Wireless Mesh Network for Pesticide Spray Monitoring and Mapping

Design Check-In

sdmay25-04
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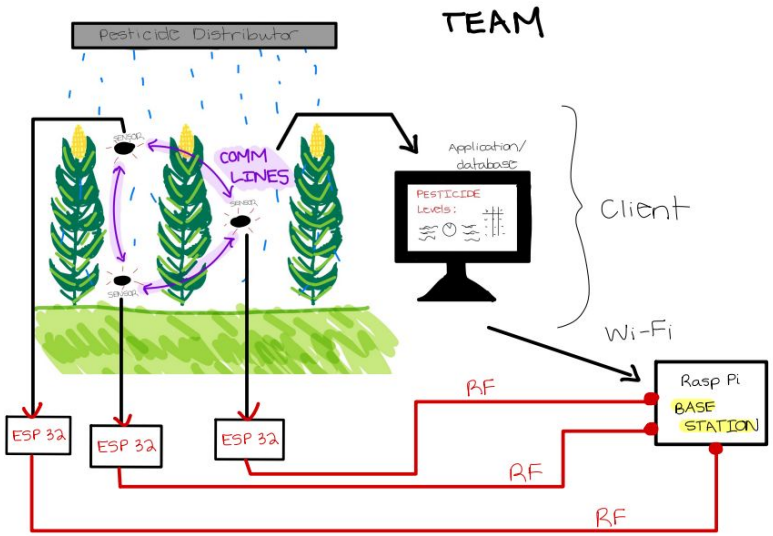
Project Overview

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 on poles at various levels of corn canopies and locations and create a mesh network
- Measurements will be sent to a centralized device and saved as .txt files to be collected by the user
  - Centralized device will be a ESP32
  - Transmitted over LR wifi
  - Text files must be user friendly



Human Considerations - User Needs

- **Record Data from Interdigitated Electrodes (IDEs)**
  - Met by the Wheatstone Bridge connected to an ESP32 which will measure and save the data from each IDE
- **Move Recorded Data to a Single Location**
  - Met by the Mesh Network comprised of each ESP32 which will collect all recorded data onto a specific ESP32 (the base station) so that collecting the sensor data is easy for the researchers
- **Ability to Start and Stop Data Collection from a Single Location**
  - Met by the SSH connection that a researcher will use to interact with the base station in order to start and stop sensor data collection

Economic Considerations

Market Gap -

- **Overcomplicated products**
  - Complex data analysis capabilities
  - Multiple customizable sensors
- **Limited pesticide monitoring**
  - Not all of these devices monitor pesticide spray the way we need to
- **High cost**
  - $1,500 - $20,000

Libelium Waspmote

Arable Mark 3

iMETOS 3.3

Economic Considerations

Where we fit in -

- **An affordable and simplified device**
  - Specific to pesticide distribution monitoring
- **Easy interface and accessible raw data**
  - Print to SD card
  - SSH connection used to download data
- **Decrease time needed in field to collect data and allow control over starting and stopping data collection**
  - Interact with the base station to get multiple data

Technical Considerations - External

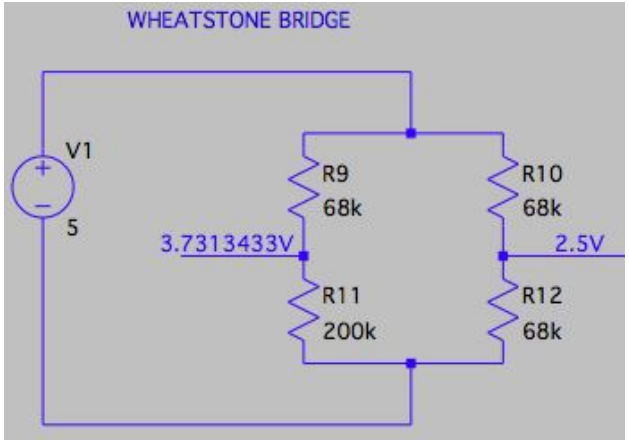
External	**Example 1**	**Example 2**	**Complexity Measure**
Established Tech	Claussen Labs Interdigitated Electrode (IDE) sensors	Existing products, such as Libelium Waspmote	Moderate complexity since few market products are similar. However, we are not required to create the sensors themselves.
Detailed Definitions of Requirements	3 microcontrollers w/ 3 IDE sensors each	User-friendly text file	The client gave clear expectations, thereby reducing the complexity.

Technical Considerations - Internal

Internal	**Example 1**	**Example 2**	**Example 3**	**Complexity Measure**
Technologies	Microcontrollers	PCB circuits	Sensors	There is not an overload of unfamiliar technologies, therefore only moderate complexity.
Engineering Principles	Embedded programming	Circuit design	Data packaging & Wireless Communication	Relatively high complexity due to a lack of experience with wireless communication.
Systems	Individual node	Mesh network	Base station	Systems are easily interconnected and aren't difficult to understand, reducing complexity.

Complexity Analysis & Justification

- **Wheatstone Bridge**
  - Provides a more precise resistance measurement compared to a simple voltage divider
  - Adds complexity due to the addition of extra components and the sensitivity of the measurement
- **Mesh Network**
  - Adds some technical complexity to the project but greatly improves cost and data reliability
  - Some framework is provided by Espressif but significant technical work is required to reach a functional solution



Questions or Comments?