Beehive Health Monitoring System

Masaki Ogikubo(EECS) Hengen Zhou(EECS) Jacob Carl Dickinson(CSE) Jossue Medina-Ramos(CSE)
Professor Quoc-Viet Dang
Department of Electrical Engineering and Computer Science

Background

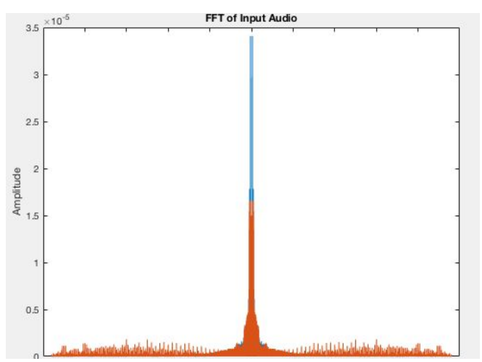
The American economy is heavily dependent on agriculture. California in particular is the number one agricultural producer in the United States. Bees alone are responsible for pollinating one-third of the plants the human population consumes. Recently this arrangement has been threatened by colony collapse disorder, causing commercial hives to lose large swathes of their population.

In this project, we aim to aid farmers with a UAV capable of autonomously measuring the general health of commercial hives, allowing for completely modular arrangements of the hives, while simultaneously dispensing of the manual labor needed to evaluate each hive one by one, in turn saving vast amounts of time and money, and helping honeybees achieve healthy population levels.

Project Goal

The goal for this project is to design a beehive monitoring system by analyzing the sound frequencies emitted by the beehives using DSP principles. An autonomous drone will fly from beehive to beehive using image recognition to identify them. The sound samples will be processed and the results sent to a main computer.

Diagrams of Process



Timeline

FALL
Week 1-5: Basic Image Recognition Training
Week 6-10 : Manual + Full Autonomous Flight

WINTER
Week 1-5: Image Recognition Integration
Week 6-8: Full System Testing

Current Progress

- Developed machine learning application that successfully performs object detection
- Illustrated the FFT spectrum for audio samples
- Visited beehives at Cal Poly Pomona under supervision of professor Mark Haag to get sound samples
- Actively consulting with Pomona professors Mark Haag, Melody Wallace, and UCCE beekeeper Karine Pouliquen

Future Work

- Finish assembling drone components.
- Test functionalities of the drone.
- Run the machine learning object detection application on board.
- Apply FFT and signal filter to establish the spectrum for the acoustic recording.

Team Structure

Masaki Ogikubo Hengen Zhou	• DSP Board setup • FFT algorithm • Noise cancellation and filter implementation
Jacob Carl Dickinson Jossue Medina-Ramos	• Autonomous Flight • Image Recognition • Wireless Communications

UCI Samueli School of Engineering | Department of Electrical Engineering and Computer Science