Efficient Utilization of Spectrum in
Cognitive Radio Networks

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Abstract:
The main function of the cognitive radio
(CR) is to use spectrum efficiently and accurately. In this paper,
the main aim is to use the spectrum efficiently, which has been
allocated to different organizations or companies by centralizing
the spectrum. This centralization spectrum can also be taken
from the companies which are not utilizing the spectrum
presently.

Key words: cognitive radio, spectrum, centralized
organization, primary user, secondary user.

1. INTRODUCTION

Cognitive radio (CR) is a promising
technology to solve the spectrum scarcity problem
[1]. In CR systems, primary users access their
allocated spectrum band whenever there is
information to be transmitted. In contrast, CR users
(forming cognitive radio networks, abbreviated as
CRN) can only access primary channels after
validating the channel is idle [3]. This refers to the
process of sensing a particular channel and verifying
(with a previously specified probability of error) that
it is not used by a primary user currently. This form
of spectrum sharing [5] is also referred to as
opportunistic spectrum access. To improve the
spectrum efficiency, cognitive radio networks (CR)
has been under active consideration [2]. In CR,
secondary users can use the spectrum when primary
users are absent, hence it could improve the spectrum
utilization [4]. Secondary users must detect the
activities of primary users efficiently since they
should not interfere the primary users. Hence
spectrum sensing is one of key issues in CR.

2. EXISTING SYSTEM

In the existing system the company or
organization will get the required spectrum from the
vender. The company is a primary user of the
spectrum. The allocated spectrum for that company
may be utilized or may not be utilized. If company
could not utilize spectrum properly there will be
wastage in the allocated spectrum. The vendors in the
current system are taking care of allocating spectrum
to the different companies and not monitoring
whether the allocated spectrum is being utilized
properly or not. This is one of the demerits of the
current system so we are focusing on new mechanism
which can overcome the current problem.

3. PROPOSED SYSTEM

In the proposed spectrum we are
maintaining the overall database of the spectrum
usage by the companies by centralizing the unused
spectrum with their permissions. So that the unused
spectrum will be used by the other companies or
organizations. In the proposed system, the main user
of the spectrum is called primary user and which
receives the spectrum from the primary user is called
secondary user. The centralized committee maintains
both databases in centralized organization.
4. IMPLEMENTATION

In the implementation of this cognitive (intelligent) usage of the spectrum in cognitive radios we mainly focus on the following three entities

i. Centralization(Database)

ii. Primary User

iii. Secondary User

Now a days, we are familiar with cognitive radio network which is one of the wireless technologies which is undergrowth, and some of the major companies o the organizations are using this radio. But here there is wastage of spectrum in some companies, and at the same time there is need for excess spectrum for some other company. So to overcome this situation we are focusing on this mechanism.

In this the companies will take spectrum from the vendors. If there is any wastage of spectrum found then immediately they will keep the unused spectrum in centralized organization, and this data will be maintained by a committee this centralized spectrum can be used by any company which is in need of excess spectrum. Once the unused spectrum is kept in centralized company anybody who is in need of spectrum can take at any instance of time by getting permission from the primary user.

4.1 Centralization

Centralization of spectrum is the process of taking spectrum which is unused in the companies with their permission, to provide it to the users which are in the need of spectrum. This centralization of spectrum is maintained by the third parity and this third parity company will maintain all the information regarding the usage of spectrum of all the companies in daily, monthly and yearly on analytical basis.
Here, the company(X) maintains the information of its unused frequency range in the centralized organization. It will be able to give this unused frequency to any other company (Z) which is able to receive more frequency for their company usage. In this case, the company(X) is called primary user because it will be able to give its own frequency to another company (Z). And the company (Z) is called secondary user because it receives or borrows the frequency from the primary user or company(X).

### Analysis of Different Companies databases maintained by Centralized Manager

i. For Company X:

<table>
<thead>
<tr>
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v. For Company N:
vi. Database Maintained by the Centralized Manager to Allocate Spectrum from Primary to Secondary User.

Let us consider an example for this spectrum allocation is that, there are five companies like X, A, Y, N and Z and these five companies will take the spectrum from the vendor. These companies will take the approximate spectrum from the vendor, because they do not know the utilization of spectrum in the continuous days. There could be need for spectrum and at the same time there might be the chances for wastage of spectrum. Consider companies X and A are using more spectrum than the other companies,

i. Primary users
   ii. Secondary user

Primary User: The users or the companies which are using spectrum that is directly taken from the vendors is called Primary user. These users will buy the spectrum from the vendor and if there is any wastage in that particular spectrum, they will directly keep that in the Centralized spectrum to let others use and to reduce the wastage of spectrum.

Secondary Users: The users who use the spectrum which is kept in the centralized spectrum are called secondary users. The secondary users may also become primary users to the vendor only by giving the spectrum which is kept in the centralized area.

5. CONCLUSION

In this paper, we are going to analyze how the unused spectrum used efficiently by keeping the entire spectrum in centralized management. The centralized manager will take care about the companies which are in the organization and allocate the spectrum efficiently without wastage.

7. REFERENCES