Student Government Project

Environmental Study Using Aerial Technology

LEVEL: Comparable to Master's Degree project for high school students grades 9-12.

Brief list of a few of the universities receptive to these types of advanced projects:

- **California Institute of Technology**
- **Massachusetts Institute of Technology**
- **CSU Long Beach**
- **Stanford**
- **Harvard**
- **UC Berkeley**
- **Columbia**
- **USC**
- **UC Irvine**
- **Cal Poly Pomona**

Aerial photography with Near Infrared (NIR) equipped UAV's (Unmanned Aerial Vehicle) is the most practical method of determining the health of plants, topographical information, etc., because UAV's are the preferred method for "dull, dirty, and dangerous" tasks[1]. One example of what Captain Brian P. Tice of the US Air Force considers as a dull task is robotic farming. Such a task can take up to several days, and UAV's can complete the job in minutes, replacing the human payload with a small flying vehicle powered by batteries.

FOR THE STUDENTS

To help students gain an advantage and prepare in the hi-tech age, PVNet has developed this exciting one of a kind college level project in collaboration with the city of RPV public works director, Michael Throne, Director of the City of Rancho Palos Verdes Public Works Department.

High school students will work after school and on weekends over the course of approximately three months beginning in February 2016. The project has been tentatively divided into four phases as follows:

Phase 1. UAV Systems Operation and Flight skills
Phase 2. Characterization of NIR Technology
Phase 3. Data Collection

[1] https://web.archive.org/web/20090724015052/http://www.airpower.maxwell.af.mil:80/airchronicles/apj/apj91/spr91/4spr91.htm

Phase 4. Data Analysis
Phase 5. Final Report and Presentation

Phase 1.

Students will have the opportunity as a group to build, operate, and deploy a specially equipped UAV. Familiarity with remote sensing equipment is important for any kind of scientific related studies which depend on an aerial view.

Phase 2.

Students will learn the science behind near infrared technology. According to Donald A. burns, in his "Handbook of Near-Infrared Analysis"[2], near infrared technology "is widely used to quantify the composition of agricultural products because it meets the criteria of being accurate, reliable, rapid, non-destructive, and inexpensive". Hailed as an emerging technology, the use of UAV's in open space analysis is critical to the future of farming and sustainability.

Phase 3.

Students will utilize what they have learned in Phases 1 & 2 to collect data. The UAV will be utilized to fly over a section of trees and vegetation identified by the Director of Public works, City of Rancho Palos Verdes.

Phase 4.

Process the NIR raw imagery using interpretive software. Meet with an arboriculturist who "is a professional in the practice of arboriculture, which is the cultivation, management, and study of individual trees, shrubs, vines, and other perennial woody plants"[3].

Determine the condition of primarily the trees and assess the value and relevance of the study.

Phase 5.

Deliver the results in a report to the public works director and discuss the overall project benefits and develop a best practices document for this process. Deliver the final document and data. Receive a certificate of completion from the President of PVNet and a letter of participation from the Director of Public Works, City of Rancho Palos Verdes.

Please make a note: Space is extremely limited.

[2] Handbook of Near-infrared Analysis, Third edition
[3] https://en.wikipedia.org/wiki/Arborist#Scope_of_work