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REVIEW OF DECENTRALIZED TECHNIQUE IN COGNITIVE RADIO WIRELESS NETWORK

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Abstract: -Cognitive radio network is the promising technology of the next generation communication networks which enables the secondary users (SUs) to use the free spectrum bands which are licensed originally to the primary users (PUs) without causing interference and utilize the spectrum more efficiently. Cognitive radio plays an important role in wireless communication. With increasing demand for wireless communication, the spectrum has become a scare resource. CR is widely regarded as one of the most promising technologies for future wireless communications. The functions of cognitive radios are spectrum sensing, spectrum management, spectrum mobility, spectrum sharing. Cognitive radio network represents an innovative approach to wireless engineering in which radios are designed with an unprecedented level of intelligence and agility. Using complex calculation, cognitive radios can identify potential impairments to communication quality in their environment. We have proposed the throughput maximization of cognitive radio for decentralized users by using wireless Torus network. We evaluate the Torus based compressive data sending protocol which will reduce the delay as compare to mesh network. By using compression technique reduce the number of bits for transmission.

Keywords: Cognitive Radio (CR), Wireless Torus Networks, Bit Error Rate (BER), Delays, Throughput.

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INTRODUCTION

Cognitive radio (CR) is a form of wireless communication in which a transceiver can intelligently detect which communication channels are in use and which are not, and instantly move into vacant channels while avoiding occupied ones. A cognitive radio (CR) is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity. Such a radio automatically detects available channels in wireless spectrum, then accordingly changes its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location. This process is a form of dynamic spectrum management. Cognitive radio is radio in which communication systems are aware of their internal state and environment, such as location and utilization on RF frequency spectrum at that location. Cognitive radio is further defined by many to utilize Software Defined Radio, Adaptive Radio, and other technologies to automatically adjust its behavior or operations to achieve desired objectives. Cognitive Radio is a communication paradigm in which wireless users are classified into two categories based on whether they are licensed to used particular spectrum band (primary users (PUs))or are unlicensed (secondary users (SUs)). Secondary users are allowed to opportunistically use the spectrum as long as they do not cause harmful interference to active primary users. This achievable if PU receiver are far enough from the SU transmitter (spatial channel availability), or no PU receiving while the SU transmitter is transmitting (temporal channel availability). The term cognitive radio is derived from “cognition”. The three major tasks of cognitive radio include.

1] Radio- scene analysis,

2] Channel identification,

3] Dynamic spectrum management and transmit power control.

Cognitive radio (CR) is one of the new long term developments, taking place and radio receiver and radio communication technology. Cognitive radio is adaptive, intelligent radio and radio network which define the set of rules and strategies that regulate the behavior of SU regarding spectrum mobility, technology that can automatically detect available channel in wireless spectrum and change transmission parameter enabling and also improving radio operating behavior. The aim of the Cognitive radio is to use natural resources efficiently including the frequency, time, and transmitted energy. Cognitive radio Technologies can be used in lower priority secondary system that improve spectral efficiency by sensing the environment and then filling the discovered gap of unused licensed spectrum with their own transmission.

1.1 Network Architecture- The basic components of CRNs are mobile station (MS), base station/access point (BSs/APs) and backbone/core networks. These three basic components compose three kinds of network architectures in the CRNs: Infrastructure, Ad-hoc and Mesh architectures, which are introduced as follows.

1.1.1 Infrastructure Architecture - In the Infrastructure architecture, a MS can only access a BS in the one-hop manner. MSs under the transmission range of the same BS shall communicate with each other through the BS. Communications between different cells are routed through backbone/core networks.

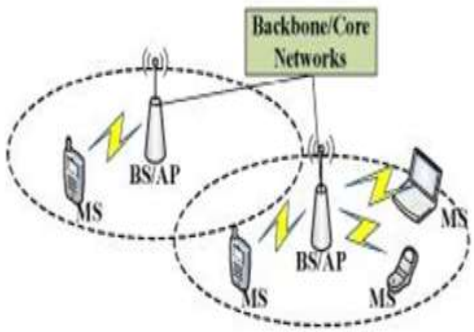

Figure1.

Infrastructure Architecture multiple communication standards/ protocols to fulfill different demands from MSs. A cognitive radio terminal can also access different kinds of communication systems through their BS.

1.1.2 Ad-hoc Architecture-There is no infrastructure support (or defined) in ad-hoc architecture. If an MS recognizes that there are some other MS nearby and are connectable through certain communication standards/protocols, they can set up a link and thus form an ad hoc network. Note that links between nodes may be set up by different communication technology. Two cognitive radio terminals can either communicate with each other by using existing communication protocols .

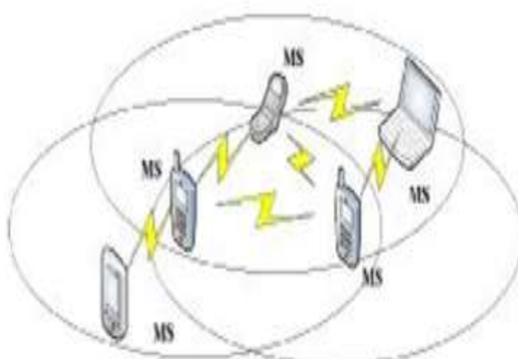

Figure 2. Ad-hoc Architecture

1.1.3 Mesh Architecture- This architecture is a combination of Infrastructure and Ad Hoc architectures by enabling the wireless connections between BSs, which is similar to the Hybrid Wireless Mesh Networks. Some BSs may connect to the wired backbone/core networks and function as gateways. Since BSs can be deployed without necessarily connecting to wire backbone or core networks, it is more flexible and less costly in planning the locations of BS.

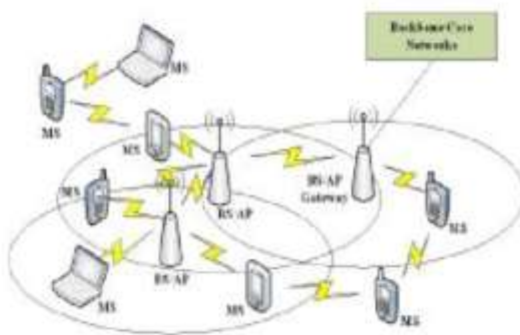

Figure 3.Mesh architecture

2. LITERTURE REVEIW-

The several methods used for evaluate the performance of throughput maximization in cognitive radio networks are described below-

In 2014 Author Amr A. EI-Sherif published the paper with title **"Decentralized Throughput Maximization in Cognitive Radio Wireless Mesh Network" [1].** In this Paper, the author presents a distributed algorithm for scheduling and spectrum allocation with the objective of maximizing the network throughput subject to a delay constraint. In this paper, the throughput and delay performance of the network are characterized using a queuing theoretic analysis and throughput s maximized via the application of Lagrangian Duality theory. Scheduling and spectrum allocation are tasks affecting the performance of cognitive radio wireless network, where heterogeneity in channel availability limits the performance and posses the great challenge on protocol design. In this work, the effect of the wireless interference between the different nodes is modeled based on protocol model i.e simultaneously packet transmission from interfering nodes result in the loss of all involved packets. In this work they focus on allocating channel and time resources to maximize the aggregate utility for all traffic steam in the network.

In 2012, the Author Chakrapani gadde, K.Chandrasekhar and I.Hemalatha**"Throughput Improvement in Wireless Mesh Networks By Integrating With Optical Networks" [2].** In this paper, author proposed One such application is to provide peer-to-peer communication for all the users who are distributed over some area. Since the users are connected in a wireless multi-hop passion complete ubiquity is provided. But as the number of users accessing the network is increasing there could be a chance of experiencing more interference by each user due to the communication link of every other user. So in a wireless mesh network as the load increases the throughput of network is going to be decreased due to wireless interference by other users. To sustain this problem we are going to integrate the WMN with passive optical network (PON). The resulting hybrid network (Optical-wireless network) could reduce the wireless hops of each user, so that they can reduce the total wireless interference experienced by each user resulting in improved network throughput. This paper aims to study the network throughput gain in Optical-wireless network subject to peer-to-peer communications.

In 2009 the Author Hyang-Won Lee, Member, IEEE, Eytan Modiano, Senior Member, IEEE, Long Bao Le, Member, **"Distributed Throughput Maximization in Wireless Networks via Random Power Allocation"[3].** They develop a distributed throughput-optimal power allocation algorithm in wireless networks. The study of this problem has been limited due to the non-convexity of the underlying optimization problems that prohibits an efficient solution even in a centralized setting. By generalizing the randomization framework originally proposed for input queued switches to SINR rate-based interference model, they characterize the throughput-optimality conditions that enable efficient and distributed implementation. Using gossiping algorithm, they develop a distributed power allocation algorithm that satisfies the optimality conditions, thereby achieving (nearly) 100% throughputs. They illustrate the performance of our power allocation solution through numerical simulation. In particular, they focused on distributed implementation of optimal power allocation algorithm.

In 2008 the Author Kaushik R. Chowdhury, Student Member, IEEE, and Ian F. Akyildiz, Fellow, **"Cognitive Wireless Mesh Networks with Dynamic Spectrum Access"[4]**. In this author proposed, promising technologies are integrated in our proposed cognitive mesh Network (COMNET) algorithmic framework, thus realizing and intelligent frequency- shifting self – manged Mesh Network. The contribution of this paper is new approach for spectrum sensing is device without any change to the working of exiting de facto mesh protocols. An analytical model is proposed that allow MRs to estimate the power in given channel and location due to nevering wireless LAN traffic, thus creating a virtual map in space and frequency domain this models are used to formulate the task of channel assignment within the mesh network as an optimization problem, which is the solved in decentralized manner in this paper, explore way in which secondary user equipped with tunable radios may share the primary band, Thus coexisting with the licensed user of that band.

In 2013 Mohammad Siraj and Saleh Alshebeili **"Performance Enhancement in multi Hop Cognitive Radio Mesh Networks"[5].** They proposed cognitive radio technology is an emerging technology which enables the term temporary use of the unused license spectrum without interfacing with the transmission of other users, thereby improving spectrum utilization. The spectrum is dynamically reused by alteration of its power, frequency, modulation and other operating parameters after sensing its radio frequency environment. Interference is the critical issue in Cognitive radio wireless mesh network (CR WMNs) performance. In this work, first an analytical model was developed for linked scheduling in CR WMN considering scheduling constraint. Then a novel scheduling algorithm was proposed and implemented t minimize interference in CR WMNs. Simulation results show effectiveness of our proposed algorithms as the result are very close to the near optimum solution.

In 2007 Author Tao Chen, Honggang Zhang, Gian Mario Maggio, and Imrich Chlamtac **CogMesh: A Cluster-based Cognitive Radio Network"[6].** In This paper, the author provide a Framework to form a CogMesh network in the context of open spectrum sharing scheme. The network is constructed in distributed way and provides coexistence with primary users of the spectrum. The basic unit of the network is the cluster, which is a sub-network formed by a group of neighbor nodes sharing common channel, and coordinated by a selected node in the cluster called cluster head. The network is constructed by interconnecting cluster after they learn each other through neighbor discovery process. This paper provides mechanism for each node to efficiently exchange neighbor information over multiple channels. A distributed topology management algorithm is proposed and its performance under various channel condition is studied. It is the objective of this paper to bring traditional wireless ad hoc networks into the open spectrum sharing scenario. Note that it is a new area where lots of problems remain. For future work, we will develop efficient algorithms for neighbor discovery, channel allocation, and topology management. where lots of problems remain. For future work, we will develop efficient algorithms for neighbor discovery, channel allocation, and topology management.

3. CONCLUSION – As per literature survey, throughput maximization of cognitive radio using mesh network has been already developed. Many algorithms are also used for the maximizing throughput of cognitive radio for decentralized users. We have proposed the throughput maximization of cognitive radio for decentralized users by using wireless Torus network. We will evaluate the Torus based compressive data sending protocol which will reduce the delay as compare to mesh network. By using compression technique reduce the number of bits for transmission. By using these two techniques we will allow the network to communicate at faster rate and also improve the life time of network.

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