

# IR Camera Project

## **Purpose of the project:**

This project's final goal is to implement an IR light camera to monitor the interior of the beehive without the need to open the hive. This is important as in numerous circumstances (for example, during winter), the beekeepers cannot open the hive to check on the bees' behavior. Thus, it is common for beekeepers to open the hive in spring only to find that all bees are dead. With the help of this project, the beekeepers will have access to the interior of the hives during those times and perform the corresponding action to save the bees from dying. Furthermore, the videos and images captured by this project can also be provided as visual data for other bee researchers. While there are already observation hives with extensive data-collection tools installed, this project benefits from its accessibility by making the deploying steps extremely easy. This project aims to make a camera module that can be easily set up by people without prior knowledge in engineering.

## **How does it work:**

The whole module will come with a camera for capturing photos, a raspberry pi for handling algorithms and picture uploading, and an IR light. These will all be enclosed in the top casing of the beehive, from where the IR camera will be able to take pictures and track the movements of bees. This will provide vital visual data to the other teams (such as the bee-tagging and weight scale teams) in order to visually confirm their data. Moreover, beekeepers will be able to fit this casing to the underside of the lid of the casing and it will remain suspended over the hive.

## **What is involved:**

- **Hardware:** Camera module on a protoboard, connection to the raspberry pi, 3d-printed cases, support on the beehive
- **Software:** set up a repository for image storage, an algorithm for auto-capturing videos/audio

## **Where the resources are stored:**

- Raspberry Pi, Protoboard: usually placed on the Wagglenet workbench
- (However, our protoboard is currently lost and we might need to remake one in the future. Po-Jen and Charles have the circuit schematic of the protoboard, it might be helpful if we eventually cannot find the protoboard)
- All the Python codes are stored in the Raspberry Pi. In order to have access to it, one just needs to connect the Pi to a monitor, a keyboard, and a mouse then the Pi will function as a Linux Computer, and all the files are stored on a repository on the desktop.

- 3-D printed parts: stored on the workbench, too. The current versions of .stl files are stored on Discord. If needed, Po-Jen has the original Fusion 360 project, and one can ask for access from him so they can make modifications to the parts and print it out later.

### **Abandoned ideas:**

What we tried to implement for collecting data was to use a fish lens because it has a wider angle of vision. However, since the fish lens we can have access to is installed with IR filters, which are hard to remove, so we eventually gave this thought up.

Fish lens, have IR filters but is hard to remove. Tried to use that because it has wider angles

### **Skills for beginners:**

- Soldering
- Wiring
- Python programming for Raspberry Pi
- Terminal Command Lines in Linux
- Basic logic circuits knowledge
- CADing for 3D printing through Fusion 360