

PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

Edited by

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Chapter 35

SPECTRUM SENSING FOR COGNITIVE RADIOS

IZYAN MUNYANTI ABU HANIFAH, SITI NATRAH CHE RUS, SIGIT PUSPITO WIGATI
JAROT

35.0 INTRODUCTION

This chapter discusses about cognitive radio and the spectrum sensing techniques which is one of the most important issue in cognitive radio. This chapter is organized into two parts: the first part is about the cognitive radio in general, about the definition and the challenges of cognitive radio, and the second part is about spectrum sensing in cognitive radio, including the techniques and the challenges.

According to the dictionary, the word “cognitive” is relating with the word cognition which means the mental action or process of acquiring knowledge through thought, experience and the sense. From the idea of cognition, most of the open literatures define the cognitive radio as a transceiver that has the ability to detect the segment of the spectrum or the communication channel whether it is in use or not, and to instantly move into the vacant channel without interfering with the transmissions of other users especially the licensed user. Nokia Research Center defined the cognitive radios are devices that aware of the surrounding and bandwidth availability and able to tune the spectrum usage based on the location, nearby radios, time of the day and other factors[1]. We can conclude that the main objectives of the cognitive radio are:(i) to facilitate efficient utilization of the radio spectrum in a fair-minded way and, (ii) to provide highly reliable communication for all users of the network. The Federal Communications Commission (FCC) has suggested [2] that any radio having adaptive spectrum awareness should be referred to as “Cognitive Radio”. More details about what have been stated by the FCC is

“A cognitive radio (CR) is a radio that can change its transmitter parameters based on interaction with the environment in which it operates. The majority of cognitive radios will probably be SDRs (Software Defined Radios), but neither having software nor being field programmable are requirements of a cognitive radio.”[2]. Cognitive radios can be categorized into two types; full cognitive radio and spectrum sensing cognitive radio. Full cognitive radio (a.k.a Mitola radio, taken from the name of J. Mitola III the first research that coined this term in 1999) takes into account all parameters where a network or wireless node can be aware of. For the second type, that known as spectrum sensing is use to determine which portion of spectrum that is available and can detects the presence of the licensed users.