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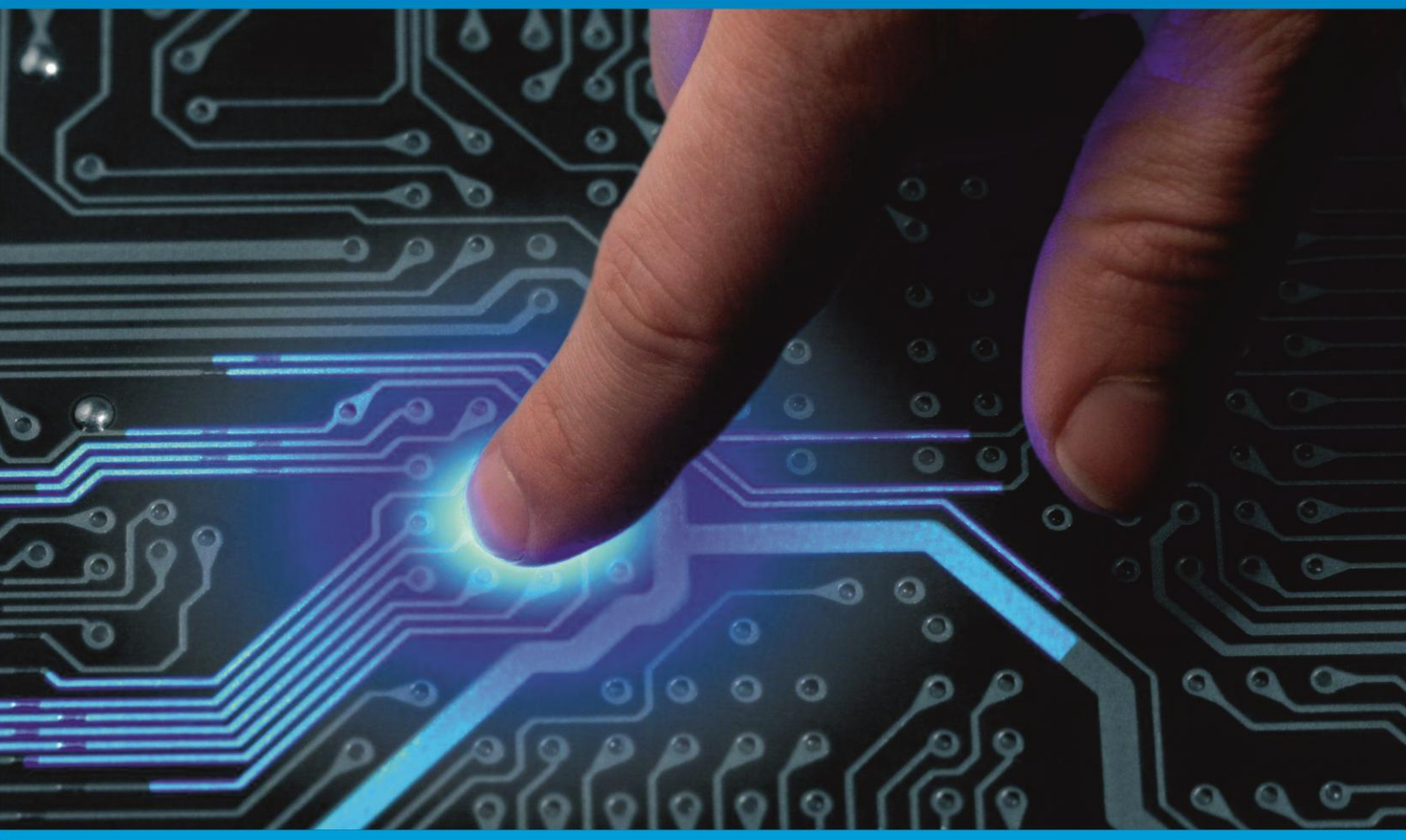

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Channel Allocation Scheme Based On Greedy Algorithm in Cognitive Radio Network

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ABSTRACT: Cognitive radio (CR) concept is a prominent approach used in the wireless communication network for increasing the spectrum efficiency and mutually sharing the spectrum for contemporary networks (unlicensed user). A primary user (PU) uses the licensed band which are utilized but unlicensed band are crowded on spectrum scarcity. CR networks can bear high traffic loads during emergency and major disasters by overcoming the limitation of network capacity. By using cognitive radio it sense the unused spectrum at a specific time and location**.** This paper deals with channel allocation scheme for secondary users (SUs) in CRN based on their priority.In the proposed system, the frequencies (spectrum resources) are allocated efficiently by using Greedy Algorithm. The main advantages of this proposed system are; it allocates spectrum resources with less interference thereby increasing the throughput. The results obtained show that this algorithm makes better utilization of unutilized licensed bands.

KEYWORDS: Primary Users, Secondary Users, Cognitive Radio base station, Cognitive Radio Networks, Throughput, Signal to Noise Ratio, Greedy Algorithm,

I.INTRODUCTION

The key enabling technology of channel allocation is cognitive radio(CR) has emerged as one of the keys that can help addressing the inefficient usage of radio spectrum. It exploits the unlicensed users to dynamically and opportunistically access the “under- utilized” licensed bands. CR was first termed by Joseph Mitola in 1991. Cognitive Radio is a smart radio that has the ability to sense the external environment and make the intelligent decisions to adjust its transmission parameters according to the current state of environment. CR aims to enable the secondary user to autonomously access spectrum holes in the entire spectrum to increase the performance, as long as they do not harmfully interfere with the primary user basically with the time and the location. It includes a transmitter in which operating parameter such as frequency range, modulation type or maximum output power can be altered by software. This is known as “dynamic channel allocation”.

I. RELATED WORK

Cognitive radio networks gained the popularity as they can provide high wireless bandwidth and support quality driven wireless multimedia services. The Quality of Experience (QoE) that directly measures the satisfaction of the end users cannot be easily realized due to the limited spectrum resources. The unstable channels allocated to the multimedia secondary users (SUs) can be re-occupied by the primary users (PUs) at any time, which causes traffic while allocating the channel for secondary users (SUs). The opportunistic spectrum access cognitive radio (CR) is an efficient technology to address this issue. However, the unstable channels allocated to the multimedia secondary users (SUs) can be re-occupied by the primary users (PUs) at any time and it is important to study how to allocate frequency or spectrum resources with less traffic. The data under different primary channels (PCs) are collected by the SUs and delivered to a Cognitive Radio Base Station (CRBS). The CRBS will allocate available channel resources to the SUs based on their priority.

II.PROPOSEDSYSTEM

COGNITIVE RADIO:

Cognitiveradioisapromisingtechnologythatenablestousespectruminthedynamicandopportunistic manner. Itcanbe formally defined as follows: A“cognitive radio”is a smart radio, which has the ability to senset he externalenvironment,learnfromthehistory,andmakeintelligentdecisionstoadjustitstransmissionparameters

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accordingtothecurrentstateoftheenvironment.CognitiveRadioisanintelligentwirelesscommunicationssystem, based on reconfigurable and agile functionality of Software Defined Radio (SDR) with awareness of its environment.Itlearnsfromitsenvironmentaboutspectrumoccupancy,networktrafficandadaptstonewscenarios based on previous experiences.

COGNITIVE RADIO NETWORK ARCHITECTURE:

In addition to spectrum sensing to effective improve spectrum utilization, a cognitive radio in CRN can sense available networks and communication systems around it. A Cognitive Radio Network (CRN) is thus not just another network to interconnect cognitive radios. The CRNs are composed of various kinds of communication systems and networks, and can be viewed as s sort of heterogeneous networks. The heterogeneity exists in wireless access technologies, networks, user terminals, applications, and service providers .The design of cognitive radio network architecture is toward the objective of improving the entire network utilization, rather than just link spectral efficiency. From the users' perspective, the network utilization means that they can always fulfill their demands anytime and anywhere through accessing CRNs. From the operators' perspective, they can provide better services to mobile users, and allocate radio and network resources to deliver more packets per unit bandwidth in a more efficient way.

A. Design considerations:

- By using Greedy Algorithm high efficiency throughput mechanism is achieved, the optimized value is taken based on the priority at each phase.
- Distributed algorithm is used to allocate the active channels to the secondary user.

B. Description of the Proposed Methodology:

In the proposed system, frequency or spectrum resources is allocated to SUs with trafficless model. The opportunistic spectrum access cognitive radio (CR) is a new efficient technology to improve the frequency/spectrum utilization by detecting unoccupied spectrum holes and assigning them to SUs. In this paper, new algorithm is proposed to allocate efficient channel to the secondary users with traffic less mechanism and to reduce the interference between the primary users (PUs) and the secondary users (SUs). Greedy algorithm works in phases. At each phase the optimized value is taken, without regard for future consequences. Using greedy algorithm high efficiency throughput mechanism is achieved. Using greedy algorithm the optimized value is taken based on the priority at each phase. The optimal (efficient) channel allocation for traffic less mechanism is attained using greedy algorithm. The distributed algorithm is used to allocate the active channels to the secondary users from the priority queue and the performance of signal to noise ratio (SNR) is achieved between the number of secondary users and the channel capacity of active secondary users. The novel idea in this paper is to allocate the optimal channel to the secondary users even in the occurrence of interference and thereby increasing the throughput. The throughput for the multimedia applications such as video conference over IJSE

III. SOFTWARE DESCRIPTION

MATLAB

MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language, developed by Math Works. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran. In 2004, MATLAB had around one million users across industry and academia. MATLAB users come from various backgrounds of engineering, science, and economics. MATLAB is widely used in academic and research institutions as well as industrial enterprises.

A. Proposed Algorithms:

1) Greedy Algorithm: A greedy algorithm is an algorithm that follows the problem solving heuristic of making the locally optimal choice at each stage. The choice made by a greedy algorithm may depend on choices made so far but not on future choices or all the solutions to the sub problem. It iteratively makes one greedy choice after another, reducing each given problem into a smaller one. In other words, a greedy algorithm never reconsiders its choices. The choice made by a greedy algorithm may depend on choices made so far but not on future choices or all the solutions to the sub problem. It iteratively makes one greedy choice after another, reducing each given problem into a smaller one. In other words, a greedy algorithm never reconsiders its choices. A simplified packet data model is the greedy source model. It may be useful in analyzing the maximum throughput for best effort traffic (without any quality-of-service guarantees).

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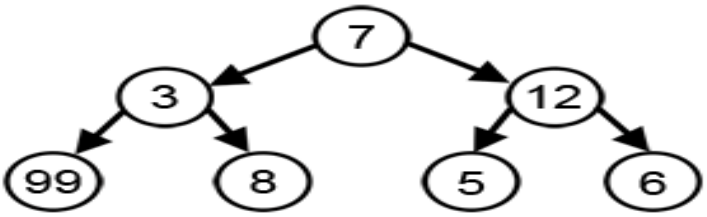
Problems also exhibit the greedy-choice property:
• When we have a choice to make, make the one that looks best right now.
• The choice that seems best at the moment is the one we go with.
• When there is a choice to make, one of the optimal choices is the greedy choice. Therefore, it's always safe to make the Greedy choice.



2) Distributed Algorithm: A distributed algorithm is an algorithm designed to run on computer hardware constructed from interconnected processors. Distributed algorithms are used in many varied application areas of distributed computing, such as telecommunications, scientific computing, distributed information processing, and real-time process control. Standard problems solved by distributed algorithms include leader election, consensus, distributed search, spanning tree generation, mutual exclusion. Distributed algorithms are sub-type of Parallel algorithm, typically executed concurrently, with separate parts of the algorithm being run simultaneously on independent processors, and having limited information about what the other parts of the algorithm are doing. One of the major challenges in developing and implementing distributed algorithms is successfully coordinating the behavior of the independent parts of the algorithm in the face of processor failures and unreliable communications links. The choice of an appropriate distributed algorithm to solve a given problem depends on both the characteristics of the problem, and characteristics of the system the algorithm will run on such as the type and probability of processor or link failures, the kind of inter-process communication that can be performed, and the level of timing synchronization between separate processes. Here the distributed algorithm is used by which the cognitive radio base station will distribute the allocated spectrum resources to the cognitive secondary users which are maintained in the priority queue.

3) Traffic model

We assume that there are two types of radio users: PUs and SUs, and the SUs can be classified as k types of calls. The queue model is shown in Fig 2 below. We have the following assumptions:
• Each SU can use one sub-band for the service.
• PUs always have the priority to use the channels and can occupy any sub-bands used by the SUs.
• The arrivals of type − i($1 \leq i \leq k$) SUs follow the poisson process with the rate of λsi.
• The call holding time of SUs are assumed to follow the exponential distribution with the expectation of 1/usi.
• For example, some are delay-sensitive. Therefore, the stable sub bands should be allocated to delay-sensitive multimedia traffic users. In this paper, we assume that type-1 SUs have the highest priority and type-k SUs have the lowest priority in terms of delay-sensitive applications.

IV. Simulation Results

Parameters taken for simulation :
Primary users: 9;
Secondary users: 18;
Antenna: 9;
User: 3; (PU+SU)
SNRdB = 10% in dB

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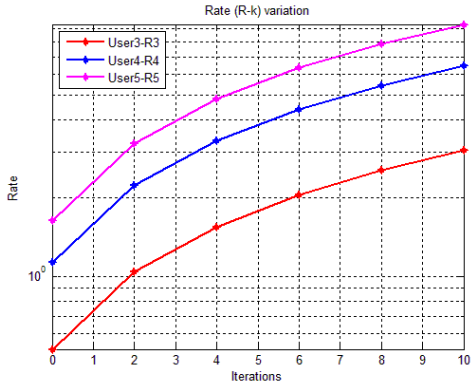

Figure 2: iterations vs Rate with 3 users.

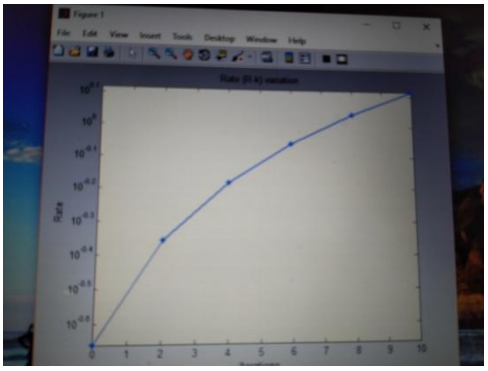

Figure 3: iterations vs Rate with single user

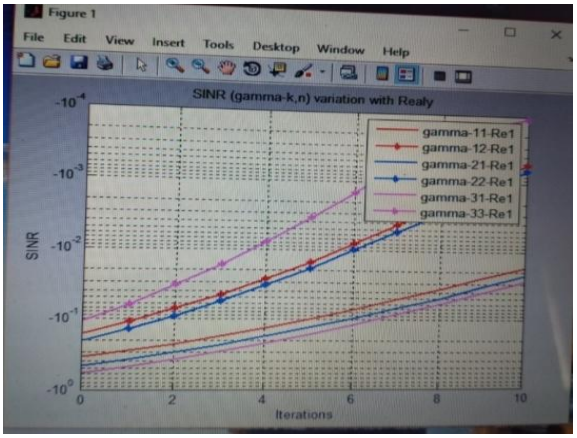

Figure 4: Iterations vs SINR

IV. CONCLUSION AND FUTURE WORK

The optimum path allocation for trafficless mechanism is achieved by using greedy algorithm. The simulation results demonstrate that the channel allocation scheme can significantly improve the performance of the priority based secondary users. Also it increases the throughput and thereby decreasing the interference and delay. The channel allocation scheme had carried out for multimedia transmissions over the cognitive radio network such as video conference using Markov model which improves the efficiency and increases the throughput with less interference. This paper proposed a novel channel allocation scheme for the multimedia transmission over the cognitive radio networks. Using greedy algorithm high efficiency throughput mechanism is achieved. The simulation results demonstrate that the proposed channel allocation scheme can significantly improve the performance of the priority based secondary users (SUs) over the cognitive radio networks (CRNs).

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