INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 6.078
(Volume 7, Issue 1)
Available online at: https://www.ijariit.com

Cooperative spectrum sharing and maximization of throughput using cognitive radio

Immaculate Rexi Jenifer P.
jovenhaniel@gmail.com
Anjalai Ammal Mahalingam Engineering College, Kovilvenni, Tamil Nadu

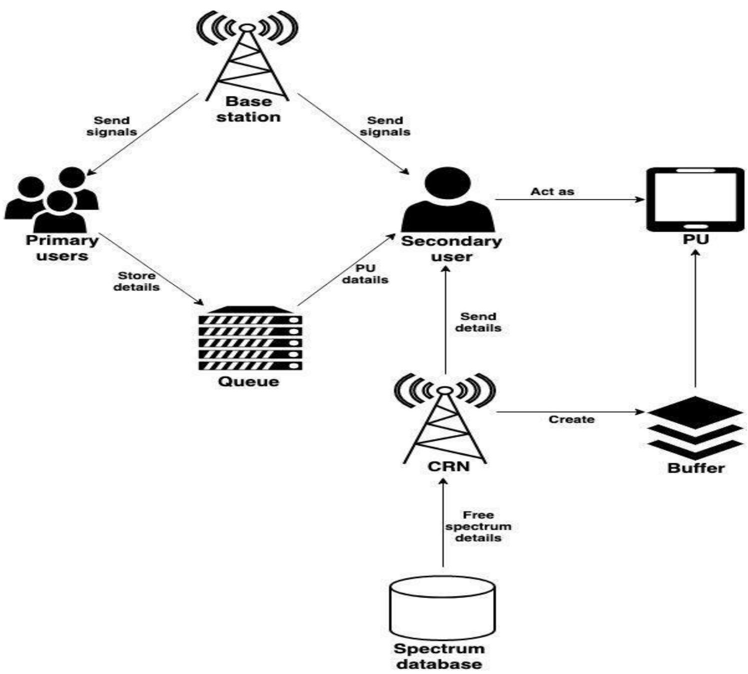
ABSTRACT

Cognitive radio is an intelligent radio which can be programmed and configured dynamically. It is widely used in spectrum sensing, spectrum sharing, environment sensing, etc. In this paper, we employ cognitive radio to harvest energy during packet transmissions using energy techniques. Energy harvesting involves two cooperation nodes: Energy cooperation mode and joint cooperation mode. In each cooperation mode, a pair of Primary Users(PUs), a pair of Secondary Users(SUs), and a cognitive radio network are used. In energy cooperation mode, secondary users transmit their own packets by harvesting energy from the primary transmission. In joint cooperation mode, Secondary users act as a relay for primary packets by using the energy harvested from the primary transmission. Further, we obtain maximum throughput by achieving a balance between energy harvesting and packet transmission.

Keywords: *The Cognitive Radio, Spectrum Sensing, Cooperative Spectrum Sharing, Total Achievable Throughput, Energy Harvesting*

1. INTRODUCTION

The growth of wireless devices led to an increasing demand of spectrum. There is limitation of spectrum scarcity. In order to avoid spectrum scarcity, we would like to reuse the spectrum using cognitive radio technology. Along with the concern about spectrum reuse, the tremendous rise in energy consumption lead to shortage of energy. The only solution is to improve the energy efficiency and prolongation the lifetime of wireless communication system. A cognitive radio (CR) is an intelligent radio that can be programmed and configured dynamically to use the best wireless channels in its vicinity to avoid user interference and congestion. CR automatically detects the available channels in wireless spectrum and change its transceiver parameters to provide concurrent wireless communication. It provides a radio access method for unlicensed/secondary users to share the spectrum of primary users.



In our project, we are going to harvest energy during packet transmission and achieve maximization of throughput. Energy harvesting is the process of deriving energy from external resources, captured and stored for wireless autonomous devices. Energy harvesting is performed in order to improve energy efficiency and saves energy. Here Energy Harvesting takes place in two cooperation modes: Energy cooperation mode and Joint Cooperation mode. The two cooperation modes represent the two limits of user cooperation, where a part of ST's harvested energy is used for secondary transmission and other part of ST's harvested energy is used for relaying primary packets.ST is equipped with harvest-then-transmit protocol. In addition to, we are utilizing the waste spectrum or unused spectrum. In order to utilize the unused spectrum, spectrum sensing need to be performed. Spectrum sensing is a key function of cognitive radio to avoid harmful interference, congestion with licensed users and detects the available spectrum for improving spectrum utilization. There will be a queue, which holds the primary users who are idle at a time based on priority (i.e.) PU's who are nearby to the SU.Suddenly,if primary user becomes busy and starts to utilize their spectrum, CR switch over to the next nearest primary user in the queue who is idle. This process continues until there is a primary user who is idle. This process is called cooperative spectrum sharing where the unlicensed or secondary users access the licensed bands of the legitimate primary users. During this process, synchronization is achieved between primary and secondary users. Further we calculate upper bound and lower bound and achieve maximum throughput which is represented through graph.

2. RELATED WORK

Renchao Xie*, F.Richard Yu and Hong Ji*(2012) **Energy Efficient Spectrum Sharing:** Right now, have considered the issues of spectrum sharing and resource distribution for heterogeneous Cognitive Radio systems with femtocells to improve energy proficiency. We have detailed the resource allocation issue as a three-stage Stackelberg game. In Stage I, the primary network offers the spectrum offering cost to the cognitive base station. In Stage II, the intellectual cognitive base station chooses to purchase the spectrum size from primary network and allocates the spectrum to femtocells or large scale secondary users. In Stage III, the femtocell base station performs power allocation for the femtocell secondary users. At that point we have utilized the in reverse acceptance strategy to understand the resource allocation also, demonstrated the presence and uniqueness of the Stackelberg game balance. A slope based emphasis calculation has been proposed to get the Stackelberg equilibrium solution. Simulation results have been introduced to illustrate the performance of the proposed plot. By and by, it is hard to have the ideal information on a powerful dynamic channel. In our future work, we will consider flawless channel state information in energy efficiency resource allocation for heterogeneous cognitive radio network with femtocells.

Nader Mukai, SaeedehParsaeefard,Hamid Saeedi and Paeiz Azmi(2014) **Cooperative Secure Resource Allocation in Cognitive Radio Networks with guaranteed Secrecy Rate for Primary Users:** Right now, we proposed a novel cooperative paradigm for secure communication in cognitive radio networks where we simultaneity provide secure communications for both primary users and secondary users. The proposed setting is different from previously proposed schemes where maximizing the secondary secrecy rate is only challenge to retaining a certain level quality of service for primary users via the interference threshed constraint. In the proposed IRA and ERA problems, transmit power, relay and time duration of two hops are selected to maximize the secondary secrecy rate even as keeping the primary secrecy rate. By thinking about imperfect channel state facts, we then proposed the strong counterparts of the proposed IRA and ERA issues and investigated the effect of uncertain parameters at the overall performance of the device. The proposed idea in fact transforms the possibly disturbing secondary service activities to a beneficial network element. Hao Yule, Miao Pan, Yuguang Fang, Savo Glisic**-Spectrum and Energy Efficient Relay Station Placement in Cognitive Radio Networks (2013):** Right now, study the spectrum and energy efficient relay station placement problem (RSPP) for CRNs. We numerically figure a cost minimization issue to register the ideal RS placement strategy with the thought of uncertain channel accessibility. Taking into account the NP-hardness of the issue, we likewise build up a system of heuristic calculations to efficiently locate the near optimal solution inside polynomial time. We think about the exhibition of the heuristic calculations with the random situation methodology and the optimal arrangement through extensive simulation. The outcomes appear that our heuristic calculations beat the random placement scheme and the quantity of RSs acquired by our calculations is continuously inside multiple times of that from the ideal arrangement. As the future work, we will extend our system to the situation where the connections between infrastructure nodes are definitely not symmetric and furthermore take the thickness and service demand of the SUs into thought.

3. PROPOSED SYSTEM

3.1 Login into the system

Here, we enter the username and password and performs validation to allow only the authorized users to access the cognitive radio network.

Algorithm for Login

GET *Username*

GET *Password*

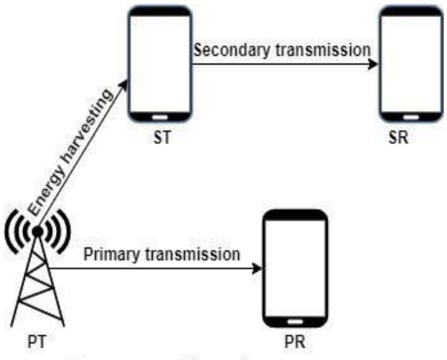
If *(Username==Entered _Username&& Password==Entered _Password)*
Login Successful

Else

Login Failed

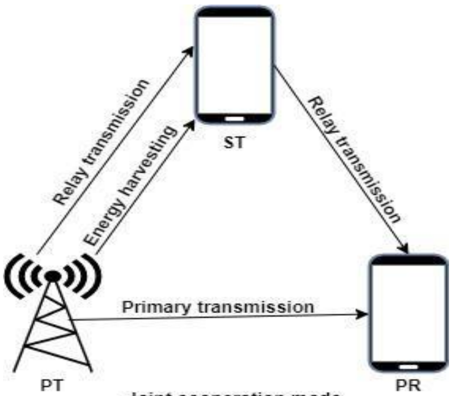
3.2 Check two way communication between two cooperation mode:

3.2.1 Energy cooperation mode: In energy cooperation mode, there exists only energy cooperation between primary users and secondary users. (i.e.)SU transmits its own packets by using the energy harvested from primary signals.



Energy cooperation mode

3.2.2 Joint cooperation mode: In joint cooperation mode, the secondary user act as a relay for primary packets with the help of energy obtained and saved during primary transmission.



Joint cooperation mode

Algorithm for energy harvesting: 'Action of SU' function
If existence of the PU

a) TX of the PU

Energy Harvesting of PU

End
ii) Concurrent TXs between the PU and SU
Else if No existence of the PU (false positive)
TX or energy harvesting of the SU

End Else
If no existence of the PU TX of the SU
Else if existence of the PU (false negative)

Concurrent TXs between the PU and SU

End

3.3 Cooperative spectrum sharing

Here the secondary user shares the spectrum of primary users. The spectrum details are stored in the spectrum database. The cooperative spectrum sharing refers to that PU allows one SU to simultaneously access the licensed spectrum. If a primary user is busy at a time, CR switch-over to another primary user based on the priority (i.e.) PU who is near to SU and idle. This process continues until there is a primary user who is idle.

Algorithm for Cooperative Spectrum Sharing
S1 transmits primary packet **If** (D1 receives the packet) Transmission successful

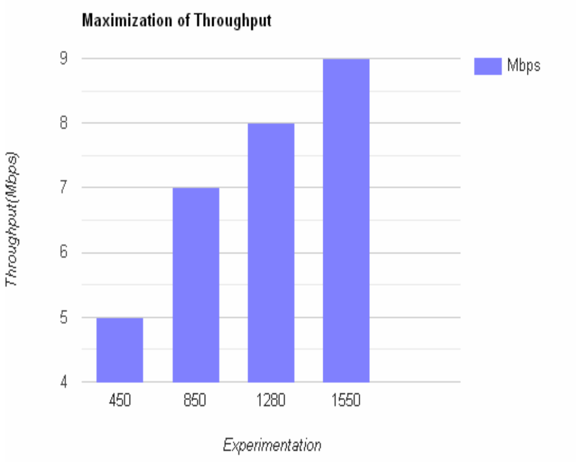
Else

Trigger cooperative spectrum sharing S1 retransmits the packet.
If (D1 receives the packet) Transmission end.
Else if (S2 receives the packet before D1) Perform encoding.
S1 and S2 retransmit the encoded Packet.
If (D1 receives the packet)

S1 and S2 achieve synchronization.

End.

3.4 Optimal Time and Power Allocation



Here, we achieve optimal time and power allocation between primary users and secondary users. We achieve a tradeoff between energy harvesting and packet transmission to obtain maximum total achievable throughput.

4. ACKNOWLEDGEMENT

We have taken endeavors in this project. However it would not have been possible without the kind support provided by our organization. We would like to extend our sincere thanks to all of them who have helped us throughout our research work. We would like to express our exceptionally incredible thankfulness to Mrs.P.Immaculate Rexi Jennifer, Assistant Professor of Computer Science Department of our foundation for her significant and useful recommendation during the planning and advancement of this research work. Her readiness to give her time so liberally has been especially valued. We would also like to extend our gratitude to the technicians of the laboratory of the Computer Science Department for their assistance in offering us the assets in running the program.

5. REFERENCES

[1] F. Haider, C. X. Wang, H. Haas, E. Hepsaydir,
[2] Gao, W. Ejaz, and M. Jo, “Cooperative wireless energy harvesting and spectrum sharing in 5G Networks” (2016).
[3] B. Lyu, H. Guo, Z. Yang, and G. Gui, “Throughput maximization for hybrid backscatter assisted cognitive wireless powered radio networks” (2018).
[4] S. Park, H. Kim, and D. Hong, “Cognitive radio networks with energy harvesting” (2013).

