Evaluation of Range, Bandwidth, and Energy Efficiency for Integrated Sensing and Communication of UAV Based on DroneKit and NS-3

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***Abstract*—This study analyzes the performance of a UAV-based environmental monitoring system that integrates Integrated Sensing and Communication (ISAC) with 5G simulation. The framework uses DroneKit to generate flight trajectories and NS-3 to simulate network behavior, enabling evaluation of how communication performance changes with distance and bandwidth. The results indicate that as the distance between the UAV and the base station increases from 50 meters to 500 meters, latency rises from 11 milliseconds to 48 milliseconds, throughput decreases from 18 Mbps to 3 Mbps, and the packet delivery ratio drops from 99% to around 85–87%. The simulation results confirm the feasibility of integrating UAV-ISAC for real-time environmental sensing, thereby supporting the study's findings. Additionally, the results highlight essential trade-offs between distance, bandwidth, and energy efficiency. The proposed framework offers practical insights for optimizing multi-UAV coordination, enhancing communication reliability, and effective resource allocation in next-generation environmental monitoring systems.**

***Keyword*—**UAV, Environmental Monitoring, Integrated Sensing and Communication (ISAC), Simulation.

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