Power Optimization in MIMO Cognitive Radio Data Transmission

[1]Priyanka Shahare, [2]Dipti Theng

Department of Computer Science & Engineering, G. H.Raisoni College of Engineering, Nagpur, India
Email : [1]priyanka.shahare12@gmail.com, [2]dipti.theng@raisoni.net

Abstract: The Spectrum sensing technique is the technique which optimize the sensing threshold, sensing time, and transmit power of a multi-input multi-output (MIMO) Cognitive Radio system for maximization of the opportunistic system throughput under transmit power, probability of false alarm, and probability of missed detection constraints. The transmission protocol allows the CR user to simultaneously perform data transmission and spectrum sensing on different spatial sub channels. Since finding the global optimal solution of these problems entails a very high complexity, the development of two iterative algorithms are based on the concept of alternating optimization and solve only convex sub problems in each iteration. Hence the Simulation will show the developed algorithms closely approach the global optimal performance and achieve performance gains compared to baseline schemes employing equal powers or equal sensing times in all sub channels.

Key Words: Efficient Spectrum sensing, throughput maximization, MIMO, multi-band systems.

I. INTRODUCTION

Cognitive radio (CR) [3] can be recognize as a promising technology to overcome the optimization problem by allowing the frequency bands licensed to primary users (PUs) to be opportunistically used by (unlicensed) secondary users while the PUs are idle. In the Cognitive Radio Networks [1] the secondary users can simultaneously sense the spectrum to detecting the presence of primary users. The Cognitive Radio is describing as the software (radio) which can able to change its parameter which will depend on the requirements of the user and need of the user. To ensure that the PUs are sufficiently protected against interference from the secondary users [13], CRs must periodically perform spectrum sensing. However, due to effects such as fading and shadowing as well as the hidden terminal problem, the PU signal [7] at the CR receiver may be very weak. Since the PU signal characteristics are often going to unknown in practice, energy detection is a preferred spectrum sensing technique.

The sensing time [12] will optimize for maximization of the opportunistic throughput of a single- band CR system under a probability of missed detection constraint. The multi-band [10] CR systems will consider and the sensing times and transmit powers are optimize for maximization of the throughput under the assumption that the sensing times in all frequency bands are identical. In this technique (spectrum sensing tech) [13] the different frequency bands are allow to employ different sensing times and the optimization will perform for energy constrained CR systems. The joint optimization [9] of the sensing time and the sensing threshold will also consider.

A.MIMO CR Network:

The PU has needs to giving out a dedicated part of channel access time to the Secondary Units for transmitting the secondary data [4] in exchange for the Secondary Units' cooperation, which limits the performance of both Primary Units and Secondary Units. In other case, Multiple Input Multiple Output [12] (MIMO) enables transmission of multiple independent data streams and change of interference by beam-forming in the spatial domain over MIMO antenna elements to provide significant performance gains. a. Primary Network:

The Primary Network consists of primary nodes. The primary network [11] can be accessed by cognitive radio network which is base station to the licensed band and with the several access technologies the cognitive radio users require the adaptive MAC protocol [6] which is enable the roaming over multiple primary network.

b. Secondary Network:

Secondary user [9] must be connected to more neighbors, and the equipment degree of the secondary network becomes a function of the primary node density.

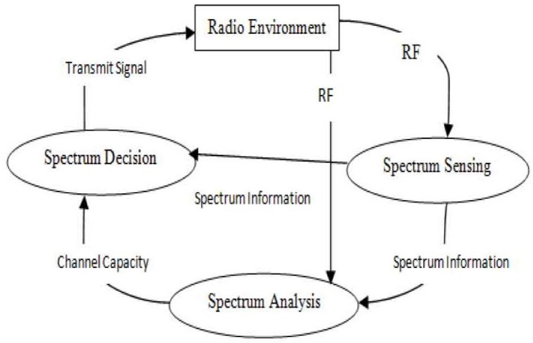
II. RELATED WORK

The multi-antenna [2] based spectrum sensing methods for cognitive radios (CRs) using the generalized likelihood ratio test (GLRT) are paradigm [13]. The primary user signals to be detected will either occupy a subspace of dimension strictly smaller than the dimension of the observation space, or have a non-white spatial spectrum. The study of the problem of designing the optimal sensing time and power allocation [1] strategy, in order to maximize the ergodic throughput of a cognitive radio that employs simultaneous multiband detection and Operates under two different schemes, namely the wideband sensing- based spectrum sharing (WSSS) and the wideband opportunistic spectrum access (WOSA)scheme[16].

In the [3] the spectrum sensing techniques are required in order to avoid interference to the primary users of the spectrum. Whereas the spectrum sensing considers impairment by additive white Gaussian noise (AWGN) theorem only [3].This technique provides the solution for the spectrum sensing problem for multiple cognitive terminals (CTs) that takes into account the difference among CTs with respect to the probabilities of a false detection and a missed detection. This will optimize the spectrum-sensing performance by differentiating the number of spectrum-sensing operations that each CT performs [8]. The addresses of Each secondary user carries out wideband spectrum sensing to get a test statistic for each channel and transmits the test statistic to a coordinator. After collecting all the test statistics from secondary users, the coordinator makes the estimation as to whether primary users are idle or not in the channels [12].

B. Spectrum Sensing:

In this[6] If it is the ability to measure, it can sense and it can be aware of the parameters which is related to the radio channels characteristics , which is the availability of the spectrum and the transmit power. A spectrum-sensing [6] and transmission of data scheme which utilizes multiple-input and multiple output (MIMO) technology to enable the spectrum to be sensed and data to be transmitted simultaneously.



The different functionalities required for spectrum management in CR networks is –

a. Spectrum sensing: A cognitive radio user can allocate only an unused portion of the spectrum. Therefore, a cognitive radio [4] user should monitor the available spectrum bands, capture their information, and then detect spectrum holes.

b. Spectrum decision: Based on the spectrum availability, cognitive radio users can allocate a channel. This allocation not only depends on spectrum availability [3], but is also determined based on internal (and possibly external) policies.

c. Spectrum sharing: Because there may be [2] multiple cognitive radio users trying to access the spectrum, cognitive radio network access should be coordinated to prevent multiple users colliding in overlapping portions of the spectrum.

d. Spectrum mobility: Cognitive radio users are regarded as visitors to the spectrum. Hence, if the specific portion of the spectrum in use is required by a primary user [5], the communication must be continued in another vacant portion of the spectrum. The proposed approach is the simultaneous CR data transmission and spectrum sensing to systems comprising multiple CR MIMO transmitters, multiple CR MIMO receivers, and multiple primary units.

III. CONCLUSION

This will formulate non-convex problems for optimization of the transmit powers, sensing times, and sensing thresholds in single-band and multi-band systems.

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