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OPTIMIZATION OF CUBESAT-BASED HEAT MAPPING SYSTEM FOR EARLY DETECTION OF FOREST FIRE

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ABSTRACT

Wildfires are an increasingly frequent ecological and social disaster due to climate change and human activities. Major fires like the one that recently hit Los Angeles demonstrate the importance of rapid and accurate early detection to save lives, mitigate environmental damage, and protect infrastructure. Existing conventional satellite imaging systems still suffer from limitations in terms of spatial resolution, recapture duration, and high operational costs. In this study, a high-resolution thermal imaging-based CubeSat system was developed specifically for local heat mapping and real-time monitoring of wildfires. Furthermore, five detection models were tested using public datasets to identify the best performing detection model. This research includes the design of real-time data collection using Cubesats equipped with the best-performing models for detecting forest fires and heat anomalies to support disaster response, sustainable resource management, and environmental conservation. This innovation not only improves the accuracy of early detection of forest fires and heat anomalies but also enables efficient monitoring of geological resources. By supporting rapid decision-making in disaster mitigation and sustainable resource management, this system is an environmentally-oriented solution that strengthens resilience to future ecological crises.

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