Detection of Selfish Node Attacks using Dirichlet's Distribution in Cognitive Radio Networks

T.E.Abinaya[1]
UG Student
Department of ECE
IFET Collegeof Engineering India,Tamilnadu

S.Rabia jebin[2]
Assistant Professor
Department of ECE
IFET Collegeof EngineeringIndia,Tamilnadu

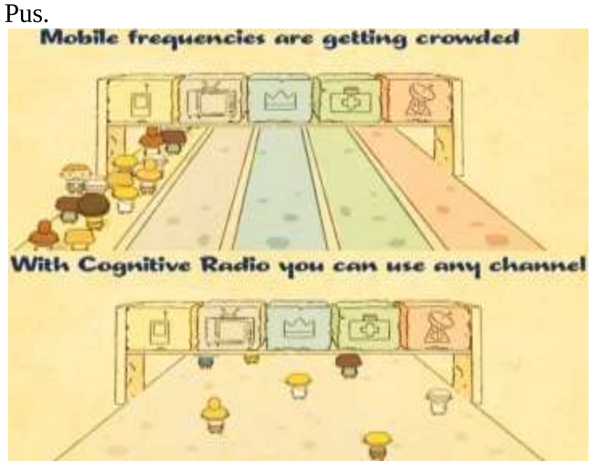
Abstract *Cognitive radio (CR) is an emerging technology that aims for efficientspectrum usage by allowing a secondary user (SU) to access a primary user (PU)spectrum bands on the condition that the interference caused to Pus is tolerable .Initially, Non-CR networks the power allocation strategy was designed to maximize theErgonomic capacity (EC) in a fading channel. In a CR network, the power allocationstrategy was modified in order to protect the Quality of Services (QoS) of the Pus fromthe interference caused by the SUs. Recently, Green communication is an inevitabletrend for designing a network, especially for a cognitive radio. In this project, for a green cognitive radio networks, the optimal powerallocation strategies are proposed to enhance the energy efficiency for the secondaryuser to maximize its ergonomic/outage capacity, under the average interference power along with average/peak transmit power constraint by using dirichlet's distribution. where a secondary user coexists with a primary user and the channels are fading.*

Keyword-selfish node, Interference, cognitive radio networks

I. INTRODUCTION

In today wireless network spectrum is a major issue to overcome these problem new technology called cognitive radio network has been introduced .Wireless technology users can be categorized as licensed users who are all accessing licensed band and unlicensed user who are all accessing unlicensed band .The cognitive radio network provides the unused licensed spectrum will also used by the unlicensed users.

It can be done by Fusion Center (FC) in the cognitive radio network by calculating the Channel State Information (CSI). The channel stateinformation is used to identify the Pus signal is presence or absence. It is obtained by estimation of channel gain of the Pus.



Delay-insensitive cognitive radio network and Delay sensitive cognitive radio network .Combined delay sensitive and delay insensitive cognitive radio where a secondary user coexists with a primary user and the channels are fading The simplified CR network model consists of One primary link-PU transmitter (PU-TX) and PU receiver (PU-Rx) pair. Secondary link - SU transmitter (SEW-TX) and a SU receiver (SEW-Rx).The secondary link coexists with the primary link under the spectrum sharing paradigm.

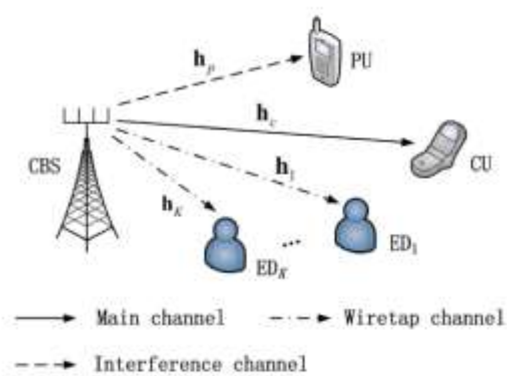


fig.1.system model

The instantaneous channel power gains
gas(e) - the secondary link
gap(e) - the link from SEW-Tx to PU-Rx
hop(e) - primary linkand hos*(e)*- the link from PU-TX to PU-Rx
where e denotes the fading index for all related channel by identifying the intermediating node whether it is an friendly node or selfish node .If it is n selfish node .we are detecting that node and it transmitted in correct path

The packet delivery ratio is defined as the ratio of the number of packets send by the destination to the no. of packets received by the source.
DELIVERY RATIO=SENT PACKETS/ GENRATED PACKETS

I. ATTACKS IN COGNITIVE RADIO NETWORKS

In cognitive radio network attacks are selfish node attack, primary emulation attacks ,objective function attacks ,jamming attacks,blackhole and gray hole attack.I can particular detect the selfish node attack

SELFISH NODE ATTACKS:

In cognitive radio terminology of Ad-Hoc network, we have to transfer a packet from one node to another node by using intermediate node.
Thus intermediate node has not send the packet, instead it consumes the packet energy for their own process and also doesn't transfer full set of packet(or) anything else.

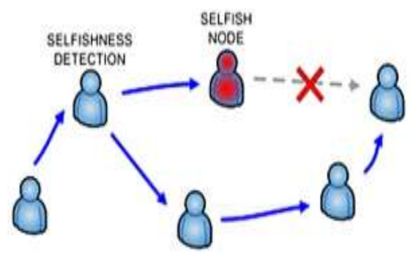


fig.2. Selfish node detectionn

fig.2. Selfish node detection

Fractional programming and convex optimization techniques are proposed subject to constraints on
1)Average interference power
2)peak to average transmitted power

II. PROPOSED WORK

In the proposed model, there are two kinds of power constrains. One is the PTP constraint which is related to the non linearity of power amplifiers. The other is the ATP constraint for the aim of satisfying the long-term power budget of the SU. The PTP constraint and the ATP constraint can be given as

$$P_s(v) \leq P_{th,\forall v,}$$

$$E\{P_s(v)\} \leq P_{th\forall v,}$$

$$P_s(v) \geq 0, \forall \mathbf{v}$$

where$P_s(v)$denotes the transmit power of the SU at fading state e. Pth denote the PTP and the maximum ATP of the SU respectively. E(PS(V) denotes the expectation over the different fading states, including the CSI of the second link, the interference link from SEW-Tx to PU-Rx, and the link from PU-TX to SEW-Rx. From the perspective of the PU, an interference power constraint should be imposed on the SEW-Tx communication in order to protect the PU from intolerable interference.
It was shown that the AIP constraint not only provides better protection of the PU, but provides the SU higher capacity in. Thus, the AIP constraint is applied here, given as

$$\mathrm{E}\{g_{sp}(v)P_s(v)\} \leq P_{1n\forall v,}$$

where*Pin* represents the maximum AIP that is tolerable for the PU-Rx link. The SU is delay-insensitive in fading channels is considered under the average power constraints. It is assumed that the PU uses a Gaussian code book and the SU experiences interference from the PU as additional Gaussian noise. Thus, the EE maximization problem under the average power constraints can be formulated as the following problem, P1, given as

$$P1: \max \eta \mathbf{EE}(P\_s(v)) =$$

$$\frac{\left(\frac{E\{\log 2(1+g_{ss}(v)P_s(v)}{h_{ps}(v)\mathrm{P}p+\sigma\omega})\right)}{E\{\zeta P_s(v) + P_c\}}$$

Rajahs K. Dharma and Dana B. Rabat portrayed the approaches that are utilized for securing both the essential and optional clients in the system from the assaults [3].M. Jo, L. Han, D. Kim, and H. P., exhibited the assault known as Narrow minded assault and gave the countermeasures to recognize those egotistical aggressors by utilizing the strategy called COOPON [4].The Psychological Radios are having the capacity of powerfully changing its conduct, as indicated by the range accessibility [6].COOPON for Narrow minded Hub Discovery: COOPON gives very dependable narrow minded assault recognition results by straightforward estimation. This is solid and can be appropriate for commonsense use later on. This approach is demonstrated for subjective radio impromptu networks[19-20].

III. RESULTS AND DISCUSSION

A cognitive radio network is a wireless network in which the unlicensed users in that network periodically checks the spectrum and use the spectrum if it is not used by the licensed users. The unlicensed users will change their channel periodically according to the availability. This is what known as Dynamic Spectrum Access. The Cognitive Radios are having the capability of dynamically changing its behavior, according to the spectrum availability . The Cognitive Radios switch to another spectrum, if the licensed users are using the current spectrum or a new licenseduser is coming to use the spectrum. Due to its dynamic behavior the chances ofoccurring attacks will be very high . Thus, knowing what are all the attacks possible and how to provide countermeasure to those attacks is an important one in the Cognitive Radio networks.
At the time of transferring the data packet, throughput get increased and reduced time delay. By this Dirichlet's method we can able to identify the selfish attack in the cognitive radio. While the time of transferring the packet the selfish node will not send the all packet for their energy. For increasing the throughput ,it could reduce time delay during the packettransmission between the nodes. Speed of the delivery packet is increasing depends upon the detection of the selfish node using Dirichlet's distribution.

In this section, the simulation results of the proposed algorithms have been presented into three different modules.
module I: Deals with clustering algorithm where the secondary users are made into different clustering groups based on following factors such as the rate requirement of the SUs, power limitation, interference constraint for each cluster.
module II : Present the clustering result of our proposed clustering algorithm under 20 SUs and 1 PU in the system. As can be seen that the SUs are divided into five clusters and we can find that our proposed clustering algorithm is reasonable and convincing intuitively.

MODULE 1

In order to reduce the interference among secondary users (SU's). So, the various SU's in the Cognitive Network (CR) are divided into disjoint clusters. However, cluster size is an important parameter to make a trade-off between the share in the available spectrum and the co-tier interference among different clusters. If the cluster size is very small, the number of available subchannels for each user within a cluster is relatively large.

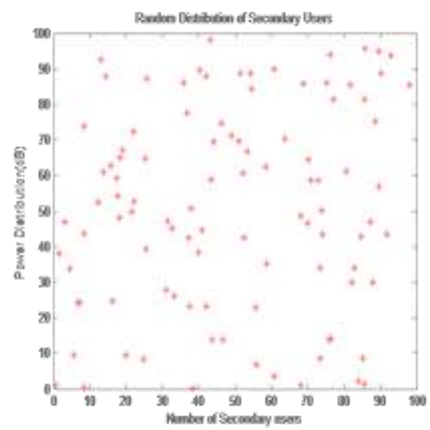


Fig 1.Random distribution of secondary users

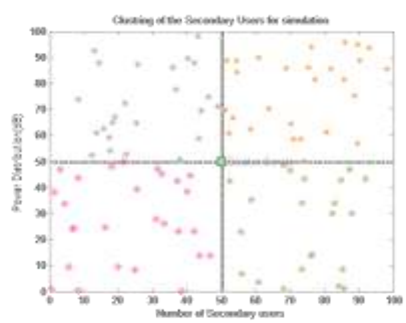


Fig.2.Single cluster with one cluster center of different

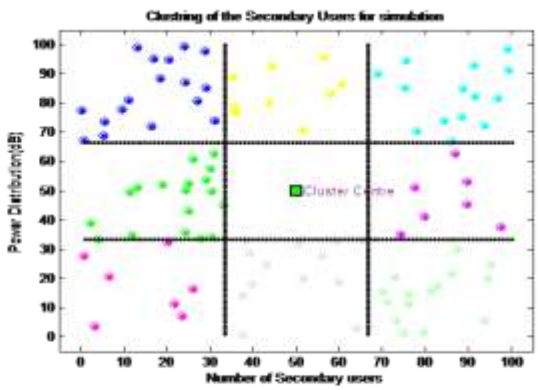


Fig.3.Single cluster with one cluster center of different

From Fig 2 and 3 are represents the results of the proposed clustering algorithm. The cluster separation are based on the signal strength among different Secondary Users (US's). That is, if the signal between two Secondary Users (US's) are very close to each other within same cluster group. Then, they are placed into two different cluster groups respectively which have been seen in Fig 3. Otherwise, it is placed in same cluster group Fig 2. Basically, clustering size is very important. Because, it will make a trade-off between the spectrum sharing and interference among different clusters.

MODULE 2:

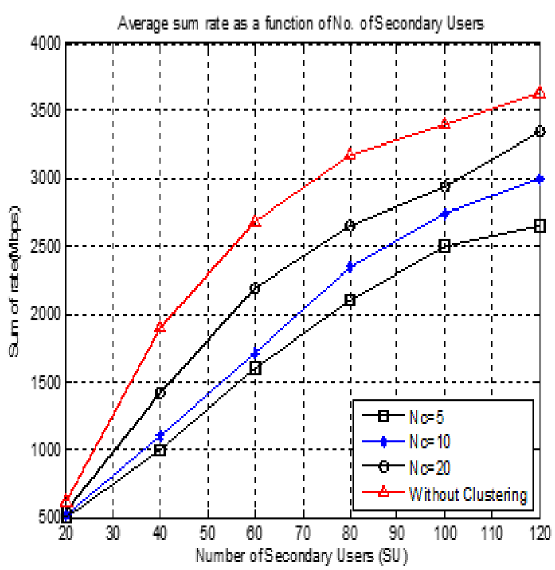


Fig.4 Average sum rate as a function of no.of secondary user with K=20;L=1;PT=1W

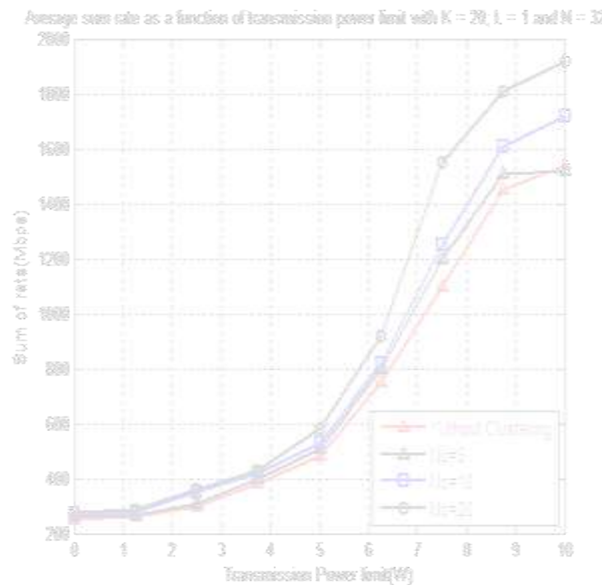


Fig.5 Average sum rate as a function of transmission power with K=20;L=1;PT=1W

Fig 4 and Fig. 5 that the sum rate increases with the increase of the number of clusters. It is intuitive because more clusters lead to higher area spectrum efficiency, which will finally increase the transmission rate of the SUs.

Fig 4 and Fig 5 show the average sum rate as a function of the number of sub channels and the transmission power limit obtained by our proposed algorithm for different number of NC, respectively. The number of SUs and Pus are 20 and 1, respectively. As can be seen from both Fig 4 and Fig 5, our proposed efficient clustering algorithm outperforms the other two. In Fig. 4, the average sum rate of the SUs increases as the number of sub channels increases, which can be explained as channel diversity in wireless environment. In Fig. 5, the sum rate of the US's increases with the increase of the transmission power limit, this is because more power can be consumed to increase the transmission rate with the growth of transmission power limit.

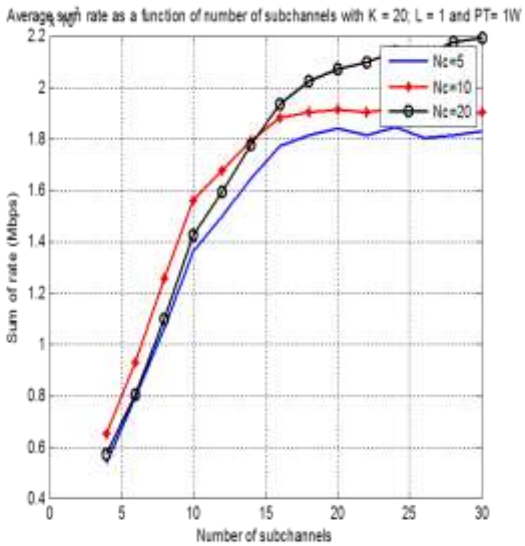


Fig 6 Average sum rate as a function of number of Secondary users (SU's) with K = 20;L = 1 and PT = 1W.

Fig 5.7 shows that whenever redcues the number of Secondary Users (SU's), thus, implies, that the clustering size is made into minimal. Therefore, the nomber of available subchannels for each Secondary Users (SU's) within a cluster is relatively large.

MODULE 3 :EE AND EC OF THE SU UNDER DELAY INSENSITIVITY COGNITIVE RADIO NETWORK

It is seen that the achievable EE and EC of the SU under the ATP constraint are larger than those achieved under the PTP constraint regardless of the EE maximization or the EC maximization

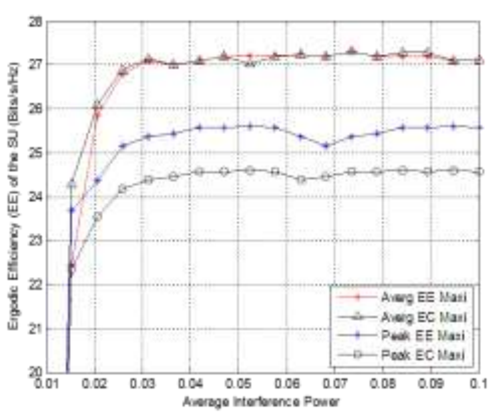


Fig 5.8 The EE of the SU versus the AIP constraint for EE maximization or for conventional EC maximization under the PTP/ATP constraint, Pth = 100 mW

IV. CONCLUSION

EE and EC of the SU under the ATP constraint are larger than those achieved under the PTP constraint regardless of the EE maximization or the EC maximization.Thus, an efficient optimal power allocation strategy is proposed for delay insensitive channels with high transmission rate at limited power and a Low deployment cost. In MATLAB simulation,the results reduced the Packets loss and Average end to end delay or reduced time delay

REFERENCS:

1) Rajahs K. Dharma, Member, IEEE and Dana B. Rabat, "Advances on Security Threats and Countermeasures for Cognitive Radio Networks:A Survey", *IEEE Communication Surveys and Tutorials*, Vol. 17,no.2, Second Quarter 20.

2)Min ho Jo, Longhouse Han, Don Kim and Ho Peter (May 2013),"Selfish Attacks and Detection in Cognitive Radio Networks", Korea University, Vol 27, Issue: 3, *IEEE Network*

3)Bacchanalian, K. Amish Po Ya mini, "Credit Risk Value based Detection of Multiple Salish Node Attacks in Cognitive Radio Networks", *IJERT: International Journal of Research in Engineering and Technology* Volume: 03, Special Issue: 07|May 2014.

4)W. Wang, Y. Sun, H. Li, Z. Han, "Cross Layer attack and Defense in Cognitive Radio Networks", in Globe com, *2010*, pp.1-6.[20] Coda Silva, B. Chou and K. Kim, "Distributed Spectrum Sensing for Cognitive Radio Systems", in Prof. *Information Theory and Applications Workshop, 2007*, pp.120-123.1106.

5)Hui Thou, Norman C. Beau lieu,Zn Li, Jungian Si, and Penchant Q, "Energy-Efficient Optimal Power Allocation for Fading Cognitive Radio Channels: Ergonomic Capacity, Outage Capacity, and Minimum-Rate Capacity", IEEE Transactions on wireless communications , vol. 15, no. 4, April 2016

6)Y. Chen, S. Hang, S. X, and G. Li, "Fundamental trade-offs on green wireless networks," IEEE Communications. Mag., vol. 49, no. 6, pp. 30–37, Jun. 2011.

7) D. Deng, C. Nanjing, G. Lin, L. J. Bimini, G. Deng, and G. Y. Li, "A survey of energy-efficient wireless communications," IEEE Communication. Surveys Tuts., vol. 15, no. 1, pp. 167–178, Feb. 2013.

8)C. Xiongnu, L. Lu, and G. Li, "Energy-efficient spectrum access in cognitive radios," IEEE J. Se. Areas Com mun., vol. 32, no. 3, pp. 550–562, Mar.2014.

9)G. Gr and F. Scalawag, "Green wireless communications via cognitive dimension: An overview," IEEE Newt., vol. 25, no. 2, pp. 50–56, Mar.2011.

10)C. Nanjing, H. Hang, Y. Re, and H. Chen, "Energy-efficient non cooperative cognitive radio networks: Micro, emos, and macro views,"IEEE Com mun. Mag.,vol. 52, no. 7, pp. 14–20, Jun. 2014

11)X. Kan, R. Hang, Y. C. Lang, and H. K. Gary, "Optimal power allocation strategies for fading cognitive radio channels with primary user outage constraint," IEEE J. Se. Areas Com mun., vol. 29, no. 2, pp. 374–383, Feb. 2011.