METHODOLOGY AND THE APPROACH

The purpose of the research is to discover answers to problem of using limited bandwidth efficiently with the help of software supported system. The nature of this research is *analytical in nature* in which we have to use facts or information already available, and analyze these to make a critical evaluation of the domain and propose an innovative idea. Our research is *applied* one as its aim is to identify a solution for practical problem of bandwidth availability that will be useful for society.

Our research domain belongs to both *quantitative* and *qualitative* both. It is *quantitative* research because it aims to support any number of cognitive users to use the holes in the spectrum. It is *quantitative* research too, because its objective is to provide the primary users of the spectrum an uninterrupted and secured service even their bandwidth is shared by secondary users.

We have used *quantitative approach* as it involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. Moreover, in the sub domain we have used *experimental* as it is characterized by much greater control over the research environment and in this case some variables are manipulated to observe their effect on other variables.

To prove the validity of our work, *simulation* approach is also used because we have constructed an artificial environment within which relevant information and data can be generated.

According to a statistical analysis, the spectrum utilization by the licensed users is as very low. Thus, the licensed spectrum is seen to be a panacea for spectrum scarcity, thereby enabling coexistence of unlicensed users with the licensed ones. This motivates the cognitive radio technology which allows unlicensed users, known as secondary users (SUs), to utilize the licensed spectrum opportunistically. The cognitive radio senses the environment and allocates the idle bands, not used by the licensed users, to the SUs thereby increasing spectral efficiency. Opportunistic spectrum usage is discussed in the context of spectrum sharing. The idle bands, also referred to as *white spaces or holes*, is a set of frequencies which are assigned to the primary users (PUs) but are not utilized during a given time duration. In this scenario, SUs can utilize these white spaces for transmissions while also mitigating interference to the PUs.
Basic components of *Opportunistic Spectrum Access* (OSA) include spectrum opportunity identification, spectrum opportunity exploitation, and regulatory policy. The opportunity identification module is responsible for accurately identifying and intelligently tracking idle frequency bands that are dynamic in both time and space. The opportunity exploitation module takes input from the opportunity identification module and decides whether and how a transmission should take place. The regulatory policy defines the basic etiquette for secondary users to ensure compatibility with legacy systems. The overall design objective of OSA is to provide sufficient benefit to secondary users while protecting spectrum licensees from interference. The tension between the secondary users’ desire for performance and the primary users’ need for protection dictates the interaction across opportunity identification, opportunity exploitation, and regulatory policy. The optimal design of OSA thus calls for a cross-layer approach that integrates signal processing and networking with regulatory policy making.

Base stations and mobile devices have limited radio frequency spectrum through which they may communicate. Moreover, this spectrum is usually owned by a party having proprietary control. As stated in the invention that, in order to allow for spectrum sharing, cognitive base stations are configured to select a radio frequency channel owned by another entity for its own use, and to determine how much additional noise it will create for such other entity. Based on this determination, the additional noise will be monetized, so that spectrum owners are compensated for the additional noise created by use of their radio frequency channel.

**STUDY PLAN**

The study will be divided into three parts. The first part of the study would deal with the theoretical discussion on cognitive radio, its growth and present status in the domain of communication technology. The second part contains various techniques being used for dynamic channel selection and their comparison. The third part contains details discussion of the proposed model and its comparative analysis with existing models and techniques. As a whole, the study would be dealt in following different modules:

- Theoretical discussion on cognitive radio
- Growth of cognitive radio and its present status in the domain of communication technology.
- Applications of cognitive radio.
- The main functionalities required for channel management in CR scenarios.
- Various techniques being used for dynamic channel selection.
- The comparative study and the limitation of these techniques.
- The details discussion of the proposed model and its analytical study.
- Comparison of proposed model with existing models and techniques.
- Summary of the findings, conclusions, limitations, and scope for further extension of the study.
- Bibliography.