A Review on Improve the Performance of Various Scheme in Cognitive Radio Network

Chandra Kumar Kachhwaha[1], Prof. Jitendra Mishra[2]
[1]M. Tech Scholar, Department of EC, PCST, Bhopal (India)
[2]Head & Professor, Department of EC, PCST, Bhopal (India)
[1]chkk39@gmail.com, [2]jitendramishra@gmail.com

ABSTRACT
Cognitive radio (CR) is emerging as a promising technology to improve the utilization of wireless spectrum resources. It is a novel technology that can potentially improve the utilization efficiency of the radio spectrum. The detection performance of spectrum sensing schemes is usually compromised by destructive channel conditions between the target-under-detection and the cognitive radios, since it is hard to distinguish between a white spectrum and a weak signal attenuated by deep fading. In this paper we presents the survey for the cognitive radio to improve the spectrum sensing and energy efficiency in radio networks.

Keywords: Cognitive radio, Wireless Sensor Network, Cognitive Radio Network, Wireless local Area Network, Spectrum.

INTRODUCTION
Wireless communication is widely used in our daily lives. We use wireless access technologies to watch TV and enjoy high-definition videos. However, wireless spectrum is limited and expensive, and most frequency bands need to be authorized before access. Furthermore, spectrum assignment policies are regulated by governmental agencies [9]. Cognitive radio technology has attracted considerable attention from both academia and industry due to its strong potential in dealing with the under-utilization of spectrum resources in wireless communications [1].

In cognitive radio networks, unlicensed secondary users (SUs) can sense the operational environment periodically and exploit the primary users' (PUs') spectrum without degrading their performance, which greatly enhances the spectrum efficiency [1]. Cognitive radio is the key enabling technology that enables next generation communication networks, also known as dynamic spectrum access (DSA) networks, to utilize the spectrum more efficiently in an opportunistic fashion without interfering with the primary users. It is defined as a radio that can change its transmitter parameters according to the interactions with the environment in which it operates [2].

The main objective of spectrum sensing is to provide more spectrum access opportunities to CR users without interference to the primary networks. Since cognitive radio (CR) networks are responsible for detecting the transmission of primary networks and avoiding interference to them, CR networks should intelligently sense the primary band to avoid missing the transmission of primary users. Thus, sensing accuracy has been considered as the most important factor to determine the performance of CR networks. Hence, recent research has been focused on improving the sensing accuracy for interference avoidance [3].

Sensing-based opportunistic spectrum access has been proposed as a candidate enabling technology for secondary spectrum usage. This approach is particularly appealing due to its low deployment cost and its compatibility with legacy primary users. However, in a fading environment, spectrum sensing is challenged by the uncertainty arising from the channel fading. In such settings, local processing may be unable to provide the detection sensitivity required by the regulator in a reasonable time limit, thereby calling for cooperation among secondary users [6].

Cognitive radio systems are generally categorized based on the spectrum access strategy they utilize. In such classification, cognitive radio networks can adopt a centralized network infrastructure for spectrum assignment or they can assume decentralized (ad-hoc) architecture. In the centralized approach, all cognitive base stations forward their spectrum sensing measurements to a central authority, which uses that collective information to make decisions about the spectrum assignment, which is then communicated back to the various cognitive base stations [13].

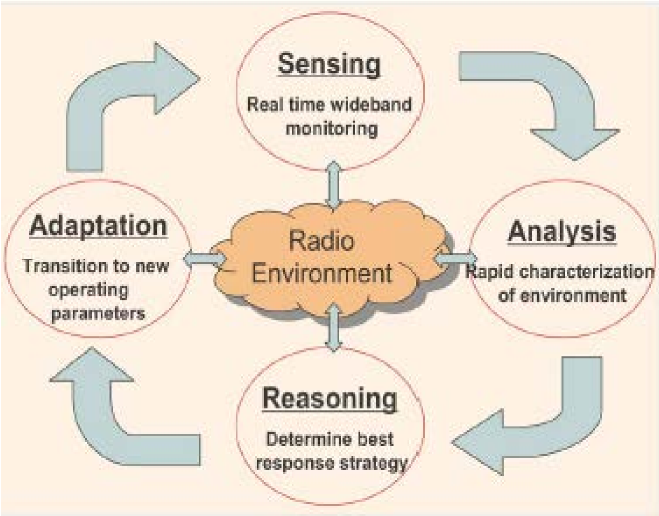

Fig 1: Cognitive cycle.

There has been a variety of research work dealing with topic. And quite a lot good solutions have been proposed. As a summary, those previous researches can be divided into two categories. As for the first category, the spectrum leasing problem in CRN is investigated by employing the widely- used economical concepts. The second category, the La grangian dual decomposition is adopted to solve such kind of spectrum leasing problem, in which the globally optimal resource allocation can be found .

Cognitive Radio (CR) has emerged as a promising technology to improve the spectrum utilization by enabling opportunistic access to the licensed spectrum bands [12]. This technology can also be applied to WSNs, which leads to Cognitive Radio Sensor Networks (CRSNs). Sensor nodes in CRSNs can sense the availability of licensed channels and adjust the operation parameters to access the idle ones, when the condition of the licensed-free channel degrades. However, since the energy consumption for supporting the CR functionalities, e.g., channel sensing and switching, is considerable for battery-powered sensor nodes the opportunistic channel access should be carefully studied to improve the energy efficiency in CRSNs.

The rest of this paper is organized as follows in the first section we describe an introduction of about the wireless sensor and cognitive radio network. In section II we discuss about the rich literature for the cognitive radio and wireless sensor networks. In section III we discuss about the problem formulation and statement as we getting from the rich literature survey, finally in section IV we conclude the about our paper which is based on the literature survey and specify the future scope.

II RELATED WORK

With ever-increasing wireless services and QoS requirements, traditional WSNs operating over the license-free spectrum, are facing unprecedented challenges to guarantee network performance. As an emerging solution for the spectrum scarcity of WSNs, CRSN has been well studied to improve the network performances, in terms of delay and throughput. In this section we discuss about the rich literature survey for the cognitive radio and wireless sensor networks**.**

[1] In this paper they propose an opportunistic cooperation scheme in a two-user buffer-aided cognitive radio network. In each time slot, the secondary user (SU) will either transmit its own packets, or help the primary user to forward packets, based on a priority factor α. According to previous cooperation schemes, some time slots will be wasted if the selected buffer is empty. However, under the proposed scheme, these time slots will be handed over to the nonempty buffer’s transmission, which increases the average service rates of buffers at the SU.

[2] This paper surveys recent advances in research related to cognitive radios. The fundamentals of cognitive radio technology, architecture of a cognitive radio network and its applications are first introduced. The existing works in spectrum sensing are reviewed, and important issues in dynamic spectrum allocation and sharing are investigated in detail. Here the fundamental concept about cognitive radio characteristics, functions, network architecture and applications are presented, and then various research topics on cognitive radio networks are discussed.

[3] In this paper, in order to solve both the interference avoidance and the spectrum efficiency problem, an optimal spectrum sensing framework is developed. More specifically, first a theoretical framework is developed to optimize the sensing parameters in such a way as to maximize the sensing efficiency subject to interference avoidance constraints. Second, in order to exploit multiple spectrum bands, spectrum selection and scheduling methods are proposed where the best spectrum bands for sensing are selected to maximize the sensing capacity.

[4] In this paper, an adaptive cooperation diversity scheme with best-relay selection is proposed for multiple-relay cognitive radio networks to improve the performance of secondary transmissions while ensuring the quality of service (QoS) of primary transmissions. Exact closed-form expressions of the outage probability of secondary transmissions, referred to as secondary outage probability, are derived under the constraint of satisfying a required outage probability of primary transmissions (primary outage probability) for both the traditional non-cooperation and the proposed adaptive cooperation schemes over Rayleigh fading channels.

[5] They provide in this paper a comprehensive survey on the CRN communication paradigm in SGs, including the system architecture, communication network compositions, applications, and CR-based communication technologies. They highlight potential applications of CR-based SG systems. They survey CR-based spectrum sensing approaches with their major classifications. They also provide a survey on CR-based routing and MAC protocols, and describe interference mitigation schemes.

[6] In this paper performance of spectrum-sensing cognitive radios is studied under channel fading. In particular, it is shown that due to the uncertainty resulting from fading, local signal processing alone may be inadequate to meet the performance requirements. To remedy this issue, cooperation among secondary users is proposed and studied in this paper. Moreover, They characterize and study a tradeoff between local processing and cooperation, which should be balanced in order to maximize the spectrum utilization.

[7] In this paper, They consider the application of these technologies to spectrum sensing and spectrum sharing. One of the most important challenges for cognitive radio systems is to identify the presence of primary (licensed) users over a wide range of spectrum at a particular time and specific geographic location. They consider the use of cooperative spectrum sensing in cognitive radio systems to enhance the reliability of detecting primary users. They shall describe spectrum sensing for cognitive radios and propose robust cooperative spectrum sensing techniques for a practical framework employing cognitive radios.

[8] In this paper, they propose an optimal linear cooperation framework for spectrum sensing in order to accurately detect the weak primary signal. Within this framework, spectrum sensing is based on the linear combination of local statistics from individual cognitive radios. Their objective is to minimize the interference to the primary radio while meeting the requirement of opportunistic spectrum utilization.

[9] In this paper, they propose an intelligent cooperative spectrum sensing algorithm based on a non-parametric Bayesian learning model, namely the hierarchical Dirichlet process, which groups spectrum sensing data without the need to know the number of hidden spectrum states, and discovers a common sparse spectrum within each group. Furthermore, a concisely distributed information exchange scheme is designed, where intra-cluster and inter-cluster spectrum information is shared for global spectrum cognition.

[10] In this paper, the interference both from SUs to PRs and from PTs to SUs is considered in the analysis of cognitive two-way relay networks with opportunistic relay selection. The exact closed-form expression for the outage probability of the secondary system is derived over Rayleigh fading channels, which is verified through various Monte Carlo simulations. Meanwhile, an asymptotic expression and diversity order are also derived to reveal additional insights into the effect of the mutual interference between the primary and secondary systems on the diversity.

[11] This papers considers a cooperative Orthogonal Frequency Division Multiplexing (OFDM)-based cognitive radio net- work, where the primary system leases a fraction of its sub carriers to the secondary system in exchange for the secondary users (SUs) acting as decode-and-forward relays. Our aim is to determine an fair resource allocation strategies among the primary user and SUs as so to maximize the network capacity. To this end, a network utility maximization optimization problem of power, subcarrier allocation and relay selection is formulated based on a class of utility.

[12] In this paper author investigate the dynamic channel accessing problem to improve the energy efficiency for a clustered CRSN. Under the primary users' protection requirement, they study the resource allocation issues to maximize the energy efficiency of utilizing a licensed channel for intra-cluster and inter-cluster data transmission, respectively. Moreover, with the consideration of the energy consumption in channel sensing and switching, they further determine the condition when sensor nodes should sense and switch to a licensed channel for improving the energy efficiency, according to the packet loss rate of the license-free channel.

[14] In this paper, they first present an analysis of reliability in sensor actor networks, and lay out the

factors that affect reliability. They then propose a scheme, where actor nodes cooperate to reach a global estimate under interruptions due to licensed user interference, i.e., consensus. They show that consensus improves reliability compared to local estimation of event features. They further show that convergence rate depends on connectivity of actors. Their analyses are generic and can be applied to inhomogeneous licensed user activity and interference on channels.

[15] In this paper, they investigate three different pricing models, namely, market-equilibrium, competitive, and cooperative pricing models for spectrum trading in a cognitive radio environment. In these pricing models, the primary service providers have different behaviors (i.e., competitive and cooperative behaviors) to achieve different objectives of spectrum trading. Specifically, in market equilibrium pricing model, the objective of spectrum trading is to satisfy spectrum demand from the secondary users, and there is neither competition nor cooperation among primary service providers.

III PROBLEM STATEMENT

The dramatic increase of service quality and channel capacity in wireless networks is severely limited by the scarcity of energy and bandwidth, which are the two fundamental resources for communications. Therefore, researchers are currently focusing their attention on new communications and networking paradigms that can intelligently and efficiently utilize these scarce resources. Cognitive radio (CR) is one critical enabling technology for future communications and networking that can utilize the limited network resources in a more efficient and flexible way [2]. As the demand for additional bandwidth continues to increase, spectrum policy makers and communication technologists are seeking solutions for the apparent spectrum scarcity [7].. Meanwhile, measurement studies have shown that the licensed spectrum is relatively unused across many time and frequency slots. To solve the problem of spectrum scarcity and spectrum underutilization, the use of CR technology is being considered because of its ability to rapidly and autonomously adapt operating parameters to changing requirements and conditions.

IV CONCLUSIONS AND FUTURE WORK

Recent years have witnessed a dramatic increase in the demand for radio spectrum. This is partly due to the increasing interest of the consumers in wireless services which in turn is driving the evolution of the wireless networks toward high-speed data networks. In this paper, we have presented a comprehensive survey of research on employing cognitive radio, We surveyed in detail spectrum sensing approaches as well as routing and MAC layer protocols for the cognitive radio based spectrum and energy sensing.

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Chandra Kumar Kachhwaha received his Bachelor`s degree in Electronics & comunication Engineering, from TIT, Bhopal M.P. in 2013. Currently he is pursuing Master of Technology Degree in Electronics & comunication (Digital communication) from PCST, (RGPV), Bhopal, Madhya Pradesh India. His research area include Wireless sesnor networks.

Mr. **Jitendra Kumar Mishra** he is Associate Professor and Head of the Department of Electronics and Communication Engineering in PCST, Bhopal (RGPV). His received Master of Technology and Bachelor's of engineering respectively in Digital communication from BUIT, Bhopal and from RGPV, Bhopal. He has more than 10 years of teaching experience and publish 25+ papers in International journals, conferences etc. His areas of Interests are Antenna & Wave Propagation, Digital Signal Processing, Wireless Communication, Image Processing etc.