

**IMPLEMENTATION OF TWO-WAY AF RELAY CRN AND ITS PERFORMANCE
EVALUATION USING OUTAGE PROBABILITY**

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Abstract-In study of orthogonal-frequency division-multiplexing to examine cognitive two-way relays network with imperfect spectrum sensing, we propose a joint resource allocation algorithm to increase total transmission rate of secondary users (SUs) under maximal transmit power constraints and interference temperature constraints. To answer this joint optimization problem, we implement the discrete searching approach, Lagrange dual decomposition method, and the Hungarian algorithm to obtain the subcarrier pairing matrix, best optimal power allocation and relay selection matrix. By the study of system performance and comparing the algorithm with perfect spectrum sensing the advantage of this algorithm with imperfect spectrum sensing is proved. The results also show the algorithm can protect primary user (PU) while SUs and relays opportunistically enter the spectrum occupied by PU. BER Performance analysis by using Outage Probability.

In this study, in an cognitive two-way AF relay network based on OFDM to increase total transmission rate of the secondary system under the imperfect spectrum sensing a joint RA algorithm is proposed where time-division half-duplex relays are taken to assist exchange of message between SUs.

KEYWORDS: Cognitive Radio Network, Two Way Amplify Forward relay, OFDM, Power Allocation, Relay Selection, Outage Probability.

I. INTRODUCTION

For ten years there is a rapid development in wireless communication. In telecommunication engineering the wireless communications have grown into the biggest sectors in 21st century. For the growth of business and marketing from 1990's to 21st century it is the most promising technology which has been evolved. The most attractive feature in wireless communications is mobility and portability. The user can also carry and handle the devices easily these features also have attracted the users. As every user cannot use this wireless technology however many of the residents were being able to access when Bell Laboratories have introduced cellular concept in 1960's and 1970's. In wireless communication day by day the demand for high data rates, Internet accessing and high reliability are tremendously increased along with the voice communication for the multimedia exchange. 3G technology has been introduced as the demand of high-speed

data and voice transmissions. Internet accessing and high reliability was increased by investing huge amount where it supports the data rate upto 2Mbps for transmitting burst data. To meet the requirements like transmission of high-quality multimedia like HD videos or audios and like online shopping it needs to satisfy 100Mbps to 1 Gbps bit rates, a new technology in wireless environment like broad band wireless communications have to be adopted.

In recent years, 5G communications and CRN with RA as a important technique has attracted a lot of attention. 4G and 5G communications are used as they have the advantage of lower interference from orthogonal subcarriers (or channels), higher utilization of spectrum and uses orthogonal frequency-division-multiplexing (OFDM) modulation. The scenarios of multicarrier communication from OFDM technique is applied to cognitive relay networks which resulted in the growth of high data rate wireless communications and the radio spectrum is becoming overcrowded and scarce. The use of spectrum as efficiently as possible is very important under these circumstances. Cognitive radio (CR) is a technique that allows the radio spectrum to be utilized efficiently by two classes of users with two levels of priority: primary and secondary users. In CR networks, the radio spectrum is used by the secondary users by using one of the following strategies: interweave, underlay and overlay. Resource allocation (RA) techniques for wireless communications face not only sustainable developments but also significant challenges with the rapid increase in number of wireless users and various devices. The efficient use radio spectrum resources is one of the difficult challenge. Cognitive radio (CR) technology has the ability to efficiently improve the spectrum utilization. In CR networks (CRNs), there are three spectrum sharing models: interweave, underlay, overlay and hybrid. In the process of development of CRN's, to achieve better performance, power allocation technology plays an important role.

From the viewpoint of information theory to survive with fading and time-varying characteristic of the wireless channels the view of relay networks is presented. By the several standards of classification, relay networks frequently have various kinds of classification: amplify-and-forward (AF) and decode-and-forward (DF) relay networks based on the various forward protocols, one-way and two-way relay networks depending on the various duplex modes, two hop and multi-hop relay networks by depending on the number of hops, and single relay networks and multi-relay networks