**A SURVEY OF HANDOVER METHODOLOGIES IN COGNITIVE RADIOS FOR 5G NETWORKS**

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**ABSTRACT**

The development of 5G networks introduces considerable challenges in achieving seamless connectivity, especially in dynamic settings that utilize cognitive radios. Handover methods are vital for ensuring continuous communication. This survey offers an extensive overview of handover strategies in cognitive radios for 5G networks, emphasizing essential methodologies, performance metrics, and emerging trends. The study compiles insights from recent research articles to describe the current advancements and highlight areas for potential future research. The development of 5G networks introduces considerable challenges in achieving seamless connectivity, especially in dynamic settings that utilize cognitive radios. Handover methods are vital for ensuring continuous communication. This survey offers an extensive overview of handover strategies in cognitive radios for 5G networks, emphasizing essential methodologies, performance metrics, and emerging trends. The study compiles insights from recent research articles to describe the current advancements and highlight areas for potential future research.

Keywords: Handover, Cognitive Radios, 5G, Methodologies, Network

**INTRODUCTION**

With the exponential growth in wireless communication, 5G networks have emerged as a transformative technology. Cognitive radios offer a promising solution to enhance spectrum utilization and dynamic access. However, handover management remains a fundamental challenge due to frequent mobility and dynamic spectrum allocation. This paper aims to survey handover methodologies, emphasizing their significance in maintaining Quality of Service (QoS) and spectrum efficiency.

**LITERATURE REVIEW**

**Handover in 5G Networks**

Elsayed et al. (2022) provide an in-depth analysis of vehicle communication handovers in 5G, discussing various challenges and solutions in dynamic environments. The survey highlights how handover decisions are impacted by user mobility, signal quality, and network congestion.

**Spectrum Sensing Techniques**

Jayachandran et al. (2022) explore cooperative spectrum sensing techniques, which enhance decision-making accuracy in cognitive radio networks. Their work presents robust frameworks that mitigate spectrum sensing errors and improve handover performance.

**Cognitive Radio for 5G Waveforms**

Ramamoorthy et al. (2022) analyse the integration of cognitive radios with LTE and 5G waveforms. The study underscores the importance of waveform compatibility in achieving seamless handovers and maximizing throughput.

**Heterogeneous Networks**

Maheswari (2023) reviews handover mechanisms in heterogeneous wireless networks, highlighting the role of multi-layer decision-making algorithms in optimizing network selection and resource allocation.

**Handover Decision Algorithms**

Goh et al. (2023) propose a handover decision-making algorithm for 5G heterogeneous networks, demonstrating improvements in handover latency and network stability.

**Machine Learning-Based Optimization**

Alraih et al. (2025) present a machine learning-based self-optimization handover technique for beyond 5G networks. Their approach leverages predictive models to optimize handover decisions and enhance network efficiency.

**METHODOLOGY**

This survey systematically reviews recent literature, categorizing handover methodologies into signal-based, mobility-based, and machine-learning-based approaches. Performance metrics such as handover latency, packet loss, and spectrum efficiency are analyzed to evaluate each method's effectiveness.

**DISCUSSION**

The analysis reveals that machine learning-based techniques offer significant improvements in adaptive handover decision-making. However, challenges related to computational complexity, data availability, and model accuracy remain. Additionally, the integration of cognitive radios with heterogeneous networks requires further exploration to enhance interoperability and network performance.

**CONCLUSION**

Handover methodologies in cognitive radios for 5G networks are critical for ensuring seamless connectivity and optimizing spectrum utilization. This survey highlights the evolution of handover techniques, emphasizing the role of machine learning and heterogeneous network integration. Future research should focus on developing lightweight, adaptive algorithms that balance performance and computational efficiency.

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