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Cognitive radio for enhancing and efficient spectrum sensing based trust management

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ABSTRACT

The goal of the paper is to enhance the throughput efficiency of data transmission and reception in network resources. A network is a collection of wireless node hosts forming a temporary network. Each node is considered wireless device for data transmission and reception. Traditional collaborative spectrum sensing (T-CSS) protocol intelligence networks in order to improve their throughput efficiency. In Cognitive Radio, network the data transmission between honest secondary users and (HSUs) and secondary user base station (SUBS). Collaborative spectrum sensing (CSS) has been proposed in which sensing reports from SUs are sent to multi decision-making authorities to produce more reliable decisions on spectrum usage. Trust and reputation management systems (TRMSs) have been proposed to combat malicious behaviors in CRNs. In addition, produce energy efficient methods for sensing, reporting, data collection, and data fusion in CRNs.

KEYWORDS: Traditional collaborative spectrum sensing (T-CSS), Public Trust and reputation management systems (TRMSs).

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1. INTRODUCTION

The ever-growing demand for mobile traffic requires new technologies to increase the data rate and enhance connectivity using finite radio resources. However, conventional static spectrum allocation policies can no longer provide substantial improvements since these are subjected to an inefficient use of the wireless spectrum. Nonetheless, the Federal Communications Commission (FCC) reported that the majority of primary users (PUs, licensed users) under-utilize their allocated resources at any given time and location. Therefore, cognitive radio (CR) networks, also known as dynamic spectrum access (DSA) networks, have been proposed as a powerful means to better utilize spectrum resources over conventional static spectrum allocation policies. In general, CR models can be further divided into two categories: opportunistic spectrum access and spectrum underlay. In the former case, secondary users (SUs, The authors are with the School of Electronic Engineering & Department of ICMC Convergence Technology, Soongsil University, Seoul 06978, Korea access the frequency bands only when the PUs are not transmitting, and interference constraints are not imposed on SUs' transmission. Instead, the SUs need to detect the licensed frequency bands to avoid interfering with the PUs. In the latter case, the SUs use the frequency bands even when the PUs are transmitting. However, they do so with restricted access and need to avoid causing detrimental interference to the PUs. In addition, sensing-based spectrum sharing was proposed in, using a hybrid model of both opportunistic spectrum access and spectrum underlay to exploit the spectrum resource more efficiently.

1. METHODS AND MATERIAL

Literature survey

Reputation and Trust Management

The reputation based frameworks are the nodes maintain reputations of other nodes and evaluate their trustworthiness are deployed to provide Scalable, Diverse and for countering different types of misbehavior resulting from malicious selfish nodes in the networks. The author (Jaydip et al.,2009) is proposed that Reputation systems are described along with their unique characteristics and working principles. Reputation and trust are very useful tools that are used to facilitate decision making Reputation is the opinion of one entity about another it signifies the trustworthiness of an entity. Trust is the expectation of one entity about the action of another. Reputation and trust have been adapted to wireless communication Network it can solve many problems in the Networks.

Classification of Reputation and Trust

All the nodes in the networks are initially assumed to be trustworthy. Every node trusts other nodes in the network. The reputations of the nodes decrease with every bad encounter. Every node is considered to be untrustworthy in the system bootstrapping stage, and the nodes do not trust each other initially. The reputations of nodes with such system increase with every good encounter. Every node in the network is considered to be neither trustworthy nor untrustworthy. All nodes start with a neutral reputation value to start with. With every good or bad behavior, the reputation value is increased or decreased respectively. In Trust and Reputation, there are two types of Networks are used

- Mobile Ad hoc Networks
- Wireless sensor Networks

It can ensure safety, security, integrity of information communication over the networks. MANETs and WSNs and discusses various types of misbehavior that may be exhibited by nodes in these networks and the effects of such misbehavior on the network performance.

Combinationarial Optimization Identification Algorithm (COI)

The COI (Combinationarial Optimization Identification Algorithm) to defend against such attacks .Cooperative Spectrum sensing has been shown good performance in improving the accuracy of primary user detection proposed a modified Design an attack model called cooperative attack in which an attacker injects self-consistent false data to multiple sensors simultaneously. A theorem that the center node of a cognitive radio network may face uncertainties under a cooperative attack, especially in the case when a large portion of sensors are compromised. A modified COI algorithm to deal with cooperative attacks. Our algorithm is a good scheme to complement IRIS for cooperative attacks, and can be flexibly adjusted to fulfill the detection delay requirement. Intensively evaluate our algorithm through simulation, with the results validating its performance. The original COI is an approach for identifying multiple instances of bad data in power system state estimation. The essential idea is to construct a partial decision tree using the branch-and-bound method to obtain a feasible solution with the minimum number of bad data. Borrow this idea and make two modifications to fit our problem. As mentioned above, there may be more than one feasible solution. Therefore, our first modification is to find all feasible solutions instead of only the one with the minimum number of bad data. The second modification is setting a time threshold to meet the time requirement in cooperative Spectrum sensing. For instance, in IEEE WRANs, the center node must make detection decision once every 2 seconds. We will run the branch-and-bound method with increasing bound until hitting the time threshold.

Clustered based algorithms

The spectrum sensing methods can be distributed in three categories i.e. transmitter, receiver. is propose cluster based algorithms is based spectrum sensing and interference-temperature based detection algorithms. From these, transmitter detection based methods are a preferred way of sensing for presence/absence of spectral holes. These methods can be implemented through various techniques including coherent detection, feature detection and energy based detection algorithms. Coherent sensor is an optimal linear detector for known primary signals in presence of white Gaussian noise. However, detector implementation requires. Demodulation of received signals for achieving the optimal gains.

The proposed system model and a brief discussion on the double correlation model are presented in Section II. In addition to that, this section also includes the derivation of asymptotic probability of detection using double exponential model under suburban environments. Section III presents the evaluation of detection probability under given environment conditions in figure 2.3. Section IV concludes the paper in addition to a brief discussion on future work. The proposed spectrum sensing scenario in this paper includes a TV transmitter as primary/licensed radio network and the secondary radio network consists of a large number of cognitive sensors, detecting primary transmissions collaboratively. The received signal energy from primary transmitter to cognitive sensor can be represented with y (n) that can be defined as a binary hypothesis testing rule.

Agent-based trust calculation

It is proposed agent based approach algorithm. The Cooperation in wireless sensor networks to detect the malicious node without any Infrastructure is a recent trend in research. The current models need more storage, Computation, security tools and communication requirements. The fail wireless sensor Network due to limitation of resources. The proposed agent based approach eliminates the computations in the sensor nodes with appropriate trust factor. The proposed approach uses an agent based collaborative concept ensure the trust in the successive node in the Path. The proposed agent based framework uses reputation of neighboring node as part of trust calculation in its successive node.

Agent based approach

Wireless sensor networks are based on these small form factor nodes transmitting the collected information to the base station. Agent based trust management systems an agent Node is introduced to store the packet transfer information from a cluster of nodes within Communication distance. The agent based system relieves the most of the processing time of Nodes and the nodes concentrate on transfer information. Trust based systems will help to detect the malicious nodes and eliminate them from the communication path. The trusted Node must transmit the minimum acceptable number of packets. The minimum acceptable Number is called threshold. The threshold is used to rate the node. The rating will be updated and maintained using spores formula or Molina's fuzzy reputation model or proposed agent Based model.

Sophisticated detection methods

The Spectrum scarcity is becoming a major issue for service providers interested in either deploying new services or enhancing the capacity for existing applications. The author is proposed that Recent Measurements suggest that many portions of the licensed (primary) spectrum remain unused for significant periods of time. Sensing-based access incurs a very low infrastructure cost and is backward compatible with the legacy primary systems.

This approach fully protects the license from inter-system interference and it results in Spectrum being greatly under-utilized. The increasing demand for the spectrum and the scarcity of vacant bands, a spectrum policy reform seems inevitable. Secondary systems may be allowed to opportunistically access the temporarily unused licensed band of a primary system (a so-called White space) to alleviate the spectrum scarcity. Guarding the licensed spectrum in a rigid Command-and-control fashion, agile secondary users provide an on-demand Interference-protection to the primary system by detecting and utilizing only the white spaces.

Existing process

The T-CSS(Traditional collaborative spectrum sensing)protocol delays in data transmission and unaware of secondary user selection for licensed bandwidth and interference occur in unlicensed secondary network, it lack in secondary power, not able to detect weak primary signals, in order to protect primary receivers from interference. By proposing an energy efficient CSS protocol, namely energy efficient collaborative spectrum sensing EE-CSS protocol is used to transmit the data efficiently. EE-CSS attempts to reduce the number of transmitted reports from HSUs, based on the observation that HSUs agree on the spectrum usage more often than they disagree. CRN is to utilize the unused licensed spectrum opportunistically. The SUs should protect the accessing right of the PUs whenever necessary. The interference of SUs to PU depends on the sensing accuracy of Secondary users, Decision aking algorithm is used to detect and decline the malicious secondary user and priority scheduling algorithm is used to allocate the spectrum bandwidth depending on the priority size. Capability of operating at high volumetric densities. Highly intelligent and adaptive to the environment. Development of globally operable CR networks. Enhancing Priority Based Secondary Selection is Used Based on Data Transmission Size.

Proposed methodology

We propose an energy efficient CSS protocol, namely energy efficient collaborative spectrum sensing EE-CSS, based on a Trust and reputation management systems TRMS, and derive expressions for the steady-state average trust value and the steady-state average total number of sensing reports transmitted by the SUs in the CRN. EE-CSS attempts to reduce the number of transmitted reports from HSUs, based on the observation that HSUs agree on the spectrum usage more often than they disagree.CRN is to utilize the unused licensed spectrum opportunistically. The SUs should protect the accessing right of the PUs whenever necessary. The interference of SUs to PU depends on the sensing accuracy of SUs.

2. RESULTS AND DISCUSSION

Cognitive radio network:

Cognitive techniques have been used in wireless networks to circumvent the limitations imposed by conventional WSNs. Cognitive radio (CR) is a candidate for the next generation of wireless communications system. The cognitive technique is the process of knowing through perception, planning, reasoning, acting, and continuously updating and upgrading with a history of learning. If cognitive radio can be integrated with wireless sensors. CR has the ability to know the unutilized spectrum in a license and unlicensed spectrum band, and utilize the unused spectrum opportunistically. The incumbents or primary users (PU) have the right to use the spectrum anytime, whereas secondary users (SU) can utilize the spectrum only when the PU is not using it.

Collaborative Spectrum Sensing

In this spectrum is used to detect spectrum band for transformation and reception. The matched filter detection technique requires a demodulation of the PU's information signal, such as the modulation type and order, pulse shaping, packet format, operating frequency, bandwidth, etc. CR Network sensing receive information from the PU's pilots, preambles, synchronization words or spreading codes etc. The advantage of the matched filter method is that it takes a short time and requires fewer samples of the received signal. Sensing reports provided by SUs for a given licensed band may differ due to differences in channel fading gains, locations of SUs and primary network transmitters, number of signal energy quantization levels used at the sensing SU, and sensing errors.

Cooperative trust Management and avoid malicious behavior

CR Network sensors may encounter incorrect judgments because radio-wave propagation through the wireless channels has adverse factors, such as multi-path fading, shadowing, and building penetration. In addition, CR wireless sensors are hardware constraints and cannot sense multiple channels simultaneously. It has a malicious behavior to intermediate the signal spectrum. TRMSs record the accuracy of previous sensing reports sent by SUs and compute a trust value for each SU which is taken as the trustworthiness of its future sensing reports. And encounter the reports from SUs may be required to militate against the effects of malicious behavior of MSUs.Therefore; CR wireless sensors cooperate and share their sensing information with each other to improve the sensing performance and accuracy.

Priority Based Spectrum transformation

In Cognitive Radio network the users are classified into Licensed Primary Users and Unlicensed Secondary Users and there is no dedicated channel to send data, sensors need to negotiate with the neighbors and select a channel for data communication in CR-WSNs. This is a very challenging issue, because there is no cooperation between the PUs and SUs. PUs may arrive on the channel any time. If the PU claims the channel, the SUs have to leave the channel immediately. CRN is implemented for short range wireless applications such as wireless sensor networks (WSNs) such wireless and Bluetooth, where the transmission distance is usually small (e.g., tens of meters the steady-state average total number of sensing reports transmitted for each band And assume that the packets transmitted from the FC and SUs are of equal length in both EE-CSS and T-CSS.

Conclusion

Cognitive Radio (CR) is an adaptive, intelligent radio and network technology that can automatically detect available channels in a wireless spectrum and change transmission parameters enabling more communications to run concurrently and also improve radio operating behavior. Cognitive radio uses a number of technologies including Adaptive Radio (where the communications system monitors and modifies its own performance) and Software Defined Radio (SDR) where traditional hardware components including mixers, modulators and amplifies have been replaced with intelligent software.

In this article, a spectrum sensing scheme, was proposed to improve the utilization efficiency of the radio spectrum by increasing detection reliability and decreasing sensing time. The proposed scheme presented spectrum sensing in effective manner. So for this we include the priority based and security based spectrum sensing is produced. This system also implemented in hardware successfully.

Future enhancement

Priority Based Selection: In Cognitive Radio network the users are classified into Licensed Primary Users and Unlicensed Secondary Users and there is no dedicated channel to send data, sensors need to negotiate with the neighbors and select a channel for data communication in CR-WSNs. This is a very challenging issue, because there is no cooperation between the PUs and SUs. PUs may arrive on the channel any time. If the PU claims the channel, the SUs have to leave the channel immediately. Therefore, data channels should be selected intelligently considering the PU's behavior on the channel and using some Priority Based Selection algorithms. Therefore USFR has been shown to effectively improve self-coexistence jointly in spectrum utilization, power consumption, and intra-cell fairness.

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