ABSTRACT

In wireless communications, available spectrum is limited due to fixed spectrum assignment policy and the inefficiency in the spectrum usage necessitated for the technology called *Cognitive Radio* (CR). A CR automatically detects available channels in wireless spectrum and adapts its transmission or reception parameters dynamically according to the change in environment. *Spectrum sensing* is the foremost requirement of a cognitive radio that involves detecting unused portions or holes in a spectrum.

Several methods have been proposed in literature on how to sense the radio environment to detect the presence of licensed user efficiently. Basically the detection is done either with prior information about the signal being sensed in the spectrum (normal sensing) or without any prior information (blind sensing). The likelihood of a signal being present in an AWGN channel is determined probabilistically on the basis of three performance parameters, viz. the *Probability of Detection* (P_d), the *Probability of Misdetection* (P_m) and *Probability of False Alarm* (P_{fa}).

The objective is to assist a MAC policy depending on the accuracy of spectrum sensing which can be achieved through a collaborative manner. The collaborative decision making helps solve the problems of multi path fading and shadowing faced by individual CRs. In the collaborative decision making, every node in the secondary network performs its own local sensing and forwards the result to a leader through a predefined control channel. The leader finally combines the data from the individual nodes to decide on the presence or absence of a primary node. The goal of this work is to tune the performance parameters for optimized detection decision such that in each case the probability of detection is maximized with minimum probability of false alarm for feeble signals (with low SNR value).

The selection of the leader is a difficult problem which has not yet been addressed convincingly in literature. Hence a solution to this problem has been proposed which selects leader in a distributed manner administered by a MAC based policy. An enhancement has been done on the current RTS CTS policy in CSMA/CA such that a leader is selected among the CRs with minimum message complexity.

Collaborative decision has been found to gives better result in terms of performance than individual decision on presence of a primary node. Leader selection for taking the collaborative decision has also been done optimally.