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COGNITIVE RADIO FORENHANCINGAND 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 to be 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. And produce energy efficient methods for sensing, reporting, data collection, and data fusion in CRNs.

Index Terms: Trust and Reputation Management Systems (TRMSs), Traditional Collaborative Spectrum Sensing (T-CSS), Collaborative Spectrum Sensing (CSS) & Honest Secondary Users and (HSUs)

1. Introduction:

The ever increasing demand for higher data rates in wireless communications in the face of limited or under-utilized spectral resources has motivated the introduction of cognitive radio. Traditionally, licensed spectrum is allocated over relatively long time periods, and is intended to be used only by licensees. Various measurements of spectrum utilization have shown substantial unused resources in frequency, time and space. The concept behind cognitive radio is to exploit these under-utilized spectral resources by reusing unused spectrum in an opportunistic manner. The phrase "cognitive radio" is usually attributed to Mitola, but the idea of using learning and sensing machines to probe the radio spectrum was envisioned several decades earlier. Cognitive radio systems typically involve primary users of the spectrum, who are incumbent licensees and secondary users who seek to opportunistically use the spectrum when the primary users are idle1. The introduction of cognitive radios inevitably creates increased interference and thus can degrade the quality of- service of the primary system. The impact on the primary system, for example in terms of increased interference, must be kept at a minimal level. Therefore, cognitive radios must sense the spectrum to detect whether it is available or not, and must be able to detect very weak primary user signals.

Thus spectrum sensing is one of the most essential components of cognitive radio. The problem of spectrum sensing is to decide whether a particular slice of the spectrum is "available" or not. Other types are dependent on parts of the spectrum available for cognitive radio:

- ✓ Licensed-Band Cognitive Radio, capable of using bands assigned to licensed users (except for unlicensed bands, such as the U-NII band or the ISM band.

The IEEE 802.22 working group is developing a standard for wireless regional area network (WRAN), which will operate on unused television channels.[10][11]

- ✓ Unlicensed-Band Cognitive Radio, which can only utilize unlicensed parts of the radio frequency (RF) spectrum. One such system is described in the IEEE 802.15 Task Group 2 specifications, which focus on the coexistence of IEEE 802.11 and Bluetooth.
- ✓ Spectrum mobility: Process by which a cognitive-radio user changes its frequency of operation. Cognitive-radio networks aim to use the spectrum in a dynamic manner by allowing radio terminals to operate in the best available frequency band, maintaining seamless communication requirements during transitions to better spectrum.
- ✓ Spectrum sharing: Spectrum sharing cognitive radio networks allow cognitive radio users to share the spectrum bands of the licensed-band users. However, the cognitive radio users have to restrict their transmit power so that the interference caused to the licensed-band users is kept below a certain threshold.
- ✓ Sensing-based Spectrum sharing:[13] In sensing-based spectrum sharing cognitive radio networks, cognitive radio users first listen to the spectrum allocated to the licensed users to detect the state of the licensed users. Based on the detection results, cognitive radio users decide their transmission strategies. If the licensed users are not using the bands, cognitive radio users will transmit over those bands. If the licensed users are using the bands, cognitive radio users share the spectrum bands with the licensed users by restricting their transmit power. Here used Wi-Fi as primary user (licensed) and Bluetooth as secondary user (unlicensed)

2. Related Works:

An energy efficient collaborative spectrum sensing (EE-CSS) protocol, based on trust management, is proposed. The protocol achieves energy efficiency by reducing the total number of sensing reports exchanged between the honest secondary users (HSUs) and the secondary user base station (SUBS) in a traditional collaborative spectrum ensign (T-CSS) protocol. It is shown that the minimum total number of sensing reports required to satisfy a target global false alarm (FA) and missed detection (MD) probabilities in T-CSS is higher than that in EE-CSS. Expressions for the steady-state average SU trust value τ and total number N of SU sensing reports transmitted are derived, as is an expression for the energy consumption, in EE-CSS and T-CSS. The global FA and detection probabilities Qf and Qd are obtained for a commonly used decision fusion technique. The impact of link outages on τ, N, Qf, and Qd is also analyzed. The results show that the energy consumption in EE-CSS can be much lower compared to that in T-CSS for long range communications where the transmit energy is dominant.

3. Proposed Work:

The propose an energy efficient CSS protocol, namely energy efficient collaborative spectrum sensing-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.CRNis 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.

Advantages:

- ✓ Development of a wireless sensor with the required cognitive capabilities.
- ✓ Development of extremely low power consumable CR wireless sensor with energy harvesting facilities.
- ✓ Capability of operating at high volumetric densities.
- ✓ Highly intelligent and adaptive to the environment
- ✓ Should be robust on security for attacks and should work in an untrustworthy environment,
- ✓ Development of globally operable CR networks.
- ✓ Enhancing Priority Based Secondary Selection is Used Based on Data Transmission Size.

Module:

- ✓ Compose Mail
- ✓ Cognitive Radio Network
- ✓ Collaborative Spectrum Sensing Techniques
- ✓ Cooperative trust Management and avoid malicious behavior
- ✓ Priority Based Spectrum transformation

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.

4. Experimental Analysis and Results:

Implementation is often used in the tech world to describe the interactions of elements in programming languages. In Java, where the word is frequently used, to implement is to recognize and use an element of code or a programming resource that is written into the program. One aspect of implementing an interface that can cause confusion is the requirement that to implement an interface, a class must implement all of the methods of that interface. This can lead to error messages due to insufficient implementation of methods. In general, the syntactical requirements of implementation and other tasks can be a burden for developers, and mastering this is part of becoming an in-depth user.

Performance Evaluation:

Performance Evaluation: As mentioned, the difference of I/O process between SeDas and Native system (e.g. pNFS) is the additional encryption/decryption process which needs support from the computation resource of SeDas' client. We compare two systems: i) a self-destructing data system based on active storage framework (SeDas for short), and ii) a conventional system without self-destructing data function (Native for short). We evaluated the latency of upload and download with two schemes (SeDas and Native) under different file sizes. Also, we evaluated the overhead of encryption and decryption with two schemes under different file sizes. Fig. 6 shows the latency of the different schemes.

Experimental Setup:

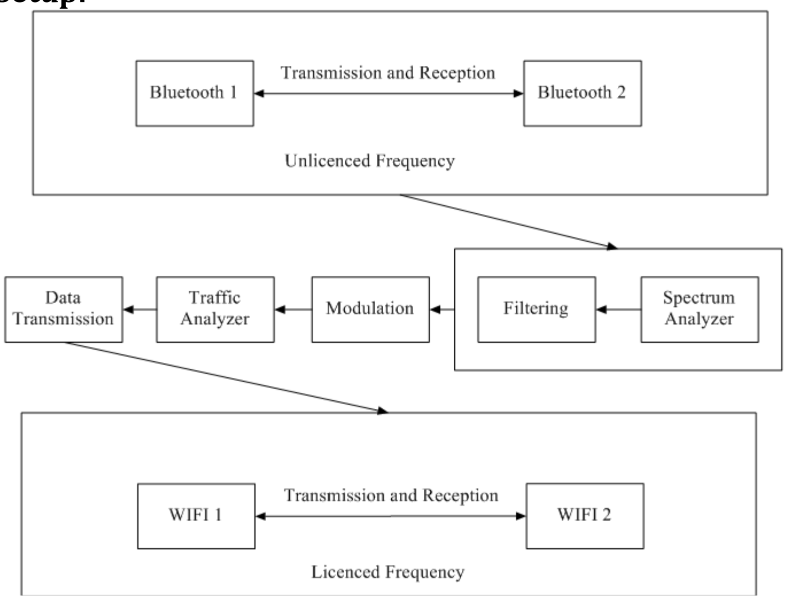

Figure 1: System Architecture

There are multiple storage services for a user to store data. Meanwhile, to avoid the problem produced by the centralized "trusted" third party, the responsibility of SeDas is to protect the user key and provide the function of self-destructing data. Fig. 4 shows the brief structure of the user application program realizing storage process. In this structure, the user application node contains two system clients: any third-party data storage system (TPDSS) and SeDas. The user application program interacts with the SeDas server through SeDas' client, getting data storage service.

Each program is tested individually at the time of development using the data and has verified that this program linked together in the way specified in the programs specification, the computer system and its environment is tested to the satisfaction of the user.

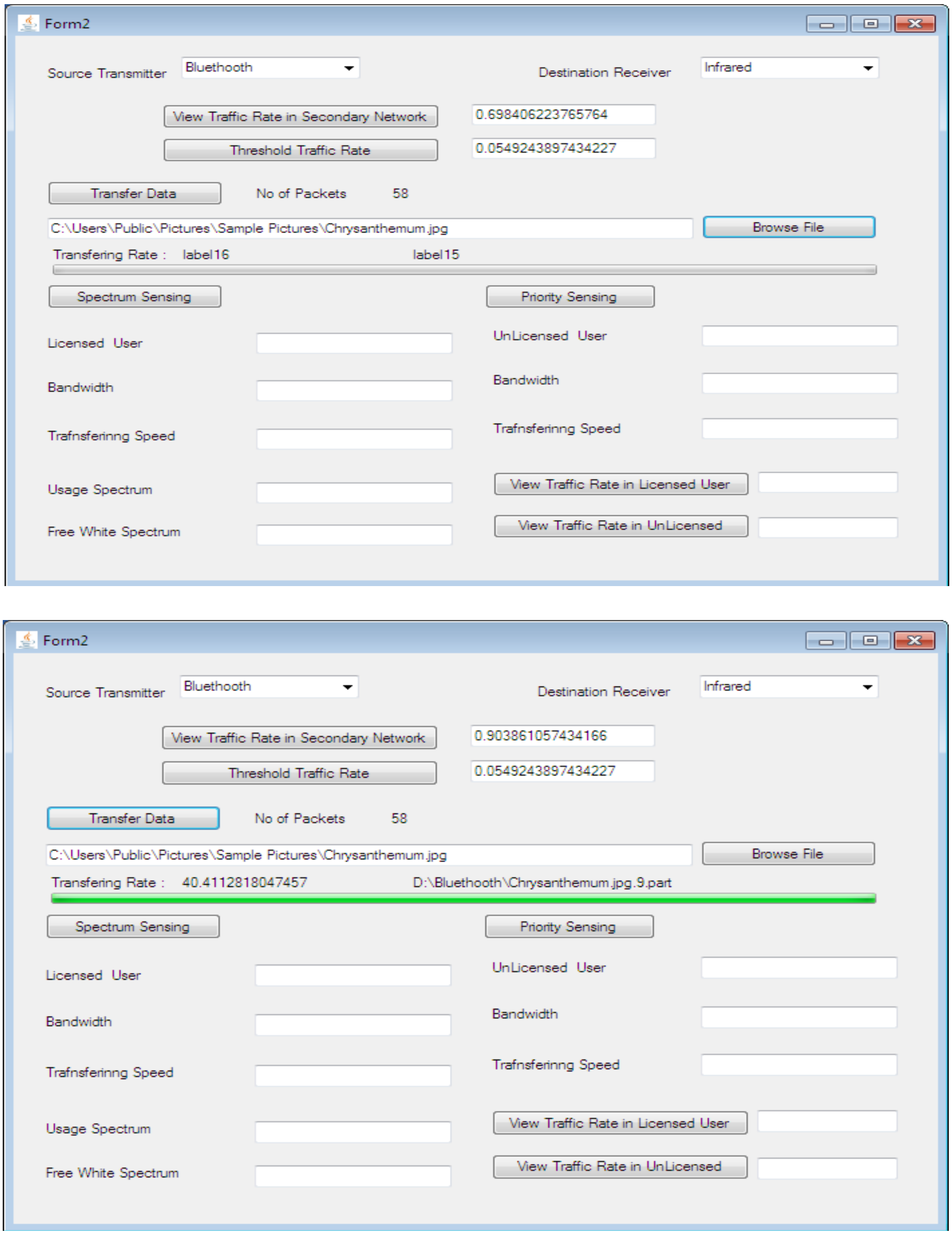

Figure 2: Transfer Data

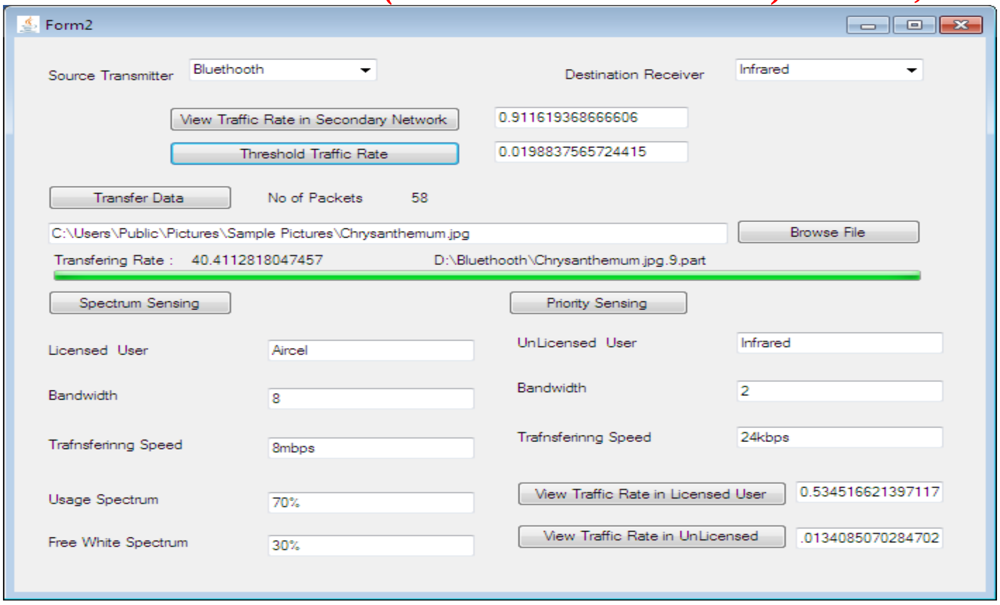

Figure 3: Minimize Traffic in Unlicensed Network by Priority Sensing

5. 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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