Washington University in St. Louis
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Wireless Irrigation System

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Client: Dr. Benjamin Wolf, Greenhouse Manager at Jeanette Goldfarb Plant Growth Facility

Background

Origin and Evolution: The original idea was to design a small-scale irrigation system. This idea evolved to broader applications to include agriculture and greenhouse management.

Greenhouse Challenges: Normal manual watering of a greenhouse is not only time consuming, but it also can lead to inefficient water usage. Automating this process can enhance consistency, conserve resources, and improve crop health.

Project Goals

Proposed Solution/ Goal:

1. Sensor & Control use for real-time monitoring and remote access.
2. Find an efficient irrigation solution that boosts productivity and allows future expansion with more environmental sensors .
3. Create a GUI for our client to control and monitor the irrigation system remotely.

Methods

During this process we made three versions:

Version 1: Test the use of one valve on a singular plant. This allowed us to test our SSH and get one valve to work with a wired moisture sensor.

Version 2: Test the use of three valves with now wireless moisture sensors. Ensure all moisture sensors are transmitting accurate data to the SSH

Version 3: Finalized Irrigation system with working SSH. Working GUI for users to operate and monitor system.

Conclusion

- We used capacitive moisture sensors to read the soils moisture level in percentage where 100% is saturated and 0% is dry.
- Our SSH is able to wirelessly read the moisture level of the tomato plants and save the values in a data file. Additionally, we were able to create a cohesive system that will not let the moisture level of the plants get below or above an 80% moisture level.
- Lastly, we were able to create a GUI that allows the user to not only check the moisture level of the plants but also control the watering set up. It has also been enhanced with a real time alert system.
- Successfully provided the appropriate amount of water to tomato plants over a seven-day period.

Contact Information

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The work presented here was done for the purposes of ESE 498 Capstone Design Projects.

Results / Conclusion

1

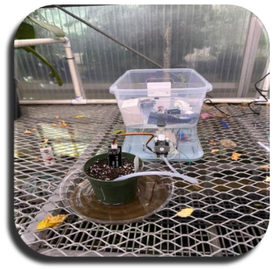

Fig 1. Irrigation System Version 1

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Fig 2. Irrigation System Version 2

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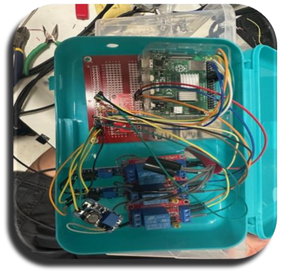

Fig 3. System Hardware

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Fig 4. Team In the Wild

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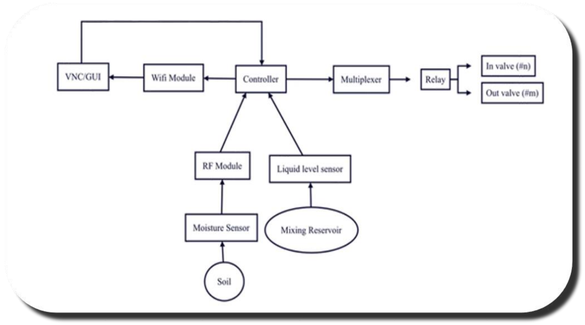

Fig 5. Block Diagram of Wireless Irrigation System

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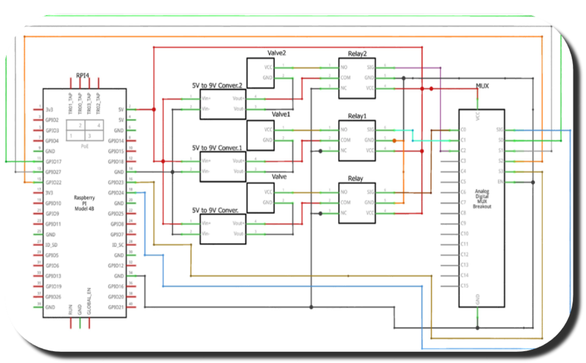

Fig 6. Control Circuit Wiring for Irrigation Valves

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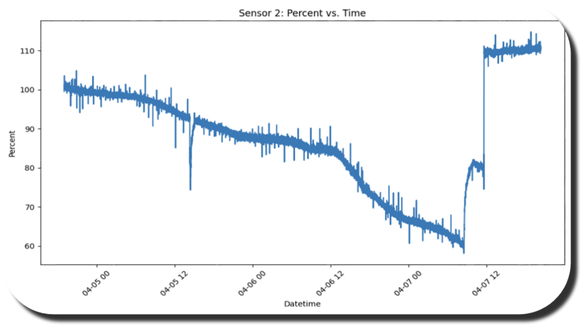

Fig 7. Testing the sensor by drying out the plant

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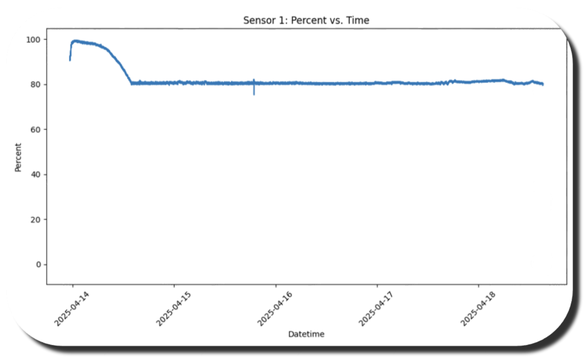

Fig 8. Showcases Irrigation System keeping the plant watered to 80% threshold, as desired.