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Title: Smart Spectrum Sharing And Sensing In Cognitive Radio Network

Abstract: Cognitive Radio Networks (CRNs) have emerged as a powerful solution to the growing problem of spectrum scarcity in wireless communications. These networks allow unlicensed users (secondary users) to opportunistically access the underutilized spectrum bands without interfering with licensed users (primary users). This paper explores the integration of intelligent spectrum sensing and dynamic spectrum sharing mechanisms to enhance the overall efficiency and reliability of CRNs.

Spectrum sensing is a fundamental task in CRNs, enabling the detection of idle channels. Traditional sensing methods like energy detection or matched filtering often face challenges in noisy or dynamic environments. To overcome these limitations, we propose the use of machine learning-based sensing techniques, such as supervised and reinforcement learning models, which can adapt to the radio environment and improve the accuracy of detection.

Simulation results demonstrate that the intelligent spectrum sensing and sharing approach significantly improves key performance metrics such as throughput, spectrum utilization, and interference management. Compared to static or rule-based systems, our smart CRN model offers greater flexibility and efficiency, especially in dense and heterogeneous environments.

It enables more efficient use of the spectrum, ensures coexistence with primary users, and lays the foundation for future wireless technologies such as 5G, IoT, and beyond.

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