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Chapter 6

Conclusion and Future Scope

6.1 Conclusion

This dissertation analyses the detection capabilities of CSS and proposes a de-centralized co-operative spectrum sensing technique employs the clustering strategy, with each cluster employing a customized two-stage hard-decision strategies. De-centralized co-operative spectrum sensing using clustering strategy is examined for its detection rate in the environment of AWGN, Rayleigh, Rician, and TWDP fading channels. In this research, localized sensing is accomplished by conventional energy based detection method. For conventional centralized-CSS we utilize hard fusion decision strategies like the AND decision and the OR decision schemes. We derived the modified hard decision schemes such as OR__OR, OR__AND, AND__OR, and AND__AND for the proposed D—CSS approach from the conventional centralized CSS model. The outcomes of the completed research are laid out in the subsequent paragraphs.

The chances of missed detection at a different SNR values is evaluated for the proposed D_CSS approach with clustering strategy and compared it with conventional centralized-CSS model without employing clustering strategy. To accomplish this scenario, we simulated the result and get different ROC graphs for the different number of SUs. The results of these simulations reveal that the OR AND decision logic achieves the lowest P_{md} values when compared with the various decision logics presented in the ROC graph. Additionally, we can generalize throughout all simulated graphs that increasing the number of secondary-users produces a superior result in terms of missed-detection probability. Also, the association among both P_{md} and P_d is inversely related to one another, therefore attaining the least missed-detection probability will result in improved detector performance.

From the ROC graphs of the P_{fa} versus P_d over TWDP fading for the number of SUs are 100. Based on the results, the recommended AND_AND decision, AND_OR decision, OR_AND logic, and OR_OR logic all have detection probabilities of 0.50, 0.51, 0.56, and 0.58, respectively, with a false-alarm probability of 0.1. The detection result value for centralized-CSS using OR logic is 0.49 when the P_{fa} value is 0.1. As

a result, it can be seen that the detection values are enhanced by the proposed de-centralized-CSS methodology compared to the centralized-CSS strategy while the P_{fa} value is 0.1. From the overall observations the detection-probability is improved by the proposed OR_OR logic approach compared to other decision approaches. The Comparative ROC graph of SNR versus P_d over TWDP fading channel shows that the minimum SNR requires achieving the P_d is 0.8 as compared to Rician channel.The performance comparisons analyzed between conventional hard-fusion strategies using AND as well as OR decision criteria over Rayleigh scenario, C-CSS methodology over TWDP faded scenario with suggested four decision methods using D_CSS using clustering approach under the influences of two-waves with diffuse-power scenario. The proposed D_CSS using clustering technique reduces the likelihood of false detection regarding the existence or availability of PU. The suggested method with AND_AND logic over TWDP fading enhances detection efficiency by up to 30% for SNR values between -20dB and -17dB as compared to the wei-bull fading scenario. According to our findings for different values of T and Δ for TWDP fading scenario, secondary users can save 25% of the energy needed to meet the minimum SNR required for detection-probability.

6.2 Future Scope

Future research can be guided by a number of suggestions and possible lines of enquiry that would expand the current body of work. Possible future directions for this work are briefly described below.

- Further work should investigate how the positions of CRs affect the detection performance of the proposed approach.
- In this work, we have not considered the height of the SUs and PU for the proposed approach. Actually in a practical scenario users may be available inside the building on the specific floor.
- Do further research into how well energy-based spectrum sensing works in the presence of composite fading, also known as multipath and shadowing.
- In furthermore, for a complete assessment on the effectiveness of methods for spectrum sensing, various diversity schemes, such as Maximal Ratio Combining (MRC), Equal Gain Combining (EGC), and so on, should be taken into consideration.