ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 14, March 2016

Enhancing Spectrum utilization for Cognitive Radio Networks using Credit Risk Value based detection technique

[1]*J.Sivajothi*, [2]*K.Mareeswari* , [3]*S.Jeyabharathi*,[[4]*Dr.R.Sureshbabu*

Under Graduate Students / Electronics and Communication Engineering

Asso.Professor / Electronics and Communication Engineering

Kamaraj College of Engineering and Technology,virudhunagar, India.

==

Abstract

Cognitive radio is an intelligent wireless technology that senses the available spectrum dynamically and allows the secondary users to use the spectrum efficiently. Selfish attack is one of the major problems that arise in spectrum sensing of cognitive radio network. Selfish attack means that some secondary users act as selfish and they occupy more licensed bands than what is actually needed for them. This in turn decreases the performance of spectrum sensing. This paper focuses on identifying the selfish secondary users i.e. selfish attack. It is assumed that the selfish users are secondary users. This proposed method is used to identify the selfish users based on credit risk value detection technique. This approach helps to identify the multiple selfish secondary users, instead of identifying single selfish user alone. The routing algorithm is implemented and evaluated with the quality of service parameters such as throughput, packet delivery ratio, packet loss ratio, detection rate, end-end delay and jitter. The result obtained shows the high throughput and also improves the performance of cognitive radio network by providing the efficient utilization of spectrum.

==

1.Introduction

Spectrum is a scarce resource that must be utilized efficiently. To minimize the spectrum scarcity problem, many techniques are used. Cognitive radio technology is the most wanting wireless technology to solve this problem. The fundamental task of cognitive radio network is to detect the licensed users, if they are present then identifies the available spectrum [9]. This process is called spectrum sensing. The objective of spectrum sensing is secondary users should not cause harmful interference to primary users. In cognitive radio network, the number of primary users and secondary users are there. Primary users are licensed users and secondary users are unlicensed users or cognitive users. CR technology is carried out in two steps. First, it searches for available spectrum bands by a spectrum-sensing technology for unlicensed secondary users (SUs). When the licensed primary user (PU) is not using the spectrum bands, they are considered available. Second available channels will be allocated to unlicensed SUs by dynamic channel access behavior. Whenever the PU is present in the CR network, the SU will immediately release the licensed bands because the PU has an exclusive privilege to use them.

1.1 Selfish Attack:

CR nodes compete to sense available channels. But some SUs are selfish, and try to occupy all or part of available channels. Usually selfish CR attacks are carried out by sending fake signals or fake channel information[6].

- If a SU recognizes the presence of a PU by sensing the signals of the PU, the SU won't use the licensed channels. In this case, by sending faked PU signals, a selfish SU prohibits other competing SUs from accessing the channels.
- Another type of selfish attack is carried out when SUs share the sensed available channels.

Christo Ananth et al. [5] discussed about a method, End-to-end inference to diagnose and repair the data-forwarding failures, our optimization goal to minimize the faults at minimum expected cost of correcting all faulty nodes that cannot properly deliver data. First checking the nodes that has the least checking cost does not minimize the expected costin fault localization. We construct a potential function for identifying the candidate nodes, one of which should be first checked by an optimal strategy. We proposes efficient inferring approach to the node to be checked in large-scale networks**.**

1.2 Effects of Selfish attack in Cognitive Radio:

If selfish is present, the performance of cognitive radio network will decrease. If the number of selfish users is present, the effective utilization of spectrum is not achieved.

1.3 Detecting the selfish attack:

There are many techniques used for detecting the selfish attack in cognitive radio. In the existing COOPON (Cooperative neighboring cognitive radio Nodes) mechanism, it is not possible to detect selfish nodes if there is more than one selfish secondary user. COOPON uses the autonomous decision capabilities of an ad-hoc network, based on exchanged channel allocation information. In this article, we focus on selfish attacks of SUs toward multiple channel access in cognitive radio ad-hoc networks.

The assumption that an individual SU accommodates multiple channels for the future purpose has been made. For single selfish node detection, each SU will regularly broadcast the current multiple channel allocation information to all of its neighboring SUs. In our proposed method, for multiple selfish node attack detection, Credit Risk Value is calculated for each node in the CR network.

2.Proposed method:

In this proposed method, multiple selfish secondary users are detected by Credit Risk Value based detection technique. In this, the Primary User is absent, so the available licensed bands must be utilized by all secondary users. The assumption of an environment that contains only secondary users is made. Based on the Credit Risk Value of each secondary user, the selfish secondary users can be detected. Later, the analysis of Quality of Service parameters in cognitive radio network is performed with the help of Routing algorithm.

3.System Model:

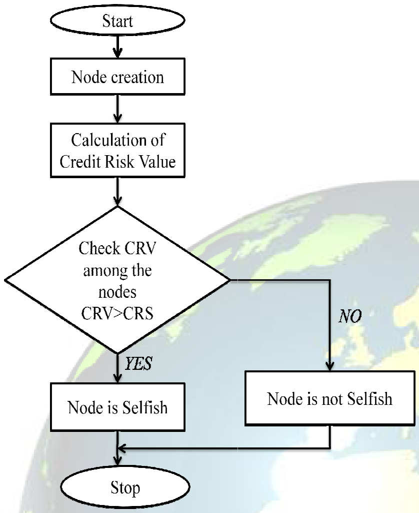
It is implemented into two categories using MATLAB software such as are,

- Detection of Selfish Secondary users using Credit Risk Value detection technique
- Analysing the Quality of Service parameters by performing the Routing algorithm.

3.1 Detection of Selfish Secondary users:

In this paper, detection of selfish users is very important thing to utilize the spectrum efficiently. A flow chart of explaining the operation happening behind the detection of selfish users has been designed. The flow chart is given below.

Flow Chart 1: Node creation and CRV Calculation


Start
Node creation
Calculation of Credit Risk Value
Check CRV among the nodes CRV>CRS
NO
YES
Node is Selfish
Node is not Selfish
Stop

Algorithm1:
\\ Detection of selfish secondary users using CRV technique \\

1) Creation of nodes. (nodes= 50)
2) Threshold Credit Risk Value (CRS) of 0.6875 has been calculated. [9]
3) Assume the Number of Data items shared by each secondary user with its neighbors randomly.
4) Assume the Number of memory space (No. of requests) shared by each secondary user with its neighbors randomly.
5) Find out the Credit Risk Values for each secondary user using CRV formula [8],

$$\mathbf{CRV = P / (ss*a + (1-a) * nd)}$$

Where,
CRV is Credit Risk Value,
P is assumed value of selfish secondary users,

SS is Number of memory space shared by

Each secondary user with the neighboring Secondary users.

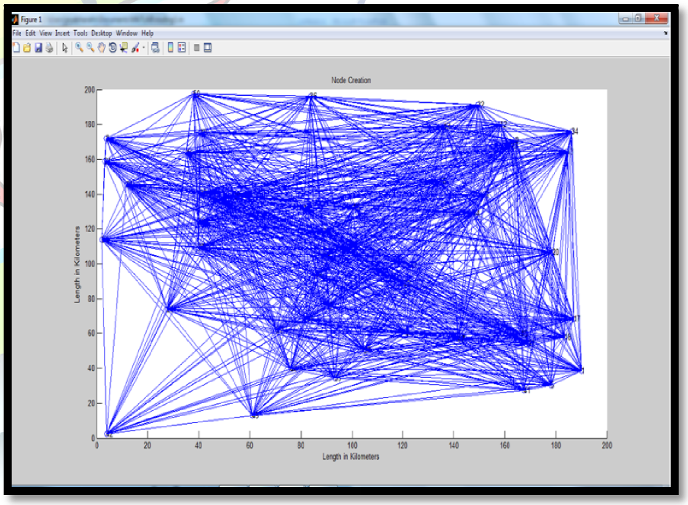
Nd is Number of data items shared by each secondary user with the neighboring secondary users.

a is System parameter, is to maintain the uniformity of the system ($0 < a < 1$).

6) Compare the threshold CRV with the CRV of each secondary user.
7) Detect the selfish user which has the greater CRV than threshold CRV.
8) Count the total number of Selfish secondary users and display it.
All operations are done by performing the MATLAB Coding.

3.1.1 Simulation of results:
Detection of selfish secondary users using CRV technique

Figure 1: Node structure



Number of nodes = 50

Figure 2: Values of ss and nd

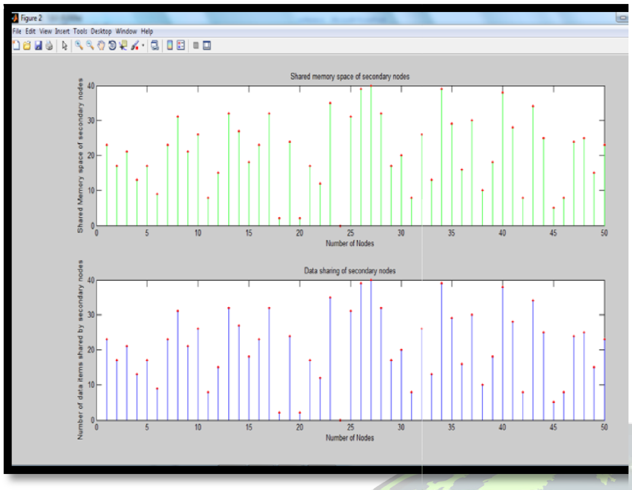


Figure 3: Values of CRV for each user

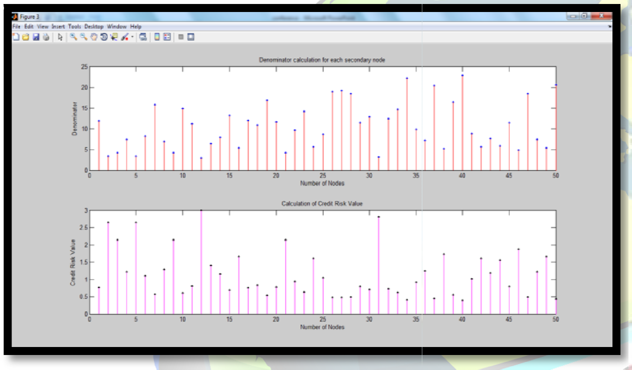
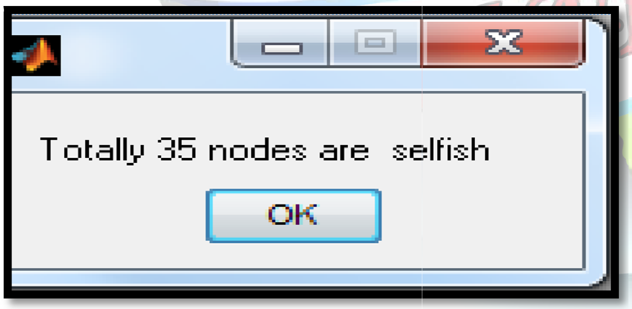


Figure 4: Display of the total selfish users

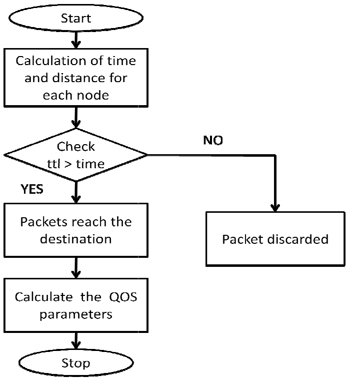


Totally 35 nodes are selfish

3.2 Analyzing the Quality of Service parameters in cognitive radio network:

In this proposed method, the Quality of Service parameters in cognitive radio network are analyzed by using some formulae. Here we analyze some QoS parameters such as Throughput, Packet Delivery Ratio, Packet Loss Ratio, Detection Rate, End-End Delay, and Jitter. In this, we implemented a Routing algorithm to make some assumptions for Packet Transmission. The flow chart for this operation is given below.

Flow chart 2: Routing & Quality of Service analysis


Start
Calculation of time and distance for each node
Check ttl > time
NO
YES
Packets reach the destination
Packet discarded
Calculate the QOS parameters
Stop

Algorithm2:
\\ Routing and Analysis of Quality of Service parameters \\

1) Initially assume the distance of each node from source node randomly using MATLAB.
2) Calculate the distance between source node and forwarding nodes.
3) compare the distance between source node and forwarding nodes with the Range value, for analysing that the corresponding forwarding node could receive a packet or not.
4) Assume the Number of packets.
5) Assume the time stamp for each packet randomly using MATLAB.
6) Fix the Time To Limit valve (TTL) and it is set as the threshold value.
7) Compare TTL with the timestamp of each packet for calculating the number of packets are successfully reached the destination.
8) Analyse the Quality of Service parameters using some Formulae.

3.2.1 Analysis the Quality of Services:

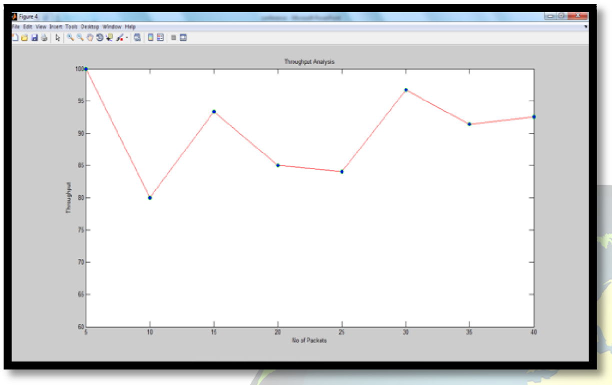
The Quality of Service parameters are analysed based on some formulae [10].

3.2.1.A) Throughput (T):

Throughput is defined as "how successfully the packets are transmitted per time". It is calculated by using [10],

(No. of Packets –No of packets Lost)
T = --
(No. of packets)

Figure 5: Analysis of Throughput



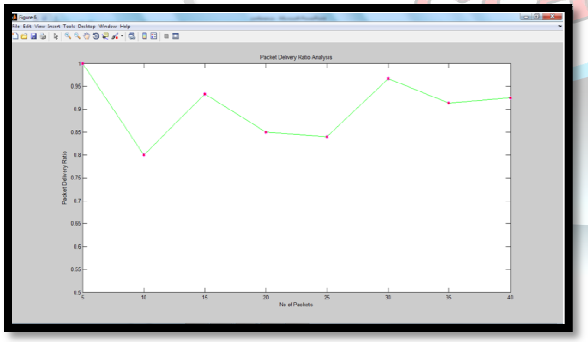
The Throughput of 80%-100% has been achieved for 5 to 40 packets.

3.2.1.B) Packet Delivery Ratio (PDR):

Packet Delivery Ratio is defined as "how many packets to be delivered to the destination from the total number of packets transmitted". It is calculated by [10] ,

$$\text{PDR} = \frac{\text{Number of packets delivered}}{\text{Number of Packets}}$$

Figure 6: Analysis of Packet Delivery Ratio



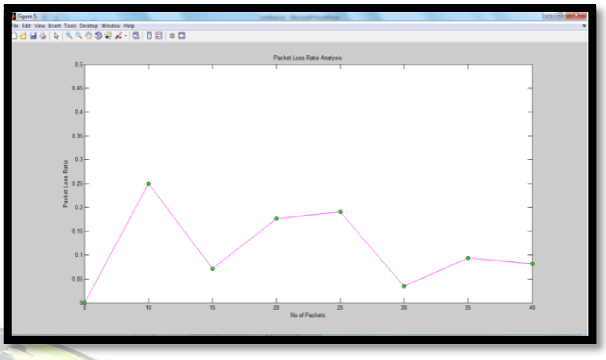
The Packet Delivery Ratio of 0.8 – 1 has been calculated for 5 to 40 packets.

3.2.1.C) Packet Loss Ratio:

Packet Loss Ratio is defined as "how many packets to be lost from the total number of packets transmitted". It is calculated by [10],

$$\text{PLR} = \frac{\text{Number of packets lost}}{\text{Number of Packets}}$$

Figure 7: Analysis of Packet Loss Ratio



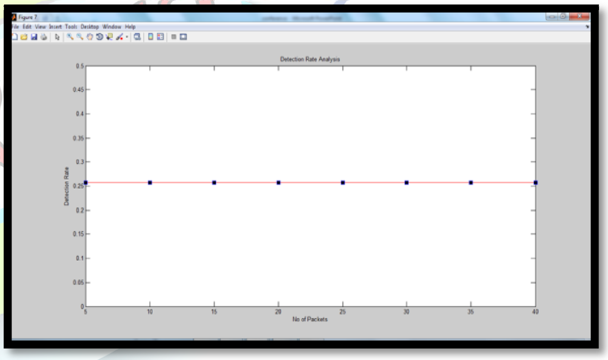
The Packet Loss Ratio of 0 – 0.25 has been obtained for 5 to 40 packets.

3.2.1.D) Detection Rate:

Detection Rate is calculated by using the formula given below [10],

Detection Rate = (No of detected selfish
Users) / (No of actual
Selfish users)

Figure 8: Analysis of Detection Rate



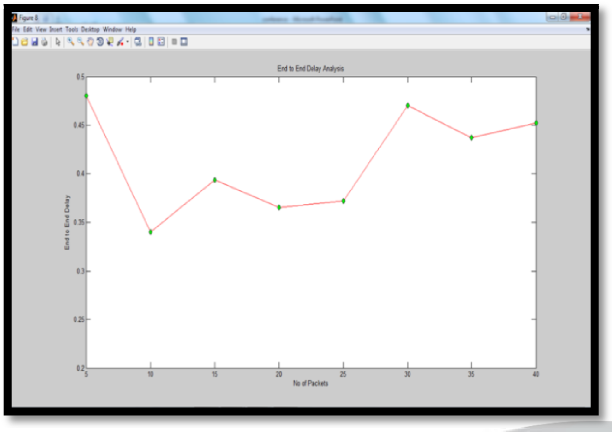
The detection rate as 0.2571 has been attained for 5 to 40 packets.

3.2.1.E) End-End Delay:

End-End Delay is defined as "how much time will the packet take to reach destination node". It is calculated by,

End-End Delay = (Time to limit of packets)
- (time stamp of each packet)

Figure 9: Analysis of End – End Delay



The end-end delay of 0.3ms – 0.5ms has been achieved for 5 to 40 packets.

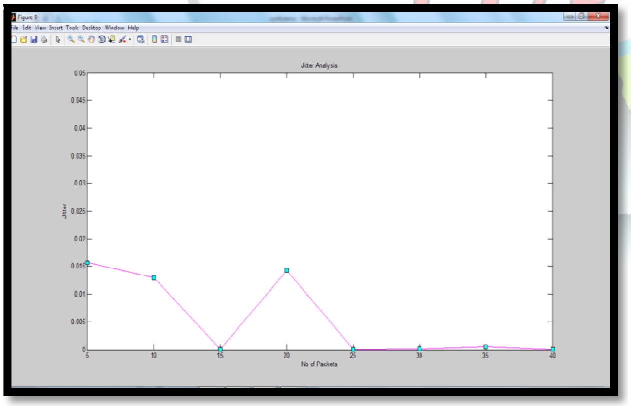
3.2.1.F) Jitter (J):

Jitter could be termed as the variation in delay or packet delay variation. The value of jitter is calculated from the end to end delay. It is the variation in the time between packets arriving.

It is calculated by[10],

$$J = \frac{\Sigma square(delay of each packet - average delay)}{(Number of Packets)}$$

Figure 10: Analysis of Jitter



The jitter value of 0 - 0.02ms has been computed for 5 to 40 packets.

Table 1: Simulation Parameters

Parameters	Value
Number of secondary Users	50 or 100 or 150
Area	200 X 200
Range	150
Threshold CRV (CRS)	0.6875
Number of Packets	40
Percentage of selfish secondary users	70%
Time To Limit (TTL)	1ms or 1us

Table 1 listed all the parameters and its values, which are considered for a simulation.

4. Future work:

In this paper, detection of multiple selfish secondary users and analysis of some quality of service parameters have been done. The throughput obtained is above 80% and the Jitter attained is below 0.02msec. In future work, resolving the detected selfish secondary users and additional quality of service parameters will have been done.

5. References:

[1] X. Tan and H. Zhang, "A CORDIC-Jacobi Based Spectrum Sensing Algorithm for Cognitive Radio," *KSII Trans. Internet and Info. Systems,* vol. 6, no. 9, Sept. 2012, pp. 1998–2016.

[2] S. Li *et al., "Location Privacy Preservation in Collaborative Spectrum* Sensing," *IEEE INFOCOM'12, 2012, pp. 729–37.*

[3] Z. Gao *et al., "Security and Privacy of Collaborative Spectrum Sensing* in Cognitive Radio Networks," *IEEE Wireless Commune., vol. 19, no. 6,* 2012, pp.106–12.

[4] Z. Dai, J. Liu, and K. Long, "Cooperative Relaying with Interference Cancellation for Secondary Spectrum Access," *KSII Trans. Internet and Information Systems, vol. 6, no. 10, Oct. 2012, pp. 2455–72.*

[5] Christo Ananth, Mary Varsha Peter, Priya.M., Rajalakshmi.R., Muthu Bharathi.R., Pramila.E., "Network Fault Correction in Overlay Network through Optimality", International Journal of Advanced Research Trends in Engineering

and Technology (IJARTET), Volume 2, Issue 8, August 2015, pp: 19-22

[6] Minho Jo, Longzhe Han, Dohoon Kim, Hoh peter In, Korea University,"selfish and detection in Cognitive radio ad-hoc networks",IEEE network may/June 2013.

[7] K. Cheng Howa, M. Maa, and Y. Qin, "An Altruistic Differentiated Service Protocol in Dynamic Cognitive Radio Networks Against Selfish Behaviors," *Computer Networks, vol. 56,no. 7, 2012, pp. 2068–79.*

[8] Jae-Ho Choi, Kyu-Sun Shim, SangKeun Lee, and Kun-Lung Wu, Fellow," Handling Selfishness in Replica Allocation over a Mobile Ad Hoc Network," IEEE Transactions on Mobile Computing, Vol. 11, No. 2, February 2012.

[9] Kiruthiga.S, Leeban Moses M,"Detecting Multiple selfish attack nodes using replica allocation in cognitive radio Adhoc networks" IJIET Vol 5 Issue 2 April 2015.

[10]Vikram Mehta, Dr.Neena Gupta, "Performance Analysis of QoS Parameters for Wimax Networks" (IJEIT) Volume 1, Issue 5, May 2012.