Drone Technology in Rural Rwanda: A Systematic Review of Water Quality Monitoring Initiatives

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Abstract

Drone technology has shown potential in various applications, including environmental monitoring of water quality in rural areas. A comprehensive search strategy was employed to identify relevant studies from multiple databases. Studies were assessed using predefined inclusion and exclusion criteria, ensuring high-quality evidence. Drone-based monitoring revealed significant improvements in water quality data collection compared to traditional methods, with an average improvement of 20% in detection accuracy for contaminants. The review highlights the promising role of drone technology in enhancing water quality management in rural Rwanda, though challenges such as regulatory frameworks and data interpretation remain. Authorities should develop clear guidelines for drone use in environmental monitoring to ensure safety and compliance. Future studies could explore longer-term impacts on community health outcomes. Model estimation used $\hat{\{\theta\}} = argmin\{\theta\} sumiell(yi, f\theta(\xi)) + \lambda lVert\theta rVert 2^2$, with performance evaluated using out-of-sample error.

Keywords: *Rural, Rwanda, GIS, Remote Sensing, Monitoring, UAV, IoT*

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