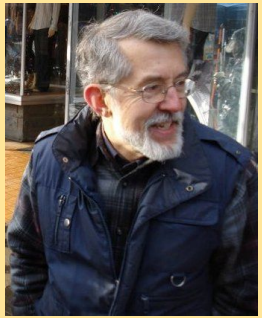
The Bee Project

Advisors:
Prof. Richard Martin & Dr. Richard Howard



Meet The Team

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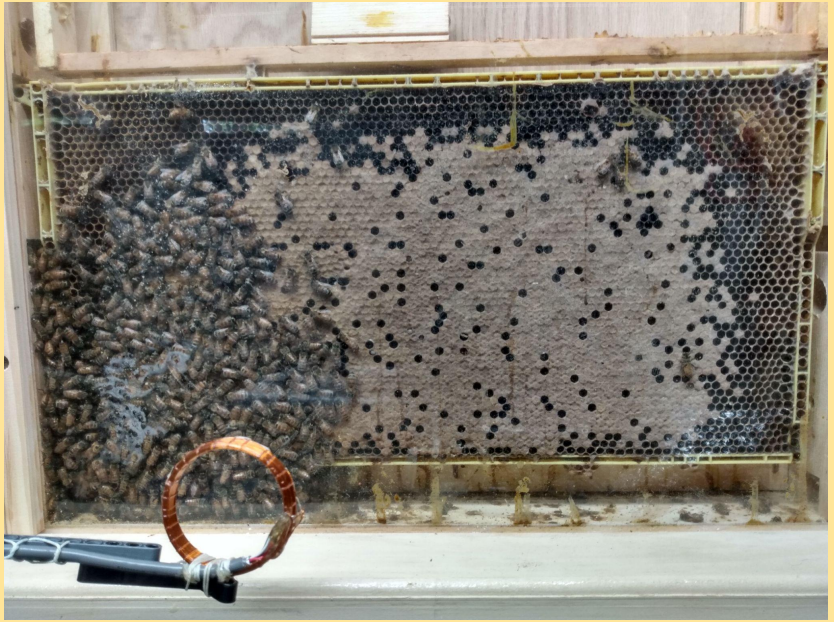
Motivation

- Nowadays there is a lot of radio frequency (RF) pollution due to electronics
- Determine possible biological impacts of RF on bees
- Specifically bees, as they account for about a third of our crops on Earth

Our Experimental Setup

- Indoor observation bee hive
- Electromagnetic coil as stimulus

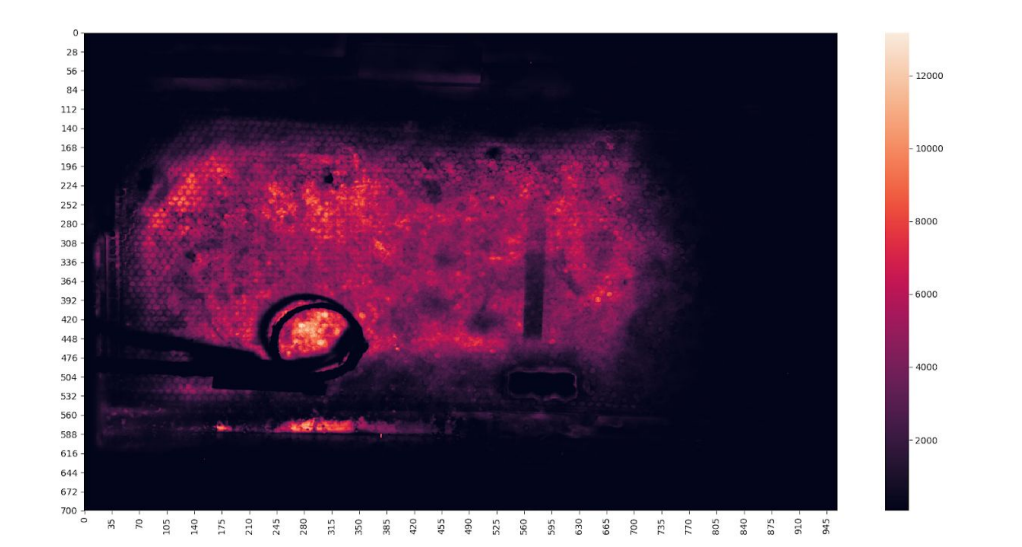


Objective:

Use computers and cameras to determine if honeybees can detect magnetic field and how they react to it

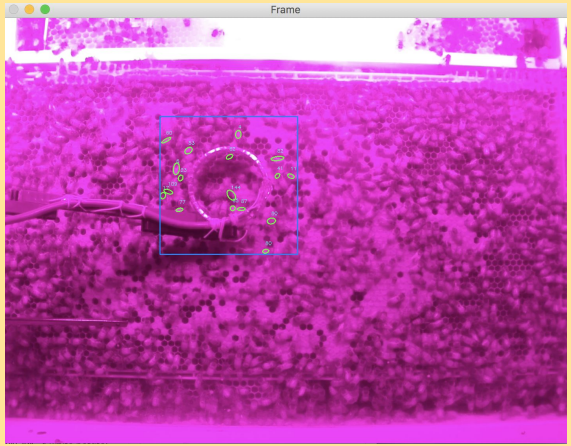
Heatmaps + a bit of orientation

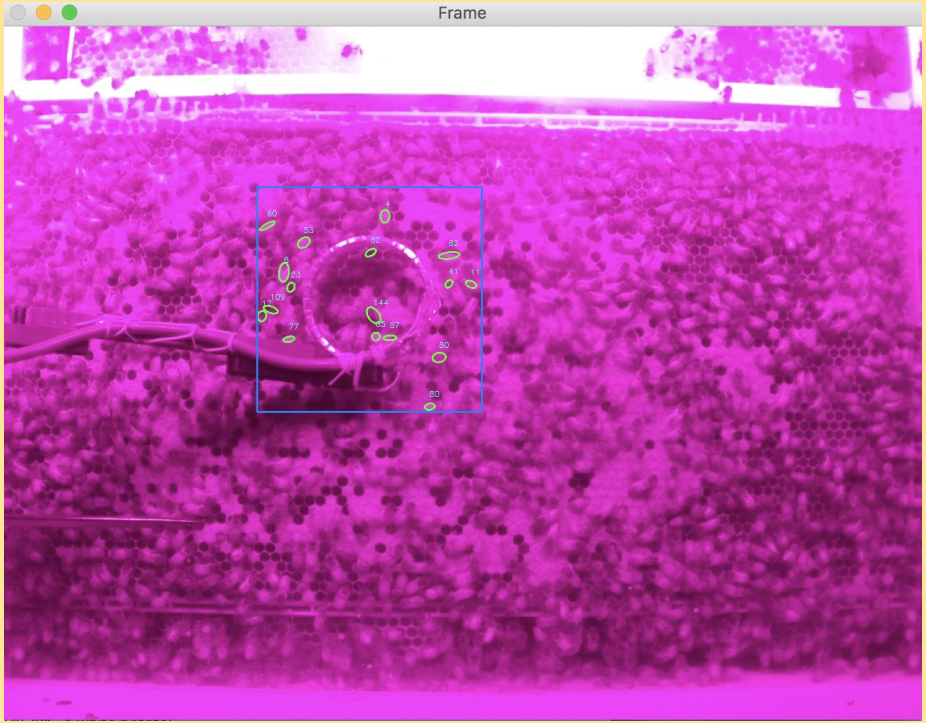
- Figure out if bees move depending on magnetic field
- Attempt to find orientation of bees
- Improve results for the future

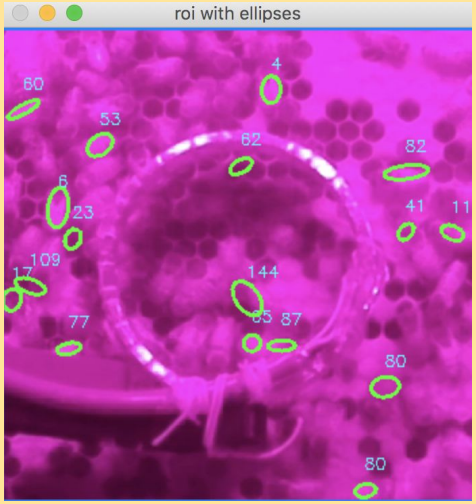


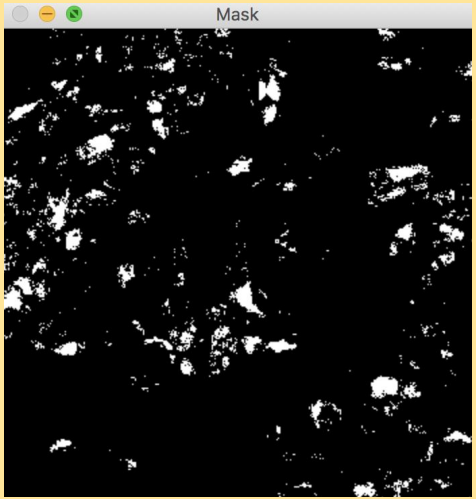
Background Subtraction and Ellipses for Bee Orientations

- Implemented background subtraction algorithm in openCV in python to analyze the movement of the bees in the videos we took
- Used the fitEllipse function to draw the proper ellipses around the moving bees that the algorithm picked up
- Plotted the angle measurements of the negative field vs. no field, and positive field vs. no field





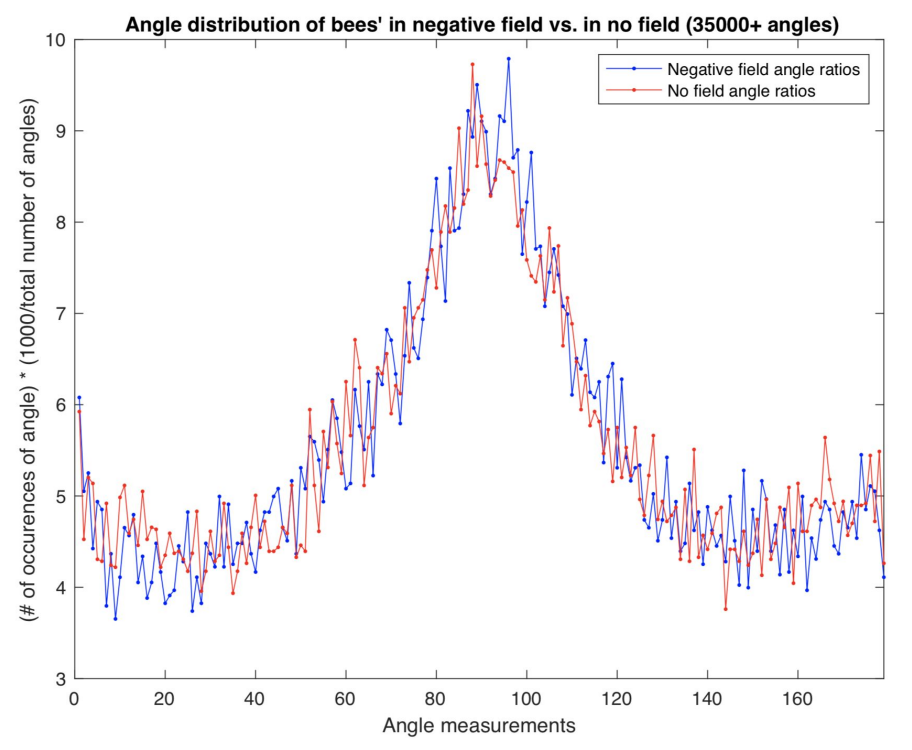


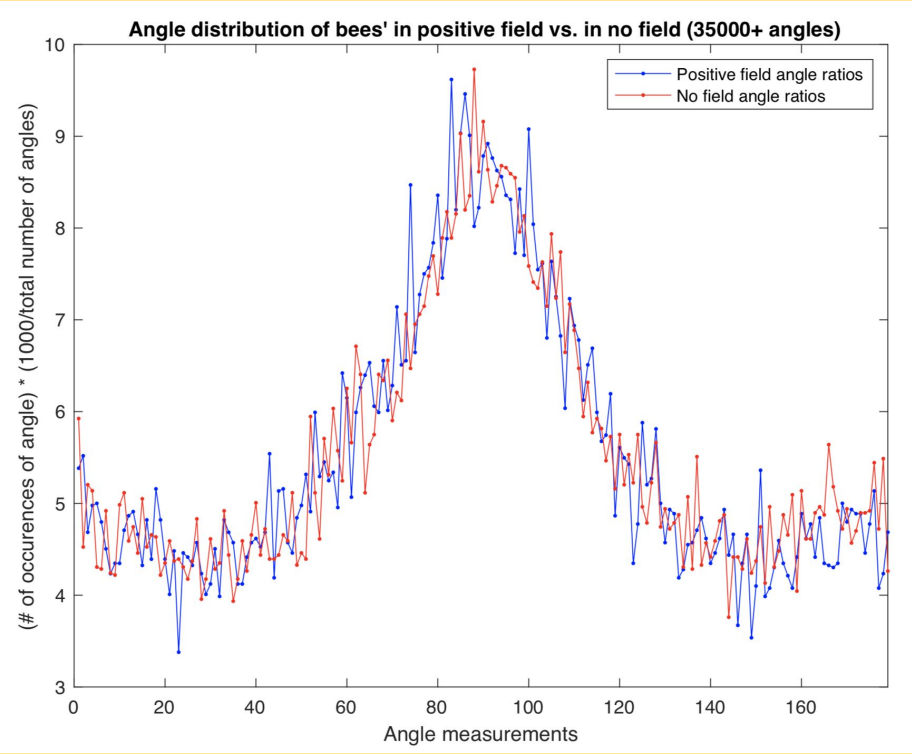


Future improvements:

- No false positives or false negatives
- Draw ellipses around the static bees

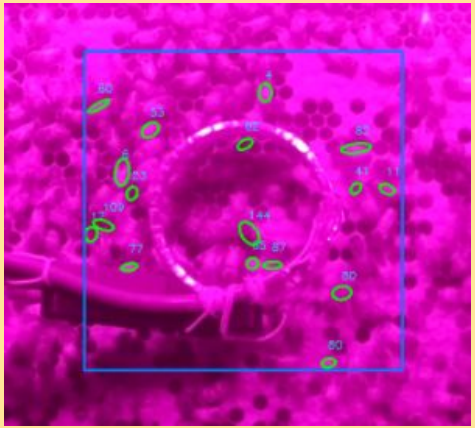
Bee Orientation Comparisons





Pygame Simulation

- The purpose of the simulation was to create a controlled environment to test the team's algorithms
- The real life video of the beehive had issues with lighting and resolution, so a controlled environment avoided these problems
- The controlled environment was developed using Pygame, a Python library to easily generate computer graphics



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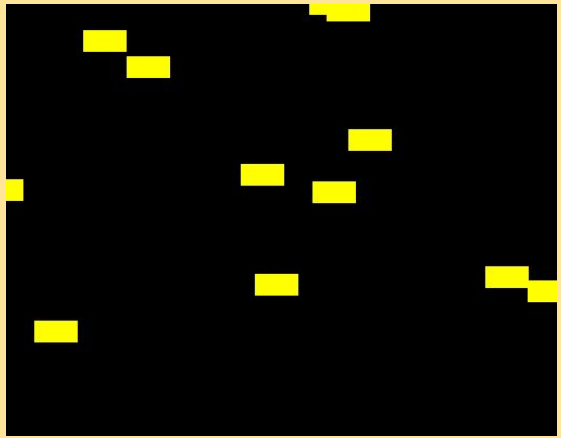
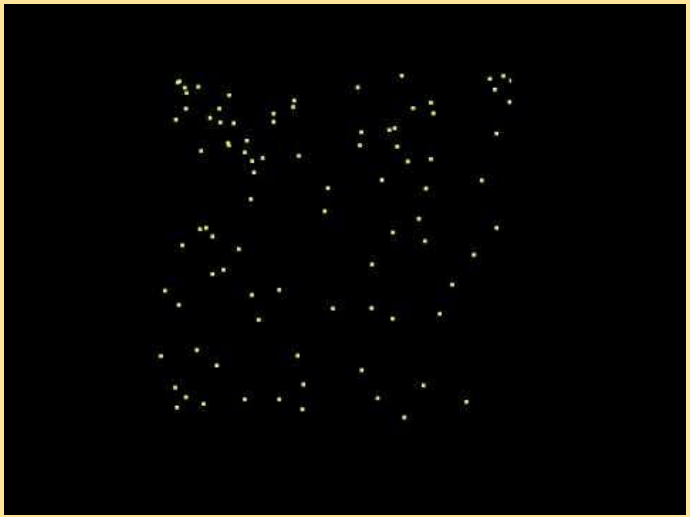


Pygame Simulation

- Progress
  - Created simulation using arbitrarily “buzzing” yellow rectangles
  - Loaded a bee image into Pygame and got it to buzz
  - Used background estimation to get a background from the hive videos
- Challenges
  - Combining two separate programs together
  - Rotating the bees to match their direction of movement
- Goals
  - Expand the program to include multiple bees with the bee image
  - Incorporate tasks that bees perform

Actual beehive video vs. simulation



Thank you!
Any questions?