Greenhouse Automation

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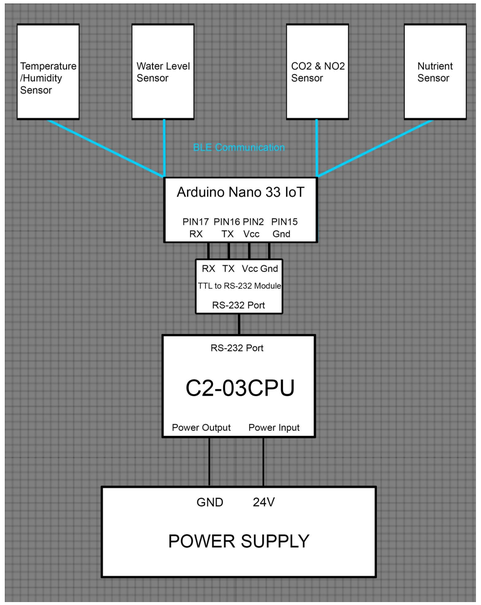
Project Overview

The overall objective of this project is to address the issue of automation inside of a greenhouse using a PLC System.

In addition to the PLC System the designed components are capable of monitoring the water level supply, measuring the temperature, humidity, CO2 and NO2 levels, nutrient levels within the soil, and also provide additional lighting for growth. These measurements are visible to the user on an HMI (Human Machine Interface) for easy view of the system. The HMI also allows the user to change the interval of time that the light are in use.



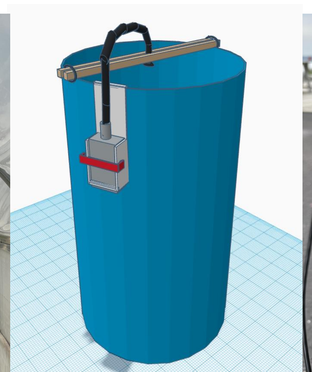
Specifications

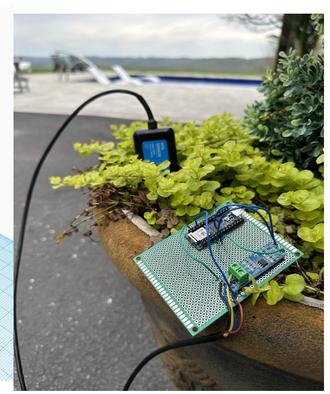
- **All communication must be done wirelessly and sent within 5 seconds to conserve power**
- **Components must be durable to withstand the conditions present inside the greenhouse**
- **All sensors must send new data every 3 minutes to ensure accurate readings are visible on the HMI**
- **All data must be logged and kept for a minimum of one month**
- **Systems must be scalable to allow for future work**

From left, Grant, Jared, Robert, Jaxson, and Bryan

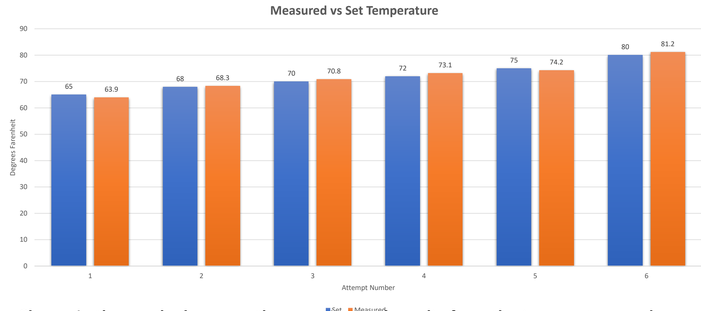
Design

- **Lighting – Composed of four high intensity grow lights which are powered through a breaker and relay. The relay allows an Arduino to turn the lights on and off.**
- **CO2 and NO2 – Allows monitoring of levels within the house and report them to the user via the HMI.**
- **Temperature and Humidity – Allows monitoring of levels in real-time and then reports to the user to allow them to make adjustments as needed.**
- **Water Level – The sensor will be placed in the house's water supply to alert the user when it is low and needs to be replenished**
- **Nutrients – Gives readings from the soil of each plant in the system to show which nutrients the plant is lacking or has a surplus of.**
- **PLC – Takes in all data from each system, stores it, and then converts the data to readable form and sends it to the HMI.**
- **HMI – The Human Machine Interface allows the user to check the levels of each system via touchscreen. It also allows for adjustments to be made to the lighting on/off cycle.**



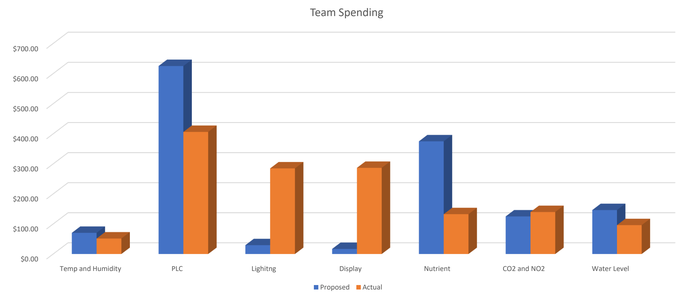


Experimentation and Results



Shown in the graph above are the experimental results from the temperature and humidity system. We placed the sensor in a controlled climate and adjusted the temperature to different intervals. The results were very close to the set temperature. This system will help the greenhouse to provide the best possible care to their plants.

Budget



The team proposed to spend $1,387.85 in our project proposal. After all ordering complete the total budget concluded at $1,397.85, which is within .72% accuracy. With the budget being economically friendly, this will allow for future teams to expand upon the project. It will also allow the agricultural department to expand to their other greenhouse locations.

Acknowledgements

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