



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

In cognitive radio, the transmitter behavior adapts according to the information about the surroundings in which it operates, thereby enhancing the spectrum utilization. Based on the available information, the spectrum-monitor decides the transmission strategies for the cognitive/secondary users (SUs)- whether to interweave, underlay, or overlay the SU signal. To improve the performance of the system multiantenna and cooperation strategies are introduced. Due to the size limitations of the devices the antennas separations may become very small which causes spatial correlation among signals. In this thesis, the performance of interweave- and underlay-paradigm based cognitive radio networks (CRNs) is analyzed under spatially correlated channels or noise. Firstly, an interweave paradigm based CRN is considered with multiantenna at SU receiver (SR) under spatially correlated noise. By exploiting the known spatial correlation information, two detectors- weighted cross-correlation absolute value detector and weighted energy detector- are proposed. The analytical expressions for decision threshold, probability of detection and false-alarm are derived. Secondly, an underlay paradigm based CRN is considered where interfering channels from secondary transmitter (ST) to licensed/primary receiver (PR) are spatially correlated. The performance of the system is analyzed with prewhitened interfering signals using outdated channel information at ST. The analytical expressions for the outage probability and the channel capacity are derived. Thirdly, the performance of a dual-hop relay-assisted cooperative underlay CRN is analyzed considering composite fading and shadowing channel model. In this scenario, the analysis is performed for single antenna users at both primary- and secondary-side. Further, this work is extended for multiantenna SR with spatially correlated channels. The analytical expressions for the outage probability and the ergodic capacity are derived for both the cases. All analytical results reported in this thesis are validated by Monte-Carlo simulations.