

## Customizable UAV Data Acquisition System with Advanced Capabilities

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**Introduction/Objective:** This project develops a quadrotor drone equipped with a multi-camera system to study sagebrush ecosystems before and after fire events. The goal is to capture geotagged images using *FLIR Vue Pro*, *MicaSense Altum PT*, and *Sony Alpha 6000* cameras, providing insights into fire impacts and ecosystem recovery.

**System Overview:** The system integrates *CubePilot Orange* + autopilot for flight control, *Sik Radios* for telemetry, and the *Emlid Reach M2* GNSS for precise georeferencing. A sliding mechanism switches between cameras: *FLIR Vue Pro* (thermal), *MicaSense Altum PT* (multispectral), and *Sony Alpha 6000* (RGB). Cameras are triggered via PWM signals (*FLIR* and *MicaSense*) and *Air Commander V2* (*Sony*).

**System Features:** The system features a flexible camera sliding mechanism, real-time geotagging with *Emlid M2 GPS*, and mission planning through *QGroundControl (QGC)* software. Future enhancements include a feedback system to monitor camera triggering, Wi-Fi enabled autopilot configuration changes, and optimized flight paths for better image quality.

**Open-Source Software:** The *CubePilot* autopilot system and *QGC* software are open-source, offering flexibility and customization for future upgrades, new hardware integrations, and improved functionality without proprietary constraints.

**Benefits of Multi-Camera Imaging:** Combining RGB, thermal, and multispectral images provides a comprehensive view of the sagebrush ecosystem. RGB imaging assesses plant health, thermal imaging evaluates fire intensity, and multispectral imaging quantifies vegetation stress and recovery.

**Conclusion/Impact:** This drone system will capture valuable data to study fire impacts on sagebrush ecosystems, aiding in conservation and restoration efforts by providing detailed, georeferenced imagery.