

CSCI 3907 – Final project presentation

Grow, Plant. Grow!

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Spring 2023

THE GEORGE WASHINGTON UNIVERSITY

Photo: Kartik Bulusu

Introduction and motivation

Key points in intro:

- Sustainable farming is important
- Urban farming is growing in popularity
- We love healthy plants

What motivated you or your group:

- The importance of plants to human life
- The potential to innovate more sustainable farming practices
- The salmon farm example from class



What were your expectations and goals for your project:

1. Ideation started after the midterm, we wanted to combine aspects of both our midterms
2. Goals:
 1. Create a device that has potential to help the world in some way
 2. Explore how we can harness the power of IoT to improve ours and other's lives



IoT Architecture

Business layer

Information layer

Edge compute
layer

Communication
layer

Sensor layer





IoT Architecture

Scalable for large
agricultural
implementation

ThingSpeak.com

Image processing

ESP32, MQTT

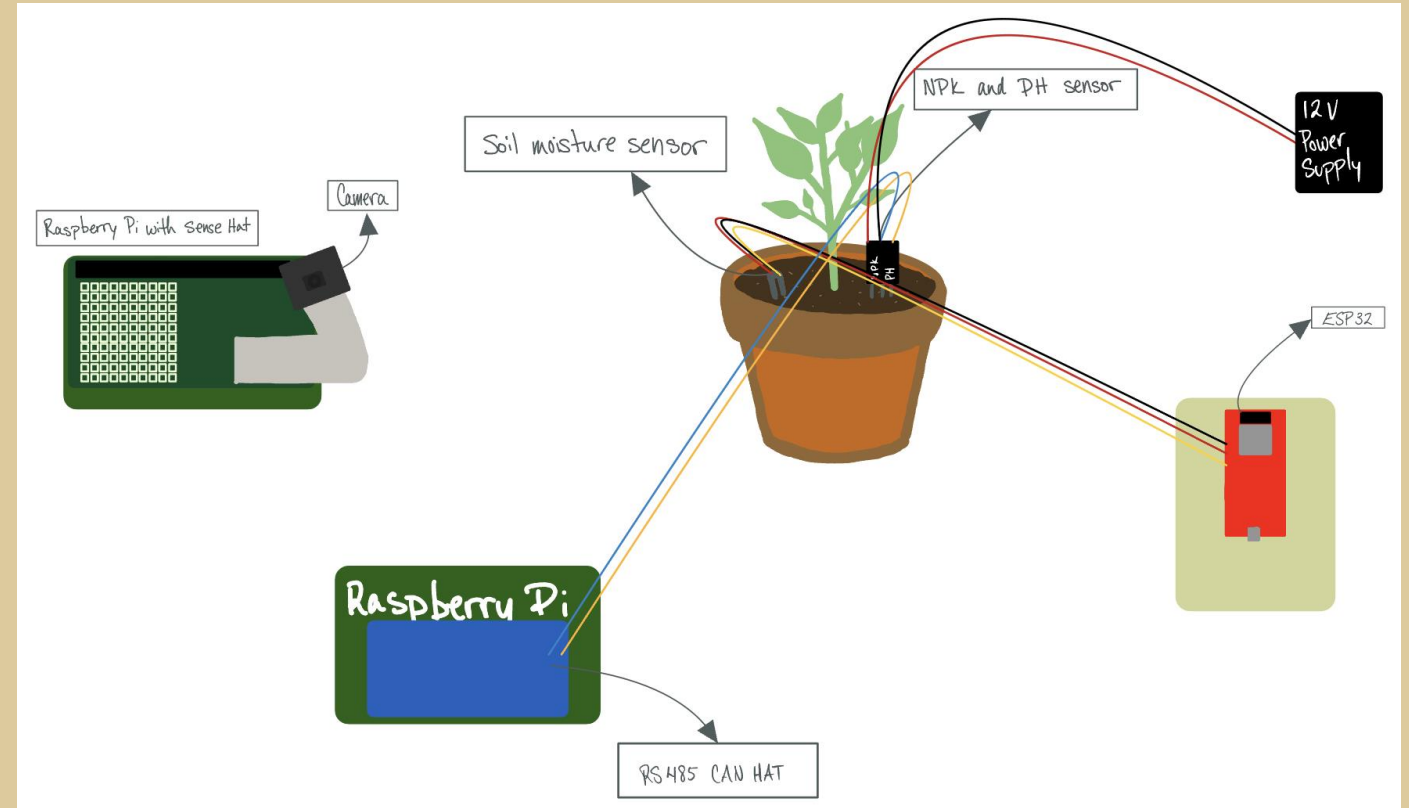
Camera, NPK, Moisture,
Temp, Humidity



Materials and methods

Materials and hardware used:

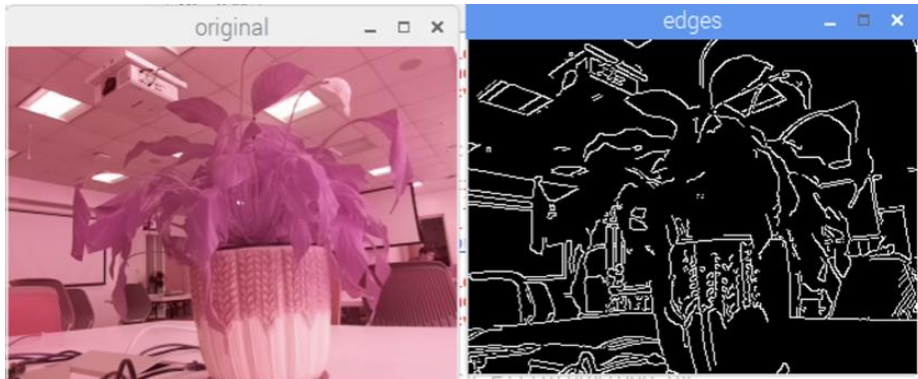
1. Camera
2. Sense HAT
3. Moisture sensor
4. NPK sensor with RS485 CAN HAT to connect to Pi (attempted)
5. Raspberry Pi 3B+ Raspian OS
6. ESP32 in the attempt to rely solely on one Pi
7. MQTT, UART and Modbus (attempted)



Edge compute strategy

1. Data comes from Sensor connected to the Pi
2. Edge computing must be done on the Pi to do OpenCV
3. IoT data can be computed on many devices

- Estimate Plant height using openCV
- Detect edges using Canny()
 - GaussianBlur
- Remove the noise using a directional gradient
- Create Contours approximations
- Select best fit contour



Conclusions and demonstration

- **What we learned**
 - We were not able to meet all the goals that we set for ourselves, however we feel that we have created a viable foundation that, given time, can be completed the way we proposed initially.
 - We were unable to complete the ESP32 and NPK aspects
- **This project has potential for scaling up to large scale applications**
 - Scaling this project up will help the goal of helping farming become more sustainable
- **There is a global welfare interest in this device**
 - We hope if implemented widely enough it would help the environment issues and help plant growers
 - Beneficial to farms/gardens/plants of all sizes

**Demonstrate your
IoT device**