Wireless Mesh Network for Pesticide Spray Monitoring and Mapping

User Needs and Requirements

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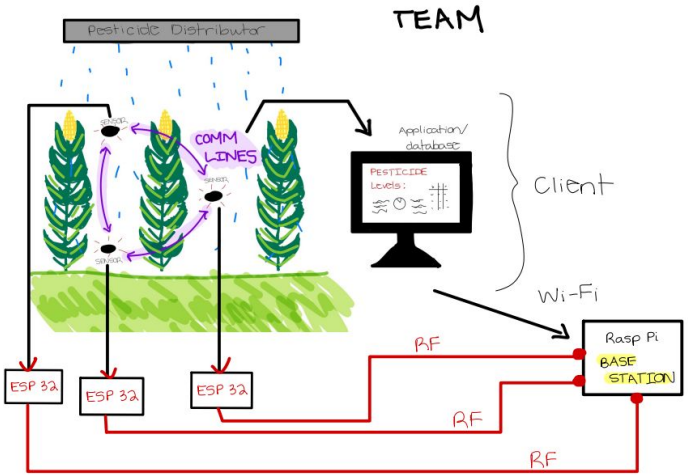
Ashley Falcon, Henry Hingst, Wesley Smith,
Yok Quan Ong, Drew Scheidler, Hector Perez Prieto

Advisor: Nathan Neihart
Client: Claussen Labs

Project Overview

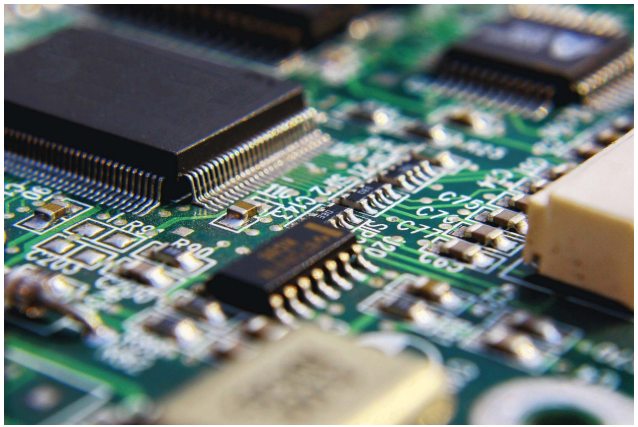
Goal: Wireless Mesh Network for Pesticide Spray Monitoring and Mapping

- Collect resistance data from IDEs (Interdigitated Electrodes) at various levels of crop canopy
- ESP32s microcontrollers will also be placed at various levels of corn canopies and locations and create a “mesh network”
- Measurements will be sent to a centralized device to be pulled by user
    - Centralized device will be a Raspberry Pi
    - Transmitted over bluetooth or wifi
    - Text files must be user friendly



User Needs

- Want accurate readings of sensor data
- Need data readings from multiple levels of crop canopies
- Need data sent to a master node by wireless mesh network
- Need the product to perform shortly after pesticide is sprayed on our devices to get better results
- Needs a final design on a PCB



Requirements 1: Sensing

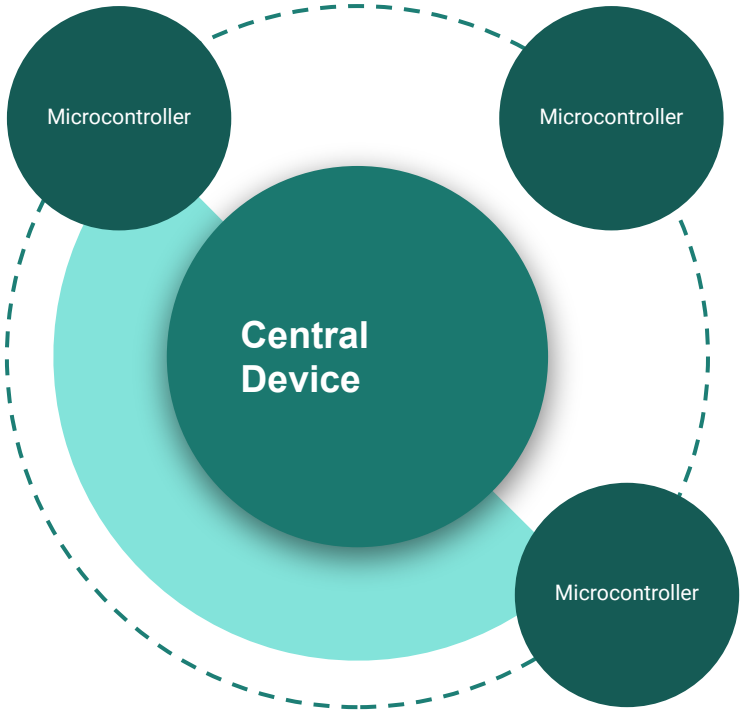
- Every level of the canopy will comprise of 1-3 ESP32 MCUs
  - Each with a minimum of 3 IDEs
- Accuracy: within +/- 1% of actual resistance with minimal noise
- Operate for 3 hours on battery power
- Final Design is on a PCB

Requirements 2: Master Node

- Client requires a “master node”
  - Centralized device to aggregate data (ex. Raspberry Pi)
  - Will be communicable from all microcontrollers
- Preferably needs to access data in real time
- Send a sleep/wake command to the nodes and verify their status

Requirements 3: Mesh Network

- Must be able to transmit all data without any losses
- Must be able to support at minimum of 6-12 sensor nodes
- Must be able to communicate over a distance of 200 ft (61 m) between each node



Engineering Standards

- Various Wi-Fi Standards
  - 802.11 b\g\n
  - 802.11 lr (ESP32 Specific)
- I2C
- Bluetooth
  - v4.2 BR/EDR
  - Bluetooth LE
- UART
- Ethernet
  - IEEE 1588

Conclusions

- Users need:
  - Device that can sense pesticide distribution
    - Will do so via resistance measurements
    - Values will be stored in file
  - Microcontrollers and IDEs at different canopy levels
  - Mesh network connecting nodes to central node
  - Remote accessibility to central node