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# ANALYSIS AND DESIGN OF A DISTRIBUTED SPACE COMMUNICATION NETWORK: INTEGRATING SATELLITES, DRONES, AND GROUND STATIONS FOR SCIENTIFIC DATA TRANSMISSION

**Abstract**

This research focuses on the analysis and design of a distributed space communication network that integrates satellites (SAT), drones, and ground stations to enable efficient and reliable transmission of scientific data. The proposed system is designed to support missions in remote or inaccessible areas, where traditional communication infrastructure is unavailable. The network architecture employs satellites as the primary data relays, drones as mobile ground stations, and fixed ground stations for final data processing and distribution.

The design emphasizes robustness, scalability, and real-time performance. Satellites equipped with high-bandwidth transceivers collect scientific data from space-based instruments, while drones act as mobile intermediaries, establishing communication links with both satellites and ground stations. The system incorporates adaptive modulation and error correction techniques to ensure data integrity, even in challenging environments. A key application of this network is in disaster response scenarios, where rapid deployment of communication infrastructure is critical for coordinating relief efforts and transmitting vital scientific data, such as environmental monitoring or damage assessment.

This work contributes to the development of next-generation communication systems for space and terrestrial applications, offering a flexible and scalable solution for scientific missions and emergency response operations. The analysis and design phase lays the foundation for future implementation and testing, with the potential to revolutionize communication capabilities in remote and critical scenarios.