

Spectrum Handoff Decision Schemes and Cognitive Radio Network

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ABSTRACT

Due to the growth and spread of wireless devices in the unlicensed spectrum bands, such as ISM, the bands become more and more crowded and therefore affect the performance of the wireless networks negatively. Thus, the cognitive spectrum access principles are required to utilize the existing spectrum bands more efficiently. There are many advantages of cognitive radio technology but there exists some obstacles like the CRT (Cognitive Radio Technology) is used over a heterogeneous radio spectrum of licensed and unlicensed spectrum bands and as for survey huge work is done in licensed spectrum bands and very small of work done in the amalgamation licensed and unlicensed bands for data transportation.

Keywords: FSA, SPTF, FCC, CRN

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(e.g., service providers, military applications, cellular telephony, service providers, and TV), all of these individual entities own absolute transmissions to their assigned frequency channels. By using this strict approach, the main method of accessing a radio spectrum resource is based on a fixed spectrum allocation method, known as Fixed Spectrum Access (FSA). An expansive report compiled by the (SPTF) Spectrum Policy Task Force [2] and issued by (FCC) The Federal Communication Commission, which conclusively proved the fact that a lot of the assigned (licensed) spectrum underwent quite low utilization efficiency, such as those dedicated to a military applications, analogue cellular telephony or TV, which are not completely utilized. The survey has uncovered temporal(time-related) as well as spatial(geographic) variations in the exploitation of radio spectrum, extending from 16-86% in the bands as low as 3GHz and below, while extending lower than this at high frequencies[3].

II. LITERATURE REVIEW

Dhivya and Murugesh(2017) the research paper entitled "A STUDY ON QUANTITATIVE PARAMETERS OF SPECTRUM HANDOFF IN COGNITIVE RADIONETWORKS" describes the need of dynamic allocation of spectrum band in an efficient manner. The paper outlines the features of Cognitive Radio networks that makes possible for unlicensed users to use licensed spectrum absolutely free with switching from

I. INTRODUCTION

With most of our activities involving some kind of access to network in one way or other, wireless communication has now become extremely important in modern society. This has caused the applications and services, standards, and the total of wireless users, to increase with every passing day, considering that the larger part of the limited available radio spectrum resources have been allocated well and can restrict this growth [1]. Also, finally, the amount of expansion is determined by the existing radio spectrum; the regulatory authorities and government bodies have taken up a stringent procedure/approach toward the distribution and licensing of radio frequency spectrum to disparate organizations

primary user to secondary due to interference engine and enables secondary users to use channel based on availability. The paper also describes the concept of spectrum mobility and its objectives. It is very important to select an effective spectrum handoff strategy for achieving better spectrum mobility.

Preetha and S. Kalaivani (2017) the research paper entitled "A Collaborative Scheme with Power Adaptation-Equalization and Spectrum Handoff for Mobile Cognitive Radio Networks" is about power adaptation equalization and spectrum handoff scheme for cognitive radio networks of mobile based. The paper also describes how to offer better communication services to unlicensed users. The paper outlines the spectrum handoff concept and its objective to offer licensed users better accessibility to channel with minimum delay.

Hernández et al (2017) the research paper entitled "Multivariable Adaptive Handoff Spectral Model for Cognitive Radio Networks" defines multivariable adaptive spectrum handoff model for the cognitive radio networks. The paper describes MAPMFF with four algorithms for decision making with different approaches fuzzy, feedback statistics, predictive and multichannel. The paper also outlines the analysis made between the proposed algorithms.

Mardeni et al (2016) the research paper entitled “Spectrum Handoff Schemes in Cognitive Radio Network Using Particle Swarm Optimization” define spectrum mobility. The paper describes three spectrum handoff strategies that can be used to reduce the handoff delay which are proactive, reactive and hybrid. The paper also describes the implementation of PSO (particle swarm optimization) to minimize the service time of spectrum handoff to the optimal value.

Tiwari and Rastogi (2016) the research paper titled “Spectrum Handoff in Cognitive Radio Network” describes the modern wireless technology and the spectrum band. The paper focus on implementation of cognitive radio networks for resolving problem of spectrum scarcity through dynamic spectrum access. The paper also outlines the importance of cognitive radio technology and the best solution for spectrum inefficiency and spectrum shortage problems. At last the paper clearly demonstrates the spectrum handoff concept.

Hossain and Sarkar (2012) the research paper entitled “Spectrum Management in Cognitive Radio Networks: Modeling and performance Evaluation” describes the cognitive radio networks and its importance in today wireless computing. The paper outlines the challenge of

sharing licensed spectrum with other licensed users without interfering. To address this the paper presents a proactive spectrum management schemes to use unoccupied spectrum with minimum latency.

Yan et al (2010) presents the 4G heterogeneous network with vertical handover decision algorithm. It increases the required QoS performance in wide range applications. This algorithm is categorized into four groups based on the handover decision criterion. These four groups are used to evaluate the complexity of implementation and efficiency.

Daojing et al (2011) proposed an improved handoff algorithm with parameters namely, state of mobile node and network conditions during handoff decision. The experimental results show that the proposed algorithm has reduced the bandwidth utilization, handoff dropping rate and handoff rate.

Yen et al (2013) compares the performance of Mobile IPv6 and Proxy Mobile IPv6 handoff techniques. Mobile IPv6 handoff technique has more packet loss and latency than proxy mobile IPv6 technique. When the handover speed is fast, it requires fast handover mobile Internet Protocol FMIPv6.

III. COMPARATIVE ANALYSIS OF LITERATURE REVIEW

Reference	Title	Technique	Research Findings
Dhivya and Murugesh	A STUDY ON QUANTITATIVE PARAMETERS OF SPECTRUM HANDOFF IN COGNITIVE RADIONETWORKS	CRN	The paper outlines the features of Cognitive Radio networks that makes possible for unlicensed users to use licensed spectrum absolutely free with switching from primary user to secondary due to interference engine and enables secondary users to use channel based on availability
Preetha and S. Kalaivani	A Collaborative Scheme with Power Adaptation-Equalization and Spectrum Handoff for Mobile Cognitive Radio Networks	Spectrum Handoff and CRN	The paper is about power adaptation equalization and spectrum handoff scheme for cognitive radio networks of mobile based
Hernández et al	Multivariable Adaptive Handoff Spectral Model for Cognitive Radio Networks	MAPMFF	Defines multivariable adaptive spectrum handoff model for the cognitive radio networks
Mardeni et al	Spectrum Handoff Schemes in Cognitive Radio Network Using Particle Swarm Optimization	PSO	The paper describes three spectrum handoff strategies that can be used to reduce the handoff delay which are proactive, reactive and hybrid
Tiwari and Rastogi	Spectrum Handoff in Cognitive Radio Network	Wireless Technology	The paper describes the modern wireless technology and the spectrum band

IV. CHALLENGES OF COGNITIVE RADIO TECHNOLOGY

The two main aspects of cognitive radio are:

1. Cognitive capability: Because of the high variation in the available spectrum and
2. The diversity of applications that can be used by CR technology, CR users must be able to:
 - Identify and detect which parts of the spectrum are available at a specific time and location through real time interaction with the surrounding environment (spectrum wideband sensing)

- Choose the appropriate band for transmission (spectrum decision)
- Share access processing with other CR users (spectrum sharing)
- Vacate the spectrum when a primary user appears in the selected band (spectrum mobility)

These network capabilities can be realized by spectrum management functions (see Section 2.9).

Re-configurability: CR users must have the following abilities:

- They must be able to adapt to the modulation scheme in order to improve spectrum access process.
- They must be able to operate on different systems with different protocols in a wideband frequency range supported by its hardware design. Using this capability, the best networks and channels can be selected and then CR users are able to reconfigure themselves to be compatible with the new environment.
- They must be able to frequency agility, which means the ability of the CR user can change its transmission frequency.
- They must be able to control the transmission power, for example, transmitting power control can be used to control the power level dynamically, which reduces the emitted power to allow greater sharing of the spectrum when a higher power level is not necessary.

V. CONCLUSION

The research paper presents the review of spectrum handoff decisions with literature survey. The paper reviews basic fundamentals of Spectrum Handoff Decision Schemes in Cognitive Radio Networks.

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