2023

The Improvements and Advantages of Hybrid UAS Systems in the Detection of Metals and Other Anthropogenic Objects

Sean Notley
Binghamton University--SUNY

The Classification and Sensing of Abandoned Oil Wells

Sean Notley
Summer Scholars and Artists Program, Binghamton University, Binghamton NY 13902

Introduction

- Oil well decommissioning began in the 50s
- Estimated 40,000 abandoned wells in New York
- Past projects have proven that aerial magnetometry (remote sensing) is highly efficient
- Current drone technology limits flights to be no longer than 30 minutes (LiPo battery restriction)

Methods

- Compare Lithium-Ion Battery drone data set with hybrid drone data set
- DJI Matrice 600 with extended batteries, high end commercial drone used for sensing
- THEA 140 Pro Hybrid drone, first hybrid drone in US used in commercial applications
- Acquire magnetometry data set, surveying ~ one acre
- Compare timings as well as inconsistencies in data sets

Image Set 1

Image Set 1: Examples of the abandoned fracking industry that exist nationwide,
The two wells up top are highly polluting

Aerial Data

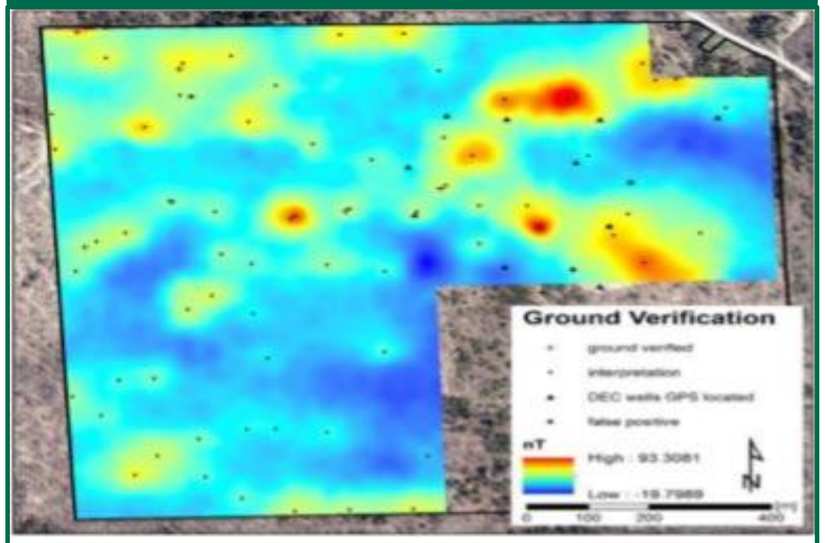

Figure 1: Image of the 72 anomalies detected by the Matrice 600 survey indicated by the black dots

Image Set 2

Image Set 2: The FOXTECH Thea 140 pro hybrid UAV, nicknamed 'Lemmy'
The large plastic object in the middle is the fuel tank,
The top right picture shows the generator off

Skills Developed during program

- Increased technical knowledge of SUAV's
- Testing for and Receiving FAA Drone Pilots License
- Establishing method for Hybrid drone in commercial use
- Practicing safe method of take-off and landing of Uavs
- Gained knowledge on fail-safe systems and how to use them to projects advantage
- Learned permitting process for Data collection at university and beyond
- Further connections made for graduate pursuits

Discussion

- Lithium-Ion drone had to be docked 6 times over the course of 4 hours to obtain data set
- Lot more opportunities for human failure
- Clean dataset, no interference with drone flying at height of 40m
- Hybrid drone found to be able to fly for 3 hrs
- 'Pit-stops' for refueling hybrid drone can be as short as 2 minutes, fewer points for human failure
- Possible interference in magnetometry coming from generator attached to drone

A special thanks to Binghamton Professors Tim DeSmet and Alex Nikulin