Project HEART: Horticulture Environment Arduino Resource Terminal

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1. Rationale

The Horticulture Environment Arduino Resource Terminal, dubbed as Project HEART, is designed to address a range of agricultural challenges, including low crop yields and food security concerns, while bridging the longstanding gap in research and development within the industry. The basis of it is its forefront sensor technology, which has the power to completely transform the Philippine agriculture industry. There is a sizable market and a pressing need for such a creative technique as farming occupies over 40% of the country's territory and employs almost five million people. In order to optimize agricultural methods, conserve resources, and increase output, this project provides farmers with real-time data and insights through the deployment of high-quality sensors that can be controlled by an Arduino Uno R3 microcontroller. This technology not only offers economic benefits but also aligns with sustainable and eco-conscious farming practices, making it a pivotal step forward in bolstering agricultural resilience and productivity in the Philippines, in the form of horticulture.

2. Research Problem

How can Project HEART optimize the integration of its various sensors to provide real-time environmental data for informed decision-making in a horticulture environment?

3. Hypotheses

Null Hypothesis (H_0): There is no significant improvement in the integration of the sensors for providing real-time environmental data for informed decision-making in a horticulture environment.

Alternative Hypothesis (H_1): There is a significant improvement of giving real-time environmental data, leading to informed decision-making in a horticulture environment.

4. Goals

- To enhance farm data monitoring in the Philippines through the integration of sensor technologies, and to promote sustainable practices by providing farmers with data-driven insights.
- To support the country's farmers by giving them access to easily navigable technology that facilitates decision-making, thereby increasing their livelihoods.
- To enhance crop yields and reduce risks associated with climate and environmental challenges in order to contribute to the nation's food security.
- To explore potential growth opportunities and serve the diverse needs of Filipino farmers across different crops and regions.

- To increase the resilience of Filipino agriculture, making it better equipped to withstand environmental challenges and enhance overall productivity.

5. Expected Outcomes

- The project will be functioning properly and can be a springboard for further research and development in the field of sensor technology that uses microcontroller technologies.
- The project will be successful in integrating sensors to provide comprehensive environmental data for informed decision-making of Filipino farmers.
- The project will be user-friendly and a practical choice to farmers and will provide optimized results in farm area monitoring for improved precision and efficiency.

6. Procedure

1. Gathering of Materials - The materials listed below will be utilized by the researchers for the formation of the prototype of Project HEART. They may be bought using cash-on-delivery shipping or getting them directly on stores.

- LM393 Soil Moisture Sensor
- DHT11 Temperature and Humidity Sensor
- Water Level Sensor
- Anemometer (DIY)
- HC-SR04 Ultrasonic Sensor
- Speaker
- SD Card Module
- Micro SD Card
- Double-Sided Circuit Protoboard
- DuPont Wires

- Jumper Wires
- Soldering Kit
- Red LEDs
- Resistors (Various Resistances)
- Power Module
- Anemometer (Recycled Junk Materials)
- Base (Recycled Junk Materials)
- Arduino Uno R3 (Original) / Arduino Uno R3 CH340G
- Arduino IDE and Computer
- Various Arts and Crafts Materials

2. Build Phasing - The build phasing will be split into different parts while the project's trial product is being built, the build phase will run at maximum for a month. The build will be inspired from the design of the character Sprout from the game Brawl Stars.

3. Coding of the Program - After securing the design of the product, which will correspond to the schematics, coding will then take place on the model. Coding will be done as a separate stage in creating the model, and it will be done using Arduino IDE software.

4. Debugging of the Program - Debugging will be tested multiple times, in order to correct mishaps that may exist on the HEART code.

5. Testing - The testing of the prototype will be done at Holy Spirit, Quezon City.

7. Risks and Safety

Specific electronic products such as power sources and chargers must be kept at dry places to avoid electric shocks and product malfunctioning.

8. Conceptual Framework

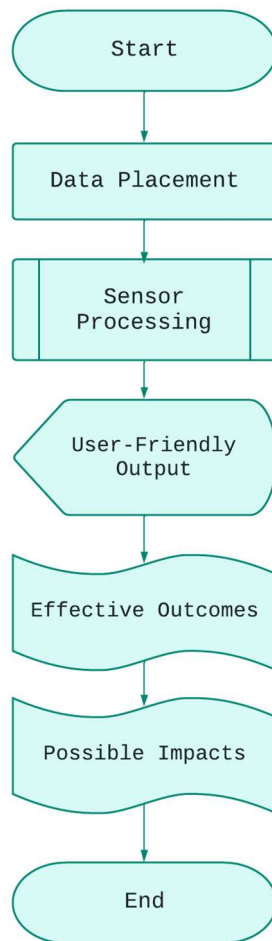Below is the conceptual framework of the project:

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┌─────────────────┐
│      Start      │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│ Data Placement  │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│     Sensor      │
│   Processing    │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│  User-Friendly  │
│     Output      │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│ Effective Outcomes │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│ Possible Impacts │
└─────────────────┘
          │
          ▼
┌─────────────────┐
│       End       │
└─────────────────┘
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Figure 1: The process flowchart for Project HEART.

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