

DRONE ENABLED SENSING AND MONITORING OF TREE CANOPIES

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Abstract

This project was proposed to Northern Illinois University, College of Engineering and Engineering Technology by The Morton Arboretum. The objective was to design and create a device to mount and retrieve a sensor arrays in tree canopies. These sensor arrays will be used to give the arboretum a better understanding of the environment of the canopies. The device that was created is to be attached to and manipulated by the DJI Matrice 600 Pro drone. The device utilizes multiple systems that are interchangeable onto the drone to deploy and retrieve the sensor arrays from tree canopies.

Introduction

Objectives:

1. Conceptualize and design a device to satisfy the specifications and constraints.
 - Universal Sensor Mount (USM): Provide a mounting surface for a sensor array and passively clamp to tree branches.
 - Delivery System (DS): Suspend from drone and manipulate USM clamps.
 - Retrieval System (RS): Suspend from drone and connect to USM.
 - Control System: Interface between drone operator and DS/RS.
2. Manufacture and test prototype.

Methods and Materials

USM: Uses torsion springs to clamp onto tree branches. The many holes can be used to attach various sensors and devices.

DS: Utilizes two servos to operate the clamping arms and secure the USM during flight and deployment.

RS: Secures to the USM's spike and allows the drone to remove the USM from the branch.

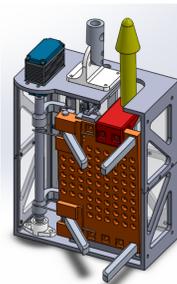


Figure 1: DS and USM

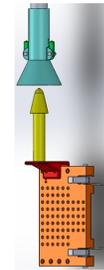


Figure 2: USM and RS

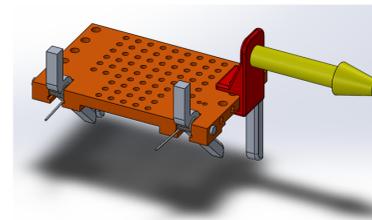


Figure 3: USM

Results

USM: The clamping mechanism was successful in keeping the USM attached to the branches

DS: The code that controls the servos works and the signals output by the drone will control the servos

RS: Testing showed that the RS does secure to the USM and is able to remove the USM from the tree branch

Discussion

Future: Remanufacture sensor platform from aluminum.

Issues: Verify specs of components if possible.

Successes: Redesign of DS enclosure to accommodate new servo motor.

Mistakes: Ensure wire connectors are appropriate for application before use.

Conclusions

A prototype was designed and developed to satisfy the objectives set forth by The Morton Arboretum. Further testing is required to confirm or deny the functionality of this novel device. Specifically, whether a drone operator will be able to deliver and retrieve the USM into a tree canopy.

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