1.1 Preface

The concept of cognitive radio was first proposed by Joseph Mitola III in a seminar at KTH (the Royal Institute of Technology in Stockholm) in 1998 and published in an article by Mitola and Gerald Q. Maguire, Jr. in 1999[1]. The idea for cognitive radio has come out of the need to utilize the radio spectrum more efficiently, and to be able to maintain the most efficient form of communication for the prevailing conditions.

Cognitive radio is widely expected to be the next Big Bang in wireless communications. Spectrum sensing, that is, detecting the presence of the primary users in a licensed spectrum, is a fundamental problem for cognitive. Spectrum sensing is the ability to measure, sense and be aware of the parameters related to the radio channel characteristics such as; the availability of spectrum and transmit power, interference and noise, radio's operating environment, user requirements and applications, available networks (infrastructures) and nodes, local policies and other operating restrictions. It is done across Frequency, Time, Geographical Space, Code and Phase.

Spectrum sensing is the very task upon which the entire operation of cognitive radio rests. To allow reliable operation of cognitive radios, the spectrum holes must be precisely detected at the link level (that is certain frequency bands are not used for transmission at certain times), which gives spectrum sensing a critical role[2].The unlicensed users called the secondary users (SUs) need to continuously monitor the activities of the licensed users, also called Primary Users (PUs), to find the spectrum holes (SHs), which is

defined as the spectrum bands that can be used by the SUs without interfering with the PUs. This procedure is called spectrum sensing.

To determine the presence or absence of the PU transmission, different spectrum sensing techniques have been used, such as matched filtering detection, energy detection, and cyclo stationary feature detection [3]. There is also a new technique known as eigenvalue detection it's based on eigenvalue and covariance methods.

1.2 Problem Statement

Spectrum limitation is a growing problem due to the growing number of spectrum uses in all fields.

1.3 Proposal Solution

Cognitive radio spectrum sensing technique is used to solve the problem of Spectrum utilization by using different methods such as Energy Detection, Matched filter Detection.

1.4 Objectives

The objective of this thesis is to;

- Study the cognitive radio network accurately.
- Compare the different spectrum sensing techniques.

1.5 Methodology

Comparing two techniques of spectrum sensing algorithms Energy Detections and Matched filter. MATLAB will be used to simulate cognitive radio system of different spectrum sensing algorithms and indicate how

cognitive radio will exploit holes dynamically to increase spectrum utilization and efficiency for each one.

1.6 Thesis Outlines

This thesis consists of five chapters;

Chapter 2: Cognitive radio network overview and an introduction to spectrum sensing techniques.

Chapter 3: Explains in details energy detection, Matched filter detection algorithms.

Chapter 4: Shows the simulation results and discussion.

Chapter 5: Provides the Conclusion and recommendation.