Chapter 9
Sensing and Performance Issues with Reconfigurable Wireless Transceiver

Amrit Mukherjee  
K. L. University, India

Sagaika Sahoo  
KIIT University, India

Amlan Datta  
KIIT University, India

ABSTRACT

With the wide applications of wireless communication, it becomes an important factor to keep the pace of the spectrum usage for all the new applications. To improve efficiently the spectrum usage in variety of applications, where the primary users are not active all the time, we can introduce the secondary users to exploit the radio frequency spectrum by not creating any interference to the Primary Users (PU). Unlike the pre-assigned spectrum allocation policy that has been adopted by various wireless technologies, in Cognitive Radio (CR), the whole spectrum is divided into many bands and corresponding channels where spectrum holes exist. The main challenge is thus to sense these holes and accommodate the secondary unlicensed users. In this chapter, proposing the Quantized data fusion sensing which is one of the type of cooperative sensing scheme used for unused spectrum sensing and acknowledgement to secondary signals. Simulation results with error rates are improved by the activity of PU and have been presented.

INTRODUCTION

The massive increase in Spectrum Access along with enhancing Spectrum efficiency along with the launching of Software Defined transceivers. Also the realization of dynamic machine learning is approached, with which, the transceivers will have the capability to create new areas and possibilities for wireless radio/communication researchers.
This chapter aims to investigate the software defined radios’ next version cognitive radio, the reconfigurable wireless transceiver and also an adaptive transceiver concepts from different other perspectives (T. Yucek & H. Arslan, 2009). CR and cognitive radio networks (CRN) are studied and analyzed with respect to wireless communication system for its enhancement and simultaneously giving an extra importance on efficient use of spectrum (R.W. Broderson, et al., 2004).

Challenges

Various challenges that are linked with the issues of spectrum sensing for cognitive transceiver system are discussed in the later sections.

REQUIREMENTS FOR HARDWARE

High sampling rate is required for cognitive transceiver spectrum sensing applications, multiple analog front-end circuitry, high resolution of Analog to Digital Converters having large and dynamic range, and fast signal processors. Calculating the interference temperature or noise variance over intended narrowband (NB) transmission signals is an old development. Such calculation of noise variance techniques was accepted for different optimal receiver designs such as soft generation of information, channel estimation, also for the case of improved hand-off, channel allocation techniques and power control. For receivers being tuned to receive/collection the signals those are transmitted over desired bandwidth the noise or interference estimation issue has become easier for these purposes. In addition, receivers are able to process the narrowband (baseband) signals with sensibly low complexity and processors consuming less power. Still, terminals are required in cognitive transceivers while processing transmission for an outspread spectrum band to sense any other opportunity for unlicensed users.

Problem of Hidden Primary User

The problem related to the Hidden primary user in Cognitive transceivers is almost similar as like hidden node problem which mainly occurs in Carrier Sense Multiple Accessing (CSMA). These issues are caused because of many factors like shadowing or excessive multipath fading which occurs by Secondary Users (SU) observation when it’s scanning the primary users’ transmissions. As per the given figure shows below, hidden node problem is illustrated. Here, the unwanted interference is caused by the CR device to the PU (receiver section) as the transmitted signal of primary user will remain undetected due to device positioning in space (J. Mitola, 2000; I. F. Akyildiz, B. F. Lo & R. Balakrishnan, pp. 40-62, 2010).

Figure 1 shows the CR transceiver system having one primary band where two licensed primary users are communicating and the secondary or cognitive users are accessing the same band but in the absence of their signals.

Spread Spectrum Primary Users

The different PU’s use different techniques of signaling ex. Frequency hoping or sometimes spread spectrum. In these cases, the primary user signal power is spreaded over a vast spreaded frequency ranges although using a narrower bandwidth for actual information for transmission (J. Unnikrishnan & V. V.
Related Content

An Enhanced DV-Hop Localization Algorithm for Wireless Sensor Networks

Factors Affecting WiFi Use Intention: The Context of Cyprus
[www.igi-global.com/chapter/factors-affecting-wifi-use-intention/58867?camid=4v1a](www.igi-global.com/chapter/factors-affecting-wifi-use-intention/58867?camid=4v1a)

QoS-Aware Green Communication Strategies for Optimal Utilization of Resources in 5G Networks
[www.igi-global.com/chapter/qos-aware-green-communication-strategies-for-optimal-utilization-of-resources-in-5g-networks/219145?camid=4v1a](www.igi-global.com/chapter/qos-aware-green-communication-strategies-for-optimal-utilization-of-resources-in-5g-networks/219145?camid=4v1a)

QoS-Constrained Resource Allocation Scheduling for LTE Network
[www.igi-global.com/article/qos-constrained-resource-allocation-scheduling-for-lte-network/125815?camid=4v1a](www.igi-global.com/article/qos-constrained-resource-allocation-scheduling-for-lte-network/125815?camid=4v1a)