INTRODUCTION

The distributions of temperatures at and near the earth’s surface influence exchanges of momentum and energy. Analyses of these exchanges are often limited by the spatial and temporal resolution of thermal imagery. The Environmental Fluid Dynamics Lab has commissioned a data collection suite to interface with a Lynxmotion HQuad500 UAV. The system:
- Provides frequent, high-resolution imagery
- Allows researchers to plan flights (select an area)
- Provides access to structured, georeferenced data

SOFTWARE IMPLEMENTATION

A web-based user interface allows researchers to select an area of interest. Software, written in Python, stores sensor readings in a consistent, accessible format.

HARDWARE IMPLEMENTATION

The hardware is designed to interface directly with the Lynxmotion HQuad500 UAV. It adds about 250 g—without the gimbal—for a total mass around 1,450 g.

OUTCOMES AND TESTS

The UAV is able to collect all relevant metrics. The results are stored in a text file that can be parsed by researchers.

The hardware reduces flight time by approximately 20% relative to the unencumbered UAV.

The GPS accuracy was evaluated at locations with known coordinates. The thermal camera was evaluated by comparing images to thermocouple measurements.

LIMITATIONS AND FUTURE DIRECTION

Several aspects of the system can be improved.
- Use of the gimbal, which was not possible with the current weight distribution
- Use of more advanced thermal camera (FLIR Lepton 3.5)
- Use of more advanced GPS technology to reduce error
- Correction of temperatures with emissivity

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