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Research paper

Location Information Assisted Joint Spectrum Sensing And Power Allocation For Cognitive Radio Networks

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Abstract

The fifth generation wireless networks are expected to attain a thousand times higher capacity compared to the fourth generation wireless networks. Thus, raising the spectrum efficiency may be a crucial drawback, that should be thought of. cognitive radio is taken into account as an effective approach to alleviate the spectrum deficiency drawback. The goal of the paper is to enhance the output potency of data transmission and further to reduces the noise in wireless adhoc networks.There are two types of users in cognitive Radio network the users are classified into authorized Primary Users and unauthorized Secondary Users and there's no dedicated channel to send data, sensors have to be compelled to discuss with the neighbors and choose a channel for data communication in CR-WSNs.PUs might arrive on the channel any time. If the PU claims the channel, the SUs need to leave the channel instantly. Therefore, data channels ought to be chosen showing intelligence considering the PU's behavior on the channel and using some Priority based mostly choice algorithms. Our projected technique reduce the interference throughout data transmission between license and unlicenced medium.

Keywords: *Cognitive Radio (CR), Interference,Joint spectrum sensing and power allocation (JSS-PA) , Priority,Radio Frequency (RF) ,Wireless regional area network (WRAN)*

1. Introduction

The radio frequency spectrum band has become terribly inadequate in certain bands because of dramatically enhanced demand in wireless devices, mobiles, smart phones, etc. As a consequence, the demand for prime data rates, bandwidth and spectrum utilization has enhanced day by day. In most countries, the government regulates the utilization of a frequency spectrum band by issuing exclusive licenses and allocating a frequency band to the systems restricted by a geographical region. This allotted spectrum keeping out from the unauthorized users or a minimum of regulation different systems with regard to these allotted bands. The recent spectrum occupancy measurement and studies have shown, however, that a large range of those allotted spectrums are rarely or seldom operationally occupied by authorized users or so-called primary user (PU). The allotted band to the PU is also completely free or idle at the actual time or geographical region. The effective usage of spectrum white areas or spectrum holes by the SU should be able to showing intelligence and autonomously adapt their transmission characteristics to suit the conditions under that should operate at any time. Such solutions will be found in cognitive radio network. cognitive radio (CR) users choose the most effective available route or channel, afterwards, synchronized access to the current channel with alternative CR users and free this occupied channel whenever the PU reclaims or continues the concurrent transmission with the other PU. The aim of the IEEE 802.22 wireless regional area network (WRAN) standard is to permit sharing of geographically unused spectrum bands allotted to the TV broadcast service. it is needed that no harmful interference is caused to the incumbent operation (i.e., TV users) and low-power accredited devices. The SUs will utilize the authorized spectrum bands via spectrum sensing or power allocation. within the former scheme, the SUs got to perform spectrum sensing to discover the PU's status. only if the PU is absent, the SUs are allowed to transmit data. However, once the PU is present, the Cr network won't be able to utilize the spectrum. in this paper, we tend to investigate the results of the SUs' locations on the scheme selection. once the distance between the primary network and also the secondary network is extremely short, the transmission of the ST even with a small value of transmit power could create the primary receiver (PR) in outage. during this situation, the SE of the OPA scheme are going to be low because of the PU outage constraint. The SUs could use the OSS scheme as a result of the signal-to-noise ratio (SNR) of the received signal is high and also the SUs will simply discover the PT's status. Thus, the SE will be improved. once the distance between the primary network and also the secondary network is extremely long, the data transmission between the SUs can have very little interference on the PU transmission. due to the result of path loss, the PU outage constraint is also satisfied even once the ST transmits data with its most power. during this situation, the spectrum sensing is unnecessary as a result of it introduces further overhead. within the alternative situations, joint spectrum sensing and power control will be used to protect the

PRs. In our paper, we tend to propose a joint spectrum sensing and power allocation (JSS-PA) scheme based on the location data of the pt. within the JSS-PA scheme, when lost detection happens, the SUs exist with PUs within the same spectrum band. If the ratio of SU signal over PU signal is larger than a planned value, the PR are in outage. both the sensing performance and the ST transmit power will be adjusted to enhance the SE of the cr network whereas satisfying the PU outage constraint. Thus, the JSS-PA scheme is predicted to get higher spectrum efficiency. If the transmit power of the ST is enhanced with the aim of rising the SE of the cr network, the interference to the PR `will be larger, therefore a lot of accurate spectrum sensing technology ought to be used to create the lost detection probability smaller. If the SUs have restricted sensing abilities and also the lost detection probability could be a massive value, the ST should control its transmit power to protect the PR sufficiently.

2. Related Work

Considered the problem of energy-efficient (EE) spectrum sensing planning with satisfactory pu protection. Our model exploits the range of Sus in their received signal-to-noise ratio (SNR) of the primary signal to work out the sensing duration for every user/channel pair for higher energy potency. we tend to model the given drawback as an optimization drawback with two totally different objectives. the primary objective is to reduce the energy consumption, and also the second objective is to reduce the spectrum sensing period to maximize the remaining time for data transmission. we solve both issues using the outer linearization methodology. additionally, we present two suboptimal however efficient heuristic methods. we offer an in depth performance analysis of our projected methods under numerous numbers of Sus, average channel SNR, and channel sampling frequency. Our analysis reveals that every one proposals with an energy minimization perspective provide important energy savings compared with a PU transmission-time maximization (TXT) technique.

On the basis of closed-form solution derived for this general drawback, the impact of network topology on the system performance is highlighted, that motivates us to propose a completely unique location-aware strategy that showing intelligence utilizes frequency and area opportunities and minimizes the power consumption whereas maintaining the quality of service of the primary system.The above work shows that additionally to exploring spectrum holes in time and frequency domains, spacial opportunities will be used to more enhance energy efficiency for cr systems.

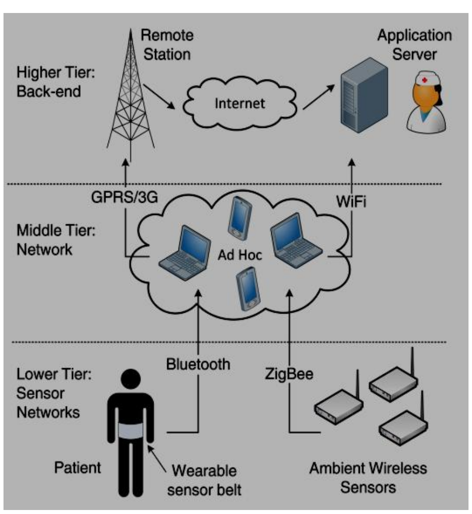


Figure 1: Three tier network architecture

A soft-decision cooperative spectrum sensing idea using continuous-valued sensing check statistics is taken into account, rather than creating hard binary decisions as in ancient hypothesis testing spectrum sensing schemes. The channel access decision regarding whether to access the channel or not is relaxed into permitting the secondary user to access channels with some probability. The sensing decision is created at the secondary base station based on the sensing statistics received from all or a subset of secondary users. This joint optimization problem is aimed toward maximizing the secondary users' total instant throughput whereas keeping the interference to primary users under a specific threshold. {the problem|the matter} is shown to be a convex optimization problem and therefore the Lagrangian dual technique is used to get the optimal solution. two heuristic algorithms are planned to reduce computational complexity. we tend to additionally discuss an alternative formulation wherever to boot interference to individual PUs is also constrained. Simulation results show that our soft sensing based mostly algorithmic rule significantly outperforms a traditional hard decision sensing algorithm.

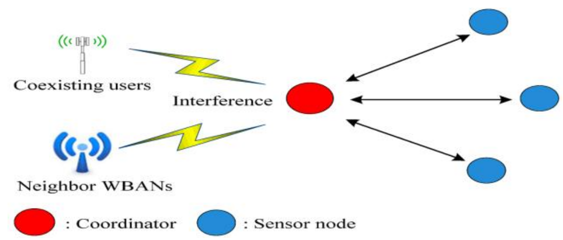


Figure 2: Conceptual operation in cognitive-receiver initiated cycled receiver (C-RICER).

3. Proposed work

The three major tasks of the cognitive radio include: (1) radio-scene analysis, (2) channel identification, and (3) dynamic spectrum management and transmit-power management.A CR will intelligently find whether any portion of the spectrum is in use, and might temporarily use it without interfering with the transmissions of different users. a number of the radio's alternative cognitive abilities include determinative its location, sensing spectrum use by neighboring devices, dynamic frequency, adjusting output power or perhaps altering transmission parameters and characteristics. All of those capabilities, and others yet to be completed, can offer wireless spectrum users with the power to adapt to real-time spectrum conditions, giving regulators, licenses and also the general public versatile, economical and comprehensive use of the spectrum. Figure 3 and 4 describes the diagram of Transmitter and Receiver.

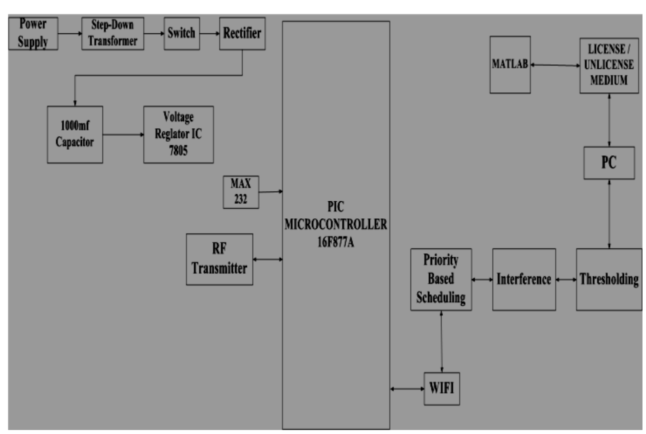


Figure 3: Block diagam for Transmitter side

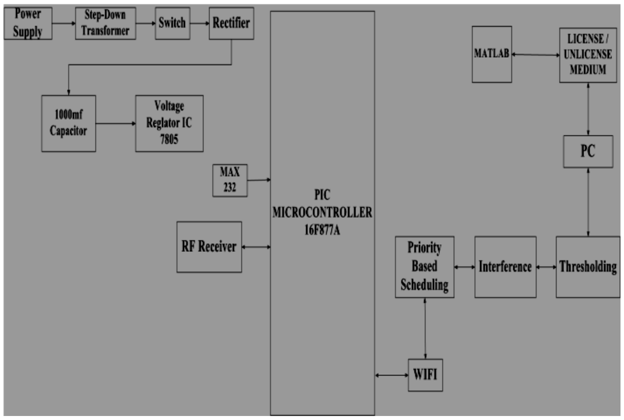


Figure 4: Block diagam for Receiver side

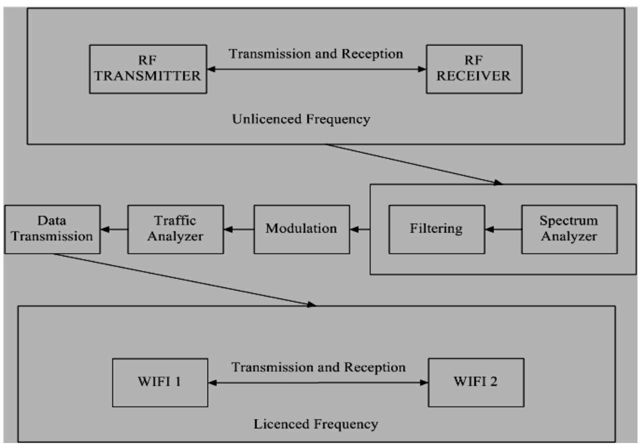
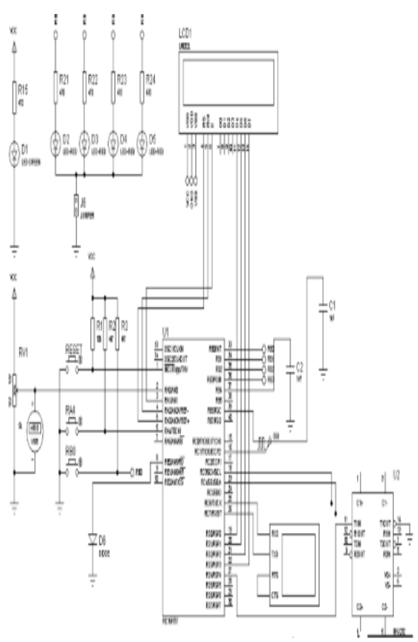


Figure 5: Architecture Diagram

3.1 Schematic Layout



3.2 Geometry of the Proposed CR

RF Transmitter / RF receiver, is the unlicensed band and WIFI is a licensed band of our project. Those two are scheduled as priority based. We reduce the interference between the two channels collision. During data transmission of SU to PU some noise will occur against the threshold level. Figure 5 describes the proposed architecture. We reduce the noise in transmission. Output will be shown in Network Simulator (NS2).

3.3 RF Transmitter/Receiver

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

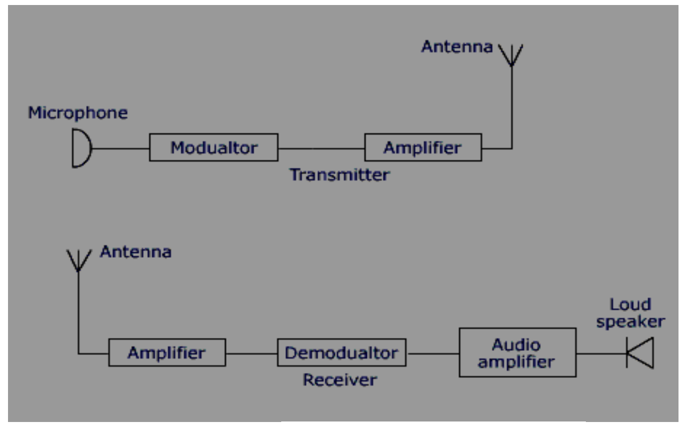


Figure 6: RF Transmitter /Receiver Diagram

This RF Module includes of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) combine operates at a frequency of 434 mhz. AN RF transmitter receives serial information and transmits it wirelessly through RF through its antenna connected at pin4. The transmission happens at the speed of 1Kbps - 10Kbps.The transmitted information is received by an RF receiver operative at an equivalent frequency as that of the transmitter.

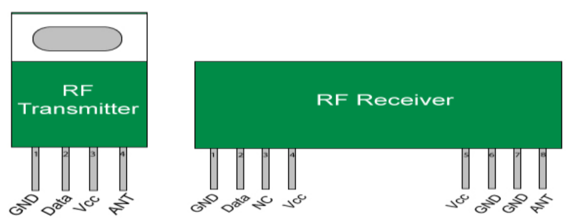


Figure 7: RF Transmitter /Receiver Pin Diagram

3.4 RF Receiver

Radio transmitters and receivers are at the center of wireless communication. Radio stations, tv remotes, and even door bells, radio transmitters and receivers have a range of applications and still be a lead research field for wireless communication. Advances in technology permit radio communication to be integrated into mobile devices whereas maintaining low costs for consumers.

An RF module (radio frequency module) could be a (usually) tiny device used to transmit and/or receive radio signals between two devices. In an embedded system it's typically fascinating to speak with another device wirelessly. This wireless communication could also be accomplished through optical communication or through radio frequency (RF) communication. for several applications the medium of selection is RF since it doesn't need line of sight. RF communications incorporate a transmitter and/or receiver.

3.5 WI-FI

Wi-Fi could be a native space wireless technology that permits an electronic device to participate in computer networking using2.4 ghz UHF and 5 ghz radio bands.The Wi-Fi defines Wi-Fi as any wireless local area network (WLAN) product supported the Institute of Electrical and electronics Engineers(IEEE) 802.11 standards. However, the term Wi-Fi is employed generally English as a equivalent word for WLAN since most modern WLANs are supported these standards. Wi-Fi could be a trademark of the Wi-Fi Alliance.

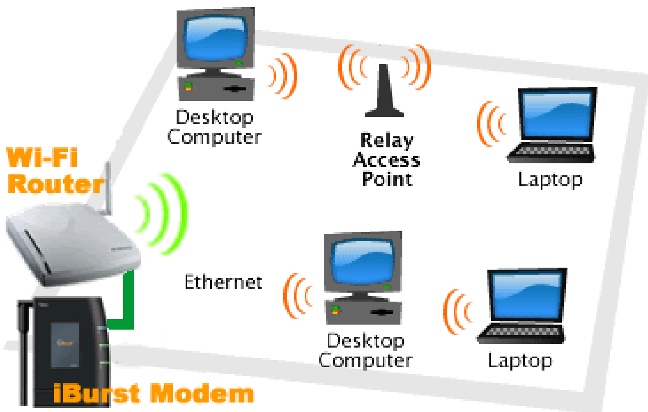


Figure 8: Wi-Fi Structure

Many devices will use Wi-Fi, e.g. pc,laptops, video-game consoles, smart phones, digital cameras, tablet computers and digital audio players. These will connect with a network resource like the internet via a wireless network access point. Such an access point (or hotspot) contains a range of regarding 20 meters (66 feet) inside and a larger range outdoors. Hotspot coverage will comprise an area as tiny as a single room with walls that block radio waves, or as massive as several square kilometers achieved by using multiple overlapping access points.

3.6 MAX232

Communicating with the PC - The MAX232 IC Now that we have the 8 bit value in the 16F877A, we want to send that value to the PC. The 16F877A has a built in serial port that makes it very easy to communicate with the PC's serial port but the 16F877A outpuuts are 0 and 5 volts and we need +10 and -10 volts to meet the RS232 serial port standard. The easiest way to get these values is to use the MAX232.

The MAX232 acts as a buffer driver for the processor. It accepts the standard digital logic values of 0 and 5 volts and converts them to the RS232 standard of +10 and -10 volts. It also helps protect the processor from possible damage from static that may come from people handling the serial port connectors.

The MAX232 requires 5 external 1uF capacitors. These are used by the internal charge PUmp to create +10 volts and -10 volts.

4. Conclusion

Cognitive Radio (CR) is an accommodative, intelligent radio and network technology which will mechanically discover out there channels in a wireless spectrum.The location information of PT and the CR network, a joint spectrum sensing and power allocation (JSS-PA) scheme is proposed to improve the spectrum efficiency. Then, efficient algorithm are proposed to obtain the optimal values. In our proposed method a spectrum sensing scheme, to improve the utilization efficiency of the radio spectrum by increasing detection reliability. Our proposed technique that takes a long sensing time and more accuracy, transmission delays is low. In our method we reduce the noise during data transmission, and threshold level are used to reduce the traffic.

5. Future Work

In this project to reduce the noise, to reduce the interference using the priority energy primarily based rule with cognitive radio network.In contrast, the authorized bands are under used because of static frequency allocation. Realizing that cr technology has the potential to use the inefficiently used authorized bands without causing interference to mandatory users.The PRs may be interfered by the secondary transmission. Therefore, more accurate estimation of the protected area will be investigated in our future work.There are so many approaches available for cognitive radio network. But accuracy for network very less work has been done till now because there is a conflict between real time processing and its accuracy. So, in future new approaches/techniques can be developed for cognitive radio network.

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