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Improved the Channel Performance in Wireless Network using Secure Communication

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ABSTRACT

The demand for mobile wireless communications due to the popularity of smart phones and devices that have internet based applications has witnessed rapid growth in the last decade. The next generation network is expected to provide a better quality of service and meet the demands of these rising number of users. The future generation networks are expected to achieve high data rates, reduced latency, increased spectral efficiency and energy efficiency of the system. Since the available spectrum is a scarce resource, its efficient utilization is the prime focus of the next generation networks. Spectrum Sharing is a key aspect that is gaining significant attention as it can prove to be beneficial in meeting the above requirements.

Keywords: Wireless networks, Spectrum sharing, Wireless sensor networks, Energy efficiency.

INTRODUCTION

Wireless sensor networks (WSNs) have gained worldwide attention in recent years, particularly with the proliferation in Micro-Electro-Mechanical Systems (MEMS) technology which has facilitated the development of smart sensors. These sensors are small, with limited processing and computing resources, and they are inexpensive compared to traditional sensors. These sensor nodes can sense, measure, and gather information from the environment and, based on some local decision process, they can transmit the sensed data to the user.

A WSN typically has little or no infrastructure. It consists of a number of sensor nodes (few tens to thousands) working together to monitor a region to obtain data about the environment. There are two types of WSNs: structured and unstructured. An unstructured WSN is one that contains a dense collection of sensor nodes [20]. A Wireless sensor network is composed of a large number of sensor nodes, which are densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be engineered or pre-determined. This allows random deployment in inaccessible terrains or disaster relief operations. On the other hand, this also means that sensor networks protocols and algorithms must possess self-organizing capabilities.

Another unique feature of sensor networks is the cooperative effort of sensor nodes. Sensor nodes are fitted with an on-board processor. Instead of sending the raw data to the nodes responsible for the fusion, sensor nodes use their processing abilities to locally carry out simple computations and transmit only the required and partially processed data. The above described features ensure a wide range of applications for sensor networks. Some of the application areas are health, military, and security. For example, the physiological data about a patient can be monitored remotely by a doctor. While this is more convenient for the patient, it also allows the doctor to better understand the patient's current condition. Sensor networks can also be used to detect foreign chemical agents in the air and the water. They can help to identify the type, concentration, and location of pollutants. In essence, sensor networks will provide the end user with intelligence and a better understanding of the environment.

Since large number of sensor nodes is densely deployed, neighbor nodes may be very close to each other. Hence, multi hop communication in sensor networks is expected to consume less power than the traditional single hop communication. Furthermore, the transmission power levels can be kept low, which is highly desired in covert operations. Multi hop communication can also effectively overcome some of the signal propagation effects experienced in long-distance wireless communication. One of the most important constraints on sensor nodes is the low power consumption requirement. Sensor nodes carry limited, generally irreplaceable, power sources. Therefore, while traditional networks aim to achieve high quality of service (QoS) provisions, sensor network protocols must focus primarily on power conservation. They must have inbuilt trade-off mechanisms that give the end user the option of prolonging network lifetime at the cost of lower throughput or higher transmission delay [19].

WSNs have great potential for many applications in scenarios such as military target tracking and surveillance, natural disaster relief, biomedical health monitoring, and hazardous environment exploration and seismic sensing. In military target tracking and surveillance, a WSN can assist in intrusion detection and identification. Specific examples include spatially-correlated and coordinated troop and tank movements. With natural disasters, sensor nodes can sense and detect the environment to forecast disasters before they occur. In biomedical applications, surgical implants of sensors can help monitor a patient's health. For seismic sensing, ad hoc deployment of sensors along the volcanic area can detect the development of earthquakes and eruptions [20].

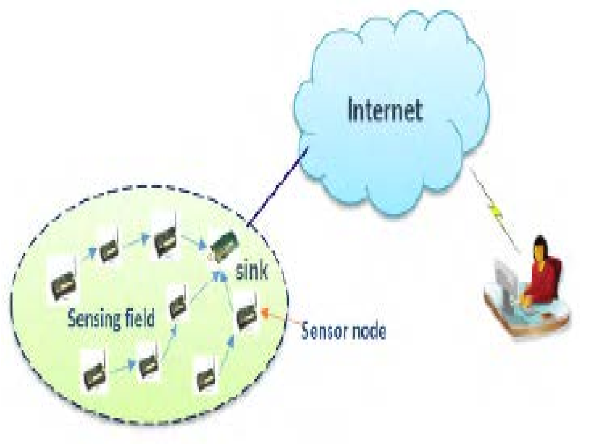

Fig 1: Architecture of a wireless sensor network.

The rest of this paper is organized as follows in the first section we describe an introduction of about the cognitive radio in wireless sensor network. In section II we discuss about the cognitive radio network, In section III we present the proposed work and result analysis, finally in section IV we conclude and discuss the future scope.

II COGNITIVE RADIO NETWORK

Cognitive radio CR is an a enhanced to Software-Defined Radio (SDR) that its automatically detects the surrounding RF, catalysts and smartly accommodates its operating parameters to the infrastructure of network according to meet user demand, if this band is further used by a licensed user, the cognitive radio stirs to other spectrum band or remains in the same band with altering its level of the transmission power or modulation scheme all of that avert interference, calibrations the congestion due to spectrum participating.

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The definition of cognitive radio states that it's a radio that able to alter its transmitter parameters based on interaction with its operation environment. CRN enables to dynamically using of spectrum, a CRN was called Next Generation (xG) network. Cognitive radio may be defined as part of radio systems that perform spectrum sensing in a continuous manner which identify spectrum holes (unused radio spectrum) dynamically and then perform operation in a time domain when it is not used by primary users. "A cognitive radio may be defined as a radio that is aware of its environment and the internal state and with knowledge of these elements and any stored pre-defined objectives can make and implement decisions about its behaviour [11]".

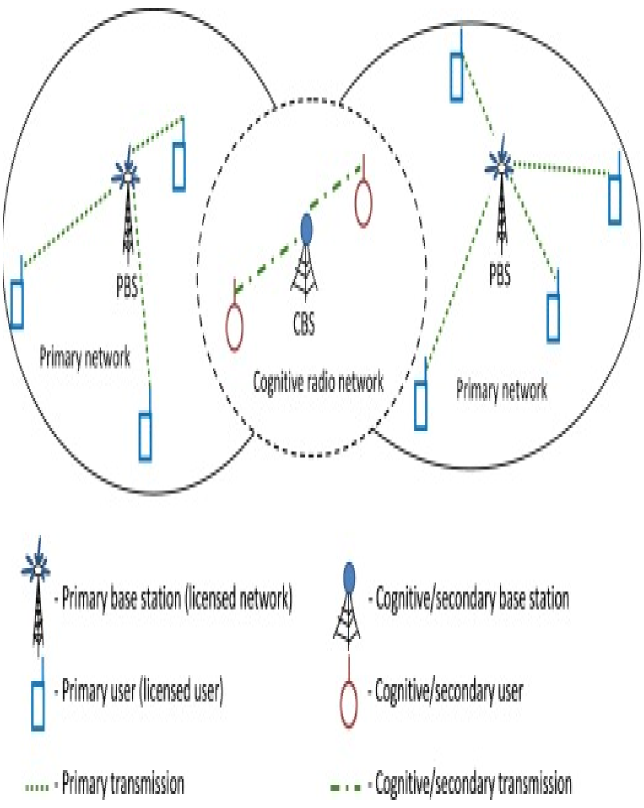

Fig 2: Cognitive radio and spectrum.

III PROPOSED WORK & RESULTS

The most important and crucial task of cognitive radio is to detect the unused portions of the radio spectrum. Cognitive radio has a characteristic that it can sense the spectrum holes and shares it with other secondary users without affecting the work of primary user. In spectrum sensing, secondary users keep track of primary users to find spectrum holes which are also known as spectrum bands. Spectrum holes can be classified as: temporal spectrum holes and spatial spectrum holes. In temporal spectrum holes, primary user does not use spectrum for the transmission for that particular amount of time so at that time secondary user can use the spectrum for transmission whereas in spatial spectrum holes, primary user activities is bound to a particular area and secondary user can use the spectrum outside that area. So in cognitive radio, to detect the presence or absence of the primary user various spectrum sensing techniques of cognitive radio such as Matched filter detection, Cyclo stationary Feature detection, Energy detection, Higher order statistics, Waveform based sensing, and Eigen value based have been deployed but the performance of every spectrum sensing technique is different in different scenarios.

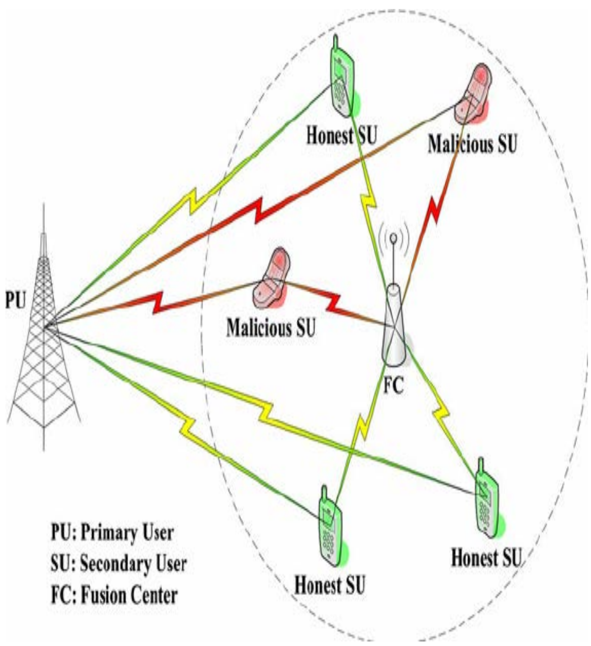

Fig 3: General Architecture for Spectrum Sensing Techniques.

The major aspects of a cognitive radio system include spectrum sensing, spectrum decision, and spectrum sharing and spectrum mobility. To know the status of the spectrum we must know its occupancy for further spectrum allocations. Spectrum sensing is the most important aspect or the first step in spectrum sharing. Sensing is required to examine the state of the spectrum as busy, idle or availability of the channels of the primary user for secondary access. It also helps in reducing the delay involved in finding the available channels, reducing the energy consumed and also helps in minimizing the interference caused to the primary users in the network.

The opportunistic users may dynamically select the best available channels, and adapt their transmission parameters to avoid harmful interference between the contending cognitive users. Therefore, the cognitive radio is a promising wireless communication technology geared to solve the spectrum scarcity problem by opportunistically identifying the unused portions of the spectrum. It observes, learns, optimizes and intelligently adapts to achieve optimal frequency band usage and establish communication, while ensuring that the licensed or primary users of the spectrum are not affected.

In this section, we focus on the analysis of the secrecy throughput and the energy efficiency by employing a cooperative spectrum sharing scheme. Different from the traditional underlay spectrum sharing scheme that SUs can access the licensed spectrum as long as the secondary power is below a prescribed threshold, the cooperative spectrum sharing refers to that the PU allows one SU to simultaneously access the licensed spectrum, and as compensation for their interference, the SU cooperates with PUs to improve the performance of PUs. Here, the primary pair allows the secondary source to transmit packets simultaneously in each time slot, and the secondary source works as both a relay for primary transmissions and a friendly jammer against the eavesdropper, in case the primary transmission fails.

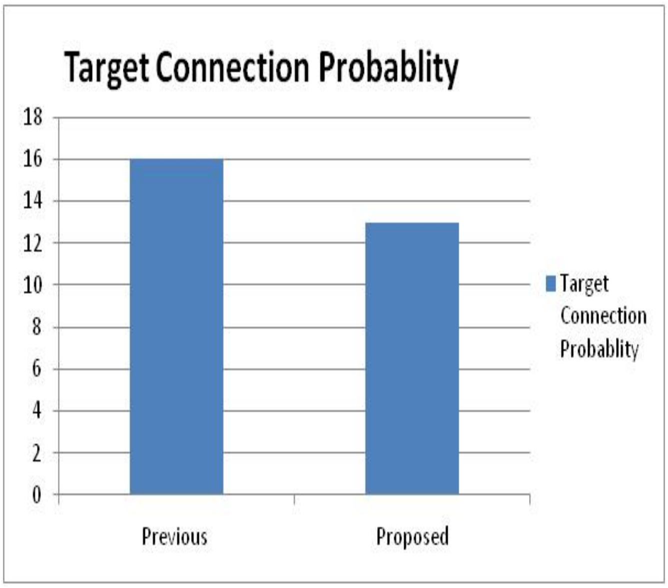

Fig 4: Experimental results for the previous and proposed approach.

IV CONCLUSION AND FUTURE SCOPE

Wireless sensor networks have become part of our networked world and their significance has grown extremely. Wireless Sensor Network a thrilling and open field of research. Still several technical issues have to be fully addressed and solved. Some potential areas where research ca n be taken up in the wireless sensor networks are self-configuration, fault-tolerance, adaptation, flexibility, energy efficiency, efficient protocol design and operation, scalability and heterogeneity, security, privacy and trust, architectural issues etc. In this paper we work on the cooperative spectrum sharing and enhance the performance of channel selection in wireless sensor networks.

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