Wireless Mesh Network for Pesticide Spray Monitoring and Mapping

Ethics and Professional Responsibility

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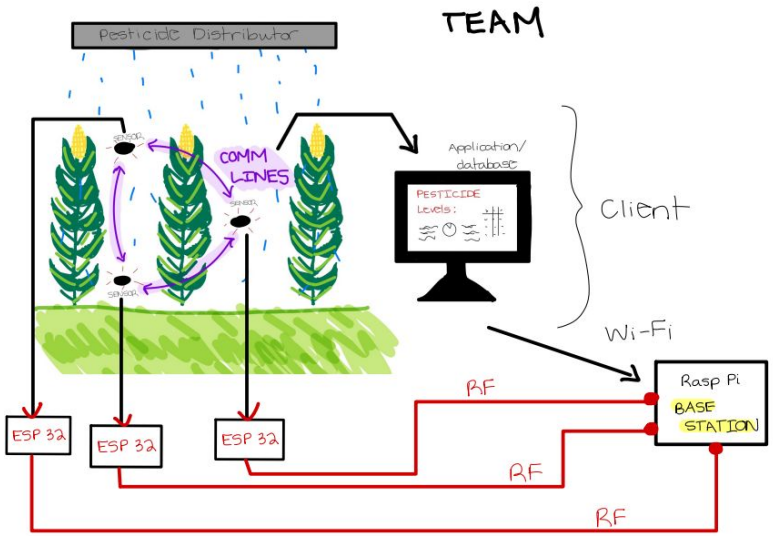
Project Overview

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



Area of Professional Responsibility We are Doing Well: Social Responsibility

Produce products and services that benefit society and communities

- **Relevance:** This project addresses the critical need for sustainable food production by reducing pesticide waste and environmental contamination through precise monitoring and data collection
- **Our approach:** Creating a scalable, user-friendly system that empowers informed pesticide application decisions
- **Why our approach upholds ethical and professional responsibilities:** By enhancing resource efficiency, ensuring data accuracy, and providing equitable access to technology for diverse agricultural communities

Area of Professional Responsibility to Improve:

Sustainability

Protect environment and natural resources locally and globally

- **Relevance:** The project aims to optimize pesticide application, which can reduce environmental damage by preventing overuse and minimizing pesticide drift
- **Our approach:** Our team's approach focuses on precise pesticide spray measurement and efficient application through IDE sensors and a wireless mesh network
- **How we can change this approach to make it work:** We may optimize energy use, select sustainable materials, and consider long-term impacts and equipment disposal

	Beneficence	Nonmaleficence	Respect for Autonomy	Justice
Public health, safety, and welfare	Increase crop yield and therefore accessible food sources.	Design will ensure certain foods are not oversaturated with pesticides.	Enables individuals to feed themselves despite the population growth.	Positive outcomes will affect all individuals evenly and fairly.
Global, cultural, and social	Promote a culture of affordable and sustainable food.	FDA will further govern to protect from negative impacts once brought to public.	Some anti-pesticide culture that could be infringed on.	Since in research stages, public opinion can still be taken into consideration.
Environmental	Pesticides are directly applied to plant life.	Avoidance of oversaturation and therefore damage.	Some concern for crops applied with pesticide.	Ensure design does not interfere with the health and layout of crops.
Economic	Affordable food due to high yields from even pesticide distribution.	Design is simple and affordable.	Will enable small farmers to have high yield crops.	Simplicity of design will make it affordable to small farmers.

Chart Area Important to Our Project:

Environmental -

Beneficence: Our project aims to improve pesticide application precision, ensuring pesticides directly benefit plant life by enhancing crop yields while minimizing wastage. This supports the broader goal of sustainable food production.

Nonmaleficence: By preventing oversaturation of pesticides, the design avoids potential harm to crops, soil, and surrounding ecosystems. This ensures that pesticide use does not lead to long-term damage, such as soil contamination or harm to beneficial insects.

Respect for Autonomy: Recognizing the individuality of crops and their specific requirements underscores the importance of tailoring pesticide applications to meet crops needs. This demonstrates respect for the unique characteristics of the environment being managed.

Justice: The project's design prioritizes equitable outcomes by ensuring that the implementation does not disrupt crop health, growth patterns, or agricultural layouts.

Concerning Ethical Issue

Data Accuracy - Accurate data is critical; if the system fails or provides incorrect readings, it could result in over- or under-application of pesticides, potentially harming crops or consumer health.

Environmental Impact - Our design will use Lithium batteries and when these batteries are no longer needed they will need to be disposed of properly.

Cost - While the design is intended to be simple and affordable, larger agricultural operations may adopt it more quickly, potentially creating inequities for small or marginalized farmers.