution and improving the precious likely resources utilization. Cognitive radio network (CRN) is an intellectual wireless communication system as well as aware of its environment. In CRN, we have sensing problem by multiple nodes with changing computational power, spectrum allocation and range of sensing. The secondary user (SU) plays major role of primary channel sensing and appropriate unused channel selection for communication. In this paper we focused on optimum resource allocations and priority based scheduling for primary user (PU) and secondary user (SU) to exploit the performance of the entire network by reducing the interference at PU and also exploiting the throughput and decreasing the risk of overlying the coverage of CRNs. The effectiveness of dynamic resource allocation priority based scheduling (DRAPBS-CRN) algorithm is compared with dynamic resource allocation (DRA-CRN) algorithm and is found to be 26% more efficient using ns-2 simulation. This proposed DRAPBS-CRN algorithm also will avoid collisions and perform smart data transmission in CRN.

Keywords: Cognitive radio, MIMO, SINR, Dynamic allocation, Femtocell, OFDMA.

1. Introduction

In modern years, wireless communication technology has been faced serious problem of insufficient radio spectrum usage [1]. Federal Communication Commission (FCC) has been specified that 70% of allocated spectrum is not in use even in screamed range where usage of the spectrum is immense.Emerging wireless applications and services of unlicensed band tried remaining percentages of allotted spectrum and leading to spectrum scarcity [2]. CR is intelligent technologies which dynamically adjust its radio environment and make it excellent communication [1][2][3]. The excellent utilization of spectrum is achieved by allowing secondary user (SU) to utilize the licensed band while primary user (PU) is in idle [4].

Cognitive radio network has an intelligent antenna with transmitter and receiver to detect whether a specific segment of the radio spectrum is presently in use or not and to access (and out of, as required) the provisionally unused spectrum very rapidly, without interfering with the transmissions of other authorized users. Smart Antenna (also known as adaptive array antenna, multiple antennas and MIMO) are antenna arrays with keen processing algorithm used to identify special signal signature such as the direction of arrival of the signal to track and locate the antenna beam on the target. Hence determines the best signal to be obtained with high SNR and optimum power utilization. The proposed algorithm will improve the throughput efficiency, avoid collusion and perform smart data transmission around the cognitive radio network.

1.1 MIMO-OFDMA

MIMO (Multiple-Input and Multiple-Output) operates the utilization of different transmitters and getting receiving wires at the offered hubs to builds the usage of system ideally and to worker multipath spread for expanding dependability. MIMO-OFDM consolidates the benefits of both MIMO and OFDM highlights [5][6]. MIMO joins numerous information various yield innovations, which duplicates limit by transmitting diverse signs over different receiving wires, and OFDM (orthogonal recurrence division multiplexing) separates a radio channel into an expansive number of firmly divided sub-channels to give more dependable correspondence at fast [6]. MIMO-OFDM is a capable mix in light of the fact that MIMO alone does not endeavor to moderate multipath engendering and OFDM keeps away from the requirement for sign adjustment. MIMO-OFDM can accomplish high ghastly productivity in any given system of operation.

1.2 Cognitive Radio and Intelligent Antenna

In recent years, there has been scrambled in numerous users in internet. We considered primary users (licensed users) and secondary users (Unlicensed users) in CRN. Primary users access a licensed radio spectrum for special purposes. In practical, the usage of licensed spectrum is very low compared to the usage of unlicensed spectrum band. The CR is an intelligent radio, which can be programmed in any given network, by using the greatest wireless channel available in its neighborhood as one key technology to activate the utilization of spectrum resource.We can use dynamic spectrum access technology that can be improves the excellent performance of wireless network communication and make it as reliable networks and robust, however the nodes are mobile and has less power sources [6][7][8][9].

Cognitive radio networks have an intelligent antenna, transmitter/receiver is designed intelligently to detect whether a certain fragment of the radio spectrum is presently in use or not and to access the temporarily unused spectrum very rapidly, without interfering with the transmissions of other authorizedusers. Smart antenna also called adaptive array antenna, multiple antenna and MIMO which can be detect the special signal with signature such as direction of arrival of the signal by using smart adaptive algorithm and perfect channel state approach and locate the antenna beam on target. Hence, regulates the excellent signal to be obtained with high SNR and optimum power utilization [6] [10].

1.3 Femtocell

Femtocell is a wireless communication system that as a promising technology and expands cellular receptions inside an office or a room in the building.In telecommunication, femtocell to expand the system scope and limit for the developing requests of cell administrations, and has been incorporated in present and future radio access systems. Femtocells in a cell system can enhance framework execution. Femtocells are low power base station that has changed over the concentrated cell system into appropriated system. The access point of femtocell is known as femto access point (FAP). It enhances scope, nature of administration, and diminishes battery channel because of short range transmissions.In wireless communication system, femtocell manages licensed and unlicensed spectrum access scenario. Femtocell as a capacity to accomplish higher information rates by shorting the correspondence extent and it has better radio frequency reuse ability. They are compatible with CDMA2000, WiMAX and UMTS mobile telephony devices, using the provider's own licensed spectrum to operate. Consumer-oriented femtocells will support no more than 4 active users while enterprise-grade femtocells can support up to 16 active users.

In the rest of this article is organized as follows: in section 2, literature review, we described about the background and related concepts, in section 3, we described about problem identification and solution, in section 4, we described about proposed problem approach, in section 5, we compared the result of proposed and exiting solution, and section 6, we concluded in this articles.

2. Literature Survey

P.Changet al [1] have proposed game theory approach for dynamic resource allocation in an OFDMA based cell as two-tire game (RA-Game and PS-Game). In RA-Game approach every PU is dynamically access sub-channels according to his traffic load requirements and payoff. In PS-Game approach, SU purchases the unused radio spectrum from PU to maximize his utilization. Additionally, they have been proposed two algorithms to distribute resource among PUs and SUs in a disseminated routine. Their additional designed algorithm to converge to Nash equilibrium automatically and which make, maximize an effective utilization of entire network resource. Besides, our relay scheme greatly improves the throughput of SUs, compared with the case that SUs access BS directly.

Yahia Tachwali et al [13] have designed a novel resource allocation framework depends on the bandwidth-power product minimization, which is an energetic metric in assessing the spectral resource consumption in a cognitive radio atmosphere. The framework takes into an attention the encounters aforementioned. The proposal has been shown that the significant achieved enrichment in spectral efficiency.

Renchao Xie et al [14] have proposed spectrum sharing and resource allocation for energy efficiency in multi-hop networks with femtocell and cognitive radios. They have been used the price of interference to model the interference between femtocells and macrocells. Further they have formulated the problem of interference management and power allocation as a Stackelberg game. In addition, to obtain the Stackelberg equilibrium solution to the resource allocation problem for energy efficiency by formulating as an iteration algorithm based on price updating method. The proposed system can be achieved a significant improvement of energy efficiency in heterogeneous wireless networks with femtocells and cognitive radios.

Yinglei Teng et al [15] have proposed energy efficient resource allocation in the multi-secondary user (SU) CRN by network coding based cooperative transmission (NcCT). They have made a system for multi-SU resource allocation game through Nash bargaining solution (NBS) beneath the cognitive radio scenario (CR-MSU-NBS game) where the quantity of pairwise NBS function with coupling strategy is affected as the network optimization objective and context conditions as limitations. The proposed scheme reaches a good tradeoff among fairness and efficiency and outperforms the accustomed distance-pairing schemes.

Mehdi Ghamari et al [16] have designed MIMO-OFDM- based cooperative CR networks for resource allocation. In order to exploit the reachable data rate of the desired SU link, the coupling of subcarrier, cooperating SU (relay) assignment and power distribution are made jointly, using the dual decomposition system, although maintaining the interference introduced to the PU below a pre-specified threshold. They have achieved high computational complexity of the optimal structure by suboptimal low complexity algorithm. The proposed system has reached performance improvement by deploying multiple antennae at the SUs.

Jin-Ling Xu et al [17] have proposed a jointly designing sensing paraments and resource allocation that maximizes the throughput of CRN subject to the entire power limitations of the CRN and the average interference power to the primary network are solved by iterative algorithm. Furthermore, they have been designed a problem to maximize minimum throughput of SUs with the consideration of SUs' fairness. The proposed scheme achieved a better throughput of a CRN by the joint optimization.

Marin Alfonso et al [18] have proposed a Compressive Sensing technique named Finite Rate of Innovation (FRI) in a Cognitive Radio Network through centralized Spectrum Management based Spectrum Broker approach for spectrum sensing. Spectrum Brokers are coordinating the processes and algorithms related to spectrum management, based on spectrum information shared by SDR users, which perform the spectrum sensing process. FRI is a cognitive sensing technique that significantly reduces the number of samples or values needed to represent the signal spectrum sensing. This approach reduces collision probability by more than 90%, when a compressive sensing technique (FRI) is used to represent the spectrum signal.

Cunhao GAO et al [19] have proposed mathematically model the opportunities and constraints to maximizing the entire network throughput. Furthermore, they proposed centralized and distributed algorithm to flexibly assign spectrum channel or spatial DoF abusing the multiuser diversity, channel diversity and spatial diversity for a higher performance in a practical network. This proposed algorithm supports different transmission priorities, reduces transmission delay and confirms fair broadcasts between nodes by providing all nodes with certain broadcast probability. Proposed algorithm is an effective and can significantly increase the network throughput while reducing the delay.

Didem Gozupek et al [20] have proposed a very general scheduling model reaching tasks such as building frequency, data rate allocation and time slot to secondary users with probably numerous antennas, in a dissimilar multi-channel and multi-user scenario. Their schedulers certify that reliable communication between the cognitive base station and secondary users are maintained, no collisions occur between secondary users and primary users in the service part of the cognitive base station are not disturbed. Further, they have proposed heuristic algorithm to provide optimum solution like fairness of the network. Their proposed system provides a performance of both total throughput and fairness for varying number of secondary users, frequencies, antennas, and window size.

Minal S. Moon et al [21] have proposed appropriate channel selection for data communication using energy detection sensing technology. They introduced a structure called preferable channel list, PCL has been used for selection of channel wherever receiver is being playing the dominating role. The proposed technology provided the delay is less whereas the throughput of the system is good.

Fen Hou and Jianwei Huang et al [22] have proposed a centralized greedy channel selection (GCS) algorithm. It is polynomial in computational sophistication, and reaches a close-to-optimal (higher than 95%) numerical performance. Furthermore, they have proposed a distributed priority order channel selection algorithm, which has significantly less signaling overhead compared with the GCS algorithm. The proposed system achieved a significant performance and fairness of entire network.

Dibakar Das et al [23] have proposed two caching and scheduling policies using Lyapunov drift techniques between primary and secondary request generation rates which should be supported increases from the case without cooperation. Fixed Primary Caching Policy (FPCP (FPCP) algorithm increases the set of request generation rates that can be maintained. Furthermore, they also proposed variable primary caching policy (VPCP) algorithm maintains higher priority files. They have been conducted widespread simulations to compare the performance of both algorithms against that of an optimal nonco-operative algorithm. Finally, they could have extended the analysis to a network with multiple channels.

Indika A. M. et al [24] have proposed a queue-based channel assembling strategy for multi-channel CRNs as well as the analytical framework for performance evaluation of such networks. They could be introduced two queuing schemes which consist of separate queues allocated for different traffic types with different priorities which could be improved an existing dynamic channel assembling strategy. Their proposed systems achieved the performance of the system in terms of different parameters and showed that the proposed schemes outperform the existing ones in terms of secondary network's capacity, blocking probability and spectrum utilization.

3. Problem Identification and Solution

In this literature survey, it can be concluded that there is no work which together offers resource distribution and scheduling in CRN. We consider wireless network with heterogeneous services, there is a very difficult to distribute resource and allocate the channel to every node in the specified network. In this article, we extended the previous work in [25] and only considered secondary users with different rate requirements and ignoring the delay requirements. Furthermore, we considered the channel quality indicator (CQI) while estimating the channel condition for efficient communication.

In this proposal we formulated the dynamic resource allocation with priority scheduling methodology for communication between dissimilar nodes in CRN. The CRN consists of PU and SU with various service requirements in multi-hop network. The responsibility of Secondary Base Station (SBS) is to allocate resource to different SUs existing in networks [25]. The SUs might be characterized as SU with minimum-rate guarantee (SU-MRG) [12], SU with minimum delay guarantee (SU-MDG), SU with minimum rate and delay guarantee (SU-MRDG) and SU with best effort service (SU-BE). While allocating the resource to a group of SU, the SUs functions should satisfy the following limitations.

1. Transmitted aggregate energy of each channels of SU ought to be inside unassuming force at auxiliary BS.
2. For SU-MGR, the rate of transmission for SU should be more than the minimum-rate threshold.
3. For SU-MDG, the delay of transmission for SU should be less than the limited threshold.
4. For SU-MRDG, the rate of transmission would be better than the minimum-rate threshold and the delay of transmission would be less than the limited threshold.
5. For BE, fairness limitation should be fulfilled.

Channel Quality Indicator (CQI) is used as utility function for all channels in network. The CQI is estimated in terms of the signal-to-interference-plus-noise ratio (SINR). For every last arriving stream, the bundles need is resolved relying upon the administration sort and queuing delay [19] is evaluated for every stream by increasing the need with channel pick up.At that point the streams can be sorted in the plummeting request of this goal values, then allotted to the particular kind of SU. The stream with most elevated target capacity is designated to the MRDG, trailed by MRG and MDG. The stream with slightest target capacity is appointed to BE.

4. Proposed Solution

4.1 System Model

Cognitive radio communication structures consist of Primary Users (PUs) and Secondary Users (SUs). The characteristics of SUs are relative low frequency band access power. The Secondary user should persistently sense the geographic atmosphere and must know around any tunings in their remote communication system and make fine tunings in harmony with correspondence enrichments, suitably without making destructive interference to the PUs. The spectrum sensing systems main objective is to find existing unused spectrum resources, channel quality estimation, data packets transmission and make self-adaptive transmitting waveform which fit the spectrum features based on its requirements. When, absence of the PUs, the SUs can access the idle channel optimally. Occasionally, check the capacity of the PUs like, the Cognitive users' handovers the channel to the PU when PU is detected. Therefore, the SU doesn't interfere with the PU and it will access the idle channel when the PU is not accessing the specified channel. PUs operations are given more priority as during the channel utilization there must not be any interference experienced by the PU (licensed user like Satellite communication, Medical Equipment's, etc.,).

In this article, we considered the following heterogeneous SUs

- SU with minimum-rate guarantee (SU-MRG) [25],
- SU with minimum delay guarantee (SU-MDG),
- SU with minimum rate and delay guarantee (SU-MRDG)
- SU with best effort service (SU-BE).

Let, we consider K1SUs with minimum-rate guarantee (SU-MRG), K2SUs with minimum delay guarantee (SU-MDG), K2SUs with minimum rate and delay guarantee (SU-MRDG) and K2SU with best effort service (SU-BE). We also assume N ideal sub-channels in a given time slot. The number K1, K2, K3, K4 and N can vary dynamically in altered time periods. And also consider N idle sub-channel in a specified time slot. The number K_1, K_2, K_3, K_4 and N must vary dynamically in different time periods. Now we can reduce the complexity, we should reflected K1, K2, K3, and K4, here, relation defined for our approach as, K1=K2=K3=K4. Hence we consider that there are equal number of heterogeneous SUs with MRG (SU-MRG), MDG SU-MDG), MDRG (SU-MDRG) and BE (SU-BE).

The following assumptions are considered for optimal resource allocation in the specified network with heterogeneous SUs and multiple Primary Users (PUs):

Let every sub-channel should be allocated to one SU must be represented as the binary catalog λk, n ∈{0, 1} to denote dynamic channel allocation. λk, n denotes the sub-channel n is accessed by SUK. If the sub-channel is free λk, n = 0, otherwise, if the channel is busy λk, n = 1.

Total power constraint: Let E total signifies the total power economically required for the SUs. E k, n, signifies the transmit power for SUK in sub-channel n.

$$\sum_{k=1}^{K_1+K_2+K_3+K_4} \sum_{n=1}^{N} E_{k,n,} \lambda_{k,n} \le E_{total} \quad (1)$$

Minimum rate guarantee: Let $MR_k \le MR_{k\,\min}$ denote the minimum rate requirement for SUk. It should satisfy the following constraints.

$$MR_k \le MR_{k\,\min} \;\; \forall k \in K_1 \cup K_2 \cup K_3 \cup K_4 \quad (2)$$

In CRN, we made an assumption that only one SU(N3) with minimum-rate guarantee, one SU(N4) with minimum delay guarantee, one SU(N2) with minimum rate and delay guarantee and one SU(N1) with best effort service (Figure 1) and then consider K1=K2=K3=K4=1 with four CR (Secondary User).

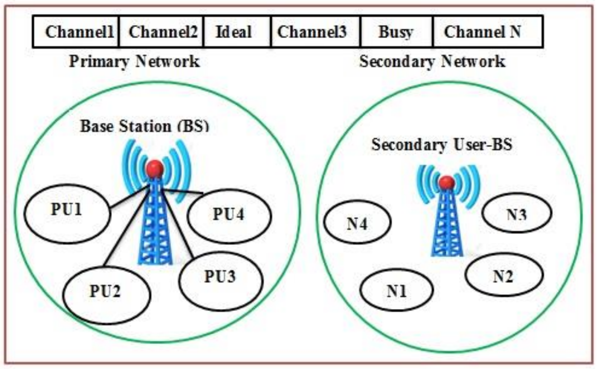

Figure.1 Heterogeneous CRN with Multiple PU and SU

1. Distinguish the presence of idle channel. Here the PU does not own the sub-channel being acquired to by the PU at a particular time.
2. If the SU confirms the existence of idle sub-channel, SU needs to periodically detect the presence of PU or occupancy of the sub-channel by other SU in-order to avoid conflict with other cognitive users who are trying to access the same sub-channel.

Let overcoming the limitations and complexities in channel sensing SU-BS. The secondary network time-slot entails of the following time intervals:

- ★ Time slots for sensing
- ★ Time slots for resource distribution
- ★ Time slots for data transmission

4.2 Channel Allocation for SU and Hand-Off

In figure 2, sub-channel has been assigned to PU2, now PU2 is idle then SU can use this channel till the PU turns back to use the same channel.

The SU should request the SU-BS to access channel. The SU-BS senses the idle channel and specified its vacancy. The SU-BS then takes the decision so as to which SU should be allocated the sub-channel based on the priority of each SU allocated by the SU-BS.

At the SU-BS, the existence of the primary user is estimated periodically using the utility function Channel Quality Indicator (*CQI*). The CQI also measures the utility, which each channel offers to the CR in terms of average information transfer capacity and the interference.

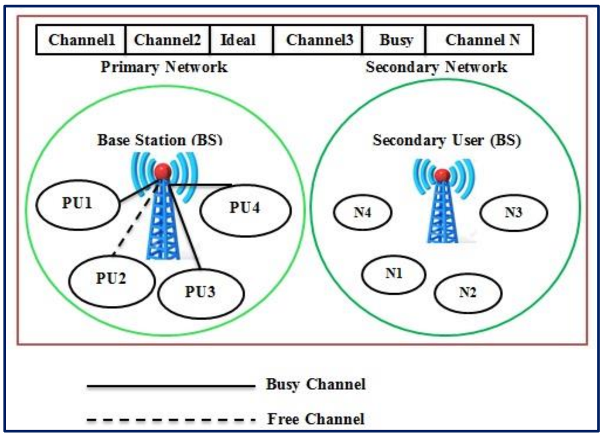

Figure.2 Idle PU2 Channel (P_r=0)

As soon as the value of CQI falls beyond a threshold value, it represents the existence of PU and henceforth the SU hands over the sub-channel back to the PU. Consider Ψ number of sub-channels in this cell. Then the set of sub-carries can be characterized as, C= {C1, C2 …CΨ}. The Total bandwidth of the cell is B and each sub-channel holds the equal quality of sub-carriers. Hence, the bandwidth of each sub-channel should be given by $\frac{B}{\Psi}$. CQI of any sub-channel is defined using the Signal-To-Interference-Plus-Noise Ratio (SINR) detected by SU-BS during channel distribution and channel accessing. SINR is used to signify channel capability in a wireless network communication system. SINR is well-defined as the power of interested signal divided by the sum of interference power and the power of arbitrary background noise.

$$SINR = \frac{E_{signal}}{E_{interference}+Noise} \quad (3)$$

Where $E_{interference}$ is signifies the interference power of other signals in the network, E_{signal}represents the power of the incoming signal of interest. If the power of background noise term $E_{interface}$ = 0 then the SINR is reduced to Signal and the signal was reduced to Signal-To-Noise Ratio (SNR). Channel Quality Indicator can be measured at SU-BS by

$$CQI = \log_2(1 + SINR) \quad (4)$$

By threshold value at the SU-BS, the CQI estimated value can be observed and as soon the SU demand for a channel the CQI value of the channel is estimated and then assigned to the SU only if the CQI>threshold, otherwise, the channel is not assigned to the SU. After the channel is allocated to SU in among the data transmission SU-BS finds deficiency in CQI showing the presence of PU, the SU hands-off the channel back to the PU. Based on Dynamic Spectrum Allocation for cognitive radio, when a primary user (PU) returns to the band area which cognitive users are using, CR have to pause the work and shift to alternative band called spectrum handoff. The exchanging needs to be done as smooth as possible because the rapid transition of working spectrum may lead to reduced transmission reliability or even transmission failure.

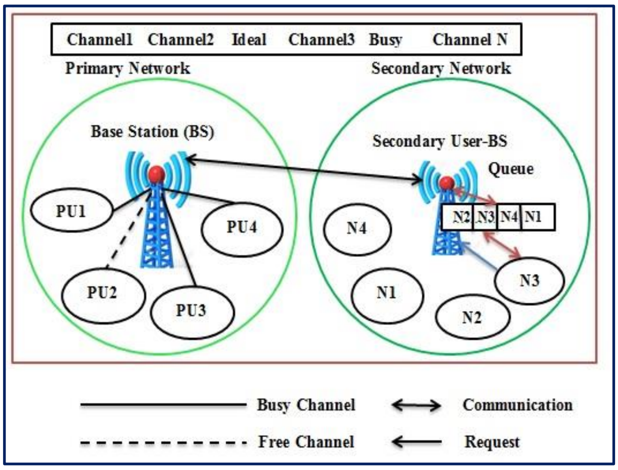

Figure.3 SU accessing the idle channel of PU through SU-BS

4.3 Existing Algorithm

The existing algorithm providing the dynamic resource allocation in cognitive radio network butinstead it is delivering the priority queue scheduling method with dynamic resource allocation as stated in the articles CRN[19][21][25][31].

Step 1: Define n sub-channels SUs K1 and K2.
Step 2: Sense the presence of PU
If yes
Hand-off
Else
Step 3: Free channel sensing and allocation to SU
Step 4: Sense the presence of PU
If yes
Hand-off
Else
Step 5: Power allocation to channel given to SU
Step 6: Sense the presence of PU
If yes
Hand-off
Else
Step 7: Data transmission takes place
Step 8: Sense the presence of PU
If yes
Hand-off
Else
Step 9: Channel allocated to other SU
Step 10: Goto step 2

4.4 Proposed Algorithm

In proposed solution, the spectrum handoff takes place from PU to the secondary user and vice versa. For every incoming stream, the packets priority is determined depending on the CQI and queuing delay [6]. Then an objective function is estimated for each stream by multiplying the priority with channel gain. Then the streams can be sorted in the descending order for the calculative values, and thenit assigned to the particular type of SU. The stream with highest priority objective function is allocated to the SU-MRDG, followed by SU-MRG and SU-MDG. The stream with least priority objective function is assigned to SU-BE.

Step 1: Define sub-channel and K1 and K2
Step 2: SU requests SU-BS for sub-channel
Step 3: SU-BS checks the value of $\lambda_{k\ n}$ and asks BS about the sub-channel
If $\lambda_{k\ n} = 1$
Request terminated
Else
Step 4: Step 4: Check CQI at SU-BS
If CQI $\ngtr$ Threshold value
Then
Request terminated
Else
Step 5: Check $P_{priority}$assigned to each SU
Step 6: The node with the highest priority (least $P_{priority}$) is selected from the database at SU-BS
Step 7: Update $P_{priority}$ value ($P_{priority}$++)
Step 8: Check queue size
If queue size $\nless$ Threshold value
Then
Goto step 5
Else
Step 9: idle channel is allocated to SU with the highest priority and least queue size
Step 10: check CQI at SU-BS
If queue size $\ngtr$ Threshold value
Then
Request terminated
Else
Step 11: check $E_{transmitted}$ (Transmitted power is less than total power (E_{total}) allocated to the channel)
If $E_{transmitted} < E_{total}$
Then
Data transfer takes place
Else
Step 12: Power allocation takes place for the SU allotted with the sub-channel
Step 13: Data transfer take place
Step 14: Check CQI at SU-BS
If CQI $\ngtr$ Threshold value
Then
Request terminated
Else
Step 15: goto step 5

5. Simulation Result

We simulated the proposed algorithm by using NS2 simulation packages. We use IEEE 802.11at MAC layer. The network field considered for the simulation is 1000m X 1000m over a flat region for 70 seconds of simulation time. All nodes have the same transmission range of 250 meters. The simulated traffic is Constant Bit Rate (CBR) with a packet size of 512 B. The simulation settings and parameters are summarized in Table1

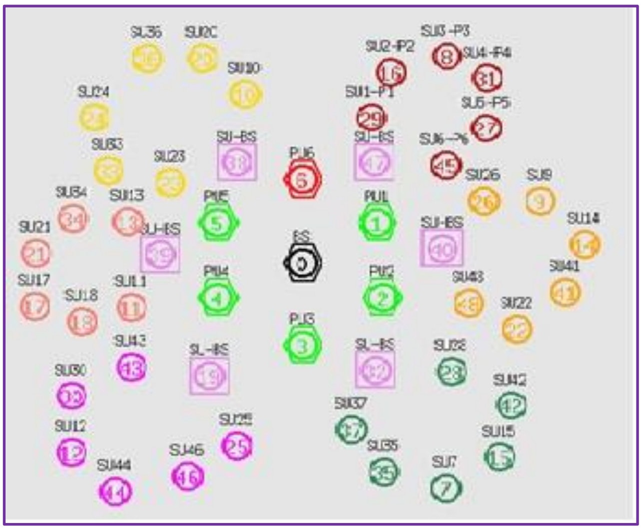

Figure 4. Screen shot of the out.nam for the proposed approach

The Proposed DRAPBS-SRN Algorithm is compared with DRA-CRN algorithm. As DRAPBS-SRN employs dynamic resource allocation; it outperforms the traditional approaches in cognitive radio.

Table 1. Simulation Environment

No. of Nodes	20,40,60,80 and 100
Area Size	1000m X 1000m
MAC Standard	IEEE 802.11
Transmission Range	250m
Simulation Time	70 sec
Traffic Source	CBR
Packet Size	1000Bytes
Sources	4

Scenario 1: Quality and robustness of Channel allocation in DRAPBS

In figure 5, shows the delay comparison of DRAPBS with DRN-CRN. With changing number of idle channels existing at the PU-BS, the proposed method is found to experience less delay since each SU is prioritized in accessing the idle channel without any interference occurring at the channel. Since every SU senses the channel before accessing the channel and also periodically checks for the existence of the PU, the interference introduced due to the sudden appearance of PU is reduced. Prioritization of SU's at the SU-BS leads to idle channel allocation robustly. DSAPBS-SRN practices 17% less delay compared to DRA-CRN method.

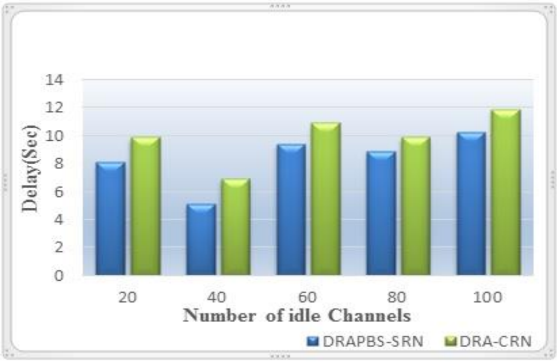

Figure.5 Channel VS Delay

In figure 6, it is also found that the delay practiced, due to fluctuating range of mobility of nodes, is 16% less than DRA-CRN approach.

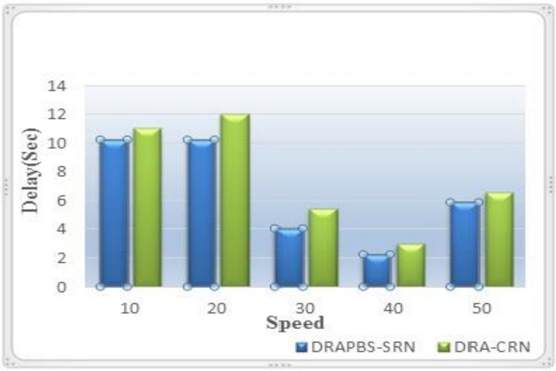

Figure.6 Speed VS Delay

Scenario 2: Network Performance Evaluation

Network throughput is the rate of effective message delivery over a communication channel. It is typically measured in bits per second (or data packets per second or data packets per time slot). Hence for an efficient and reliable network, the throughput must maximum and it should experience fewer drops in the packet. In figure 7, shows throughput in DRAPBS-SRN is 41% more efficient with changing the number of idle channels from 20 channels to 100 channels in the given network. With differences in the mobility of nodes from 10 m/s to 50 m/s the throughput of DRAPBS-CRN is found to be 3% efficient in comparison to DRA-CRN in figure 8.

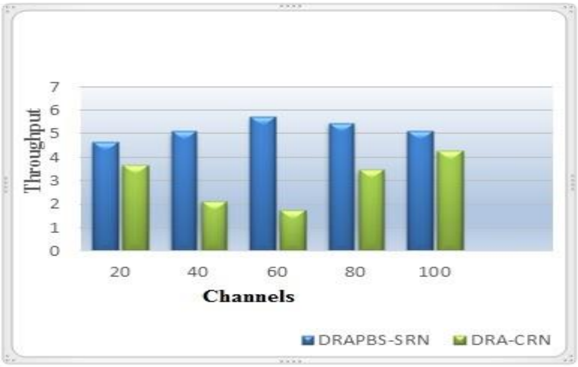

Figure.7 Channel VS Throughput

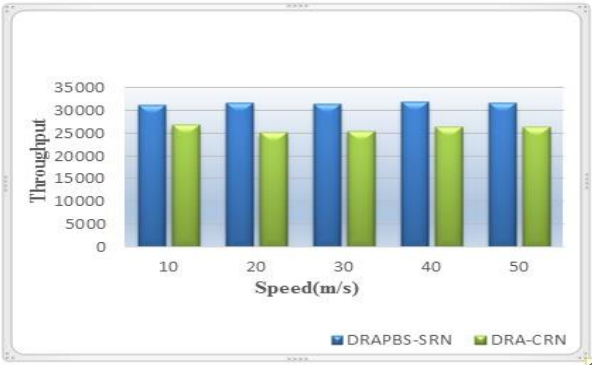

Figure.8 Speed VS Throughput

6. Conclusion

However, when cognitive radio systems are becoming recognizedregularly and start to turn an interesting topic among researchers, lots of problems challenged in practical application are still challenging the realization of the Cognitive radio network. Our proposed framework has been laid on optimum resource allocations and scheduling for primary user (PU) and secondary user (SU) to maximize the performance of the entire network by reducing the interference at PU and also maximizing the throughput and diminishing the risk of overlapping the coverage of CRNs. In future, we can use this framework and improve and achieve a best optimization performance of CRN.

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