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Raspberry Pi Imaging System for UAV Wildfire Monitoring

Wildfires are becoming more frequent and more damaging, which creates a strong need for better ways to measure vegetation fuel biomass. Current methods use satellite data, such as Landsat, to study vegetation conditions. However, satellite images often have low spatial resolution and long time gaps between data collections, which makes them less useful for small areas or fast-changing environments.

This project presents a UAV-based method using a DJI Matrice 600 equipped with thermal and multispectral sensors to collect high-resolution vegetation data. The goal is to use vegetation indices to study plant health and estimate fuel conditions related to wildfire risk. The system uses a Raspberry Pi 4 and an RTK GPS to geotag images in real time during flight, which improves location accuracy and creates more reliable datasets. The system was designed to collect synchronized sensor data and produce consistent imagery for analysis.

The results show that UAV sensing can provide much more detailed and timely data than traditional satellite methods. Real-time geotagging with RTK improves the spatial accuracy of the collected images, which strengthens the quality of the final dataset. Compared to existing approaches, this method offers better spatial detail, more flexible data collection, and stronger potential for wildfire monitoring and environmental research.