ECE 1000 Final Report: Automatic Plant watering System

Tyler Beerman, Dominic Duong,

Tennessee Technological University
Department of Electrical and Computer Engineering
Cookeville, TN, USA
Tmbeerman42@tntech.edu, Dlduong42@tntech.edu,

***Abstract*— The Automatic Plant Watering System is supposed to detect the moisture level of the soil a plant is in and depending on the moisture level, the system will either water the plant or do nothing. The reason we chose this project was because Tyler has a plant in his dorm room, and we thought that it would be neat for it to be able to automate the watering process.**

I. INTRODUCTION

This project sounds simple in theory, but the application of a water movement system is something that many places in the world do not have available. This project can be utilized to help many people but as everything does, we needed to start simpler and with a smaller goal in mind. Members, Tyler Beerman and Dominic Duong, utilized this project to complete a task that quite often gets overlooked. It was used to water a dorm room plant.

II. BACKGROUND

While we were developing our project we used a multitude of sources. Our main source came from the slides provided by JC Williams to our ECE 1000 course. Along with the slides, we took inspiration from Collin Chidac's own Plant watering system (cited). Most of our work also drew inspiration from our past education and our work in the ECE 1000 course.

III. PROJECT DESCRIPTION AND FORMULATION

Materials:

1. Raspberry Pi Pico (RPP): Acted as our microprocessor. Handled code and communicated with other materials.
2. Capacitive Soil Moisture Sensor: Used to measure the moisture in the soil. Sent outputs to our RPP.
3. Water Tank (Tupperware): Stored water for use by our water pump.
4. Water Tubes: Directs water to the plant's soil.
5. Submersible DC Motor Water Pump: Draws water from the tank and pumps it through the tubes to water the plants.
6. Relay: Used to allow the pump to communicate with our RPP and respond to outputs from RPP.

Diagram:

The image below shows the circuit wiring.

Figure 1: Sequence diagram created for project

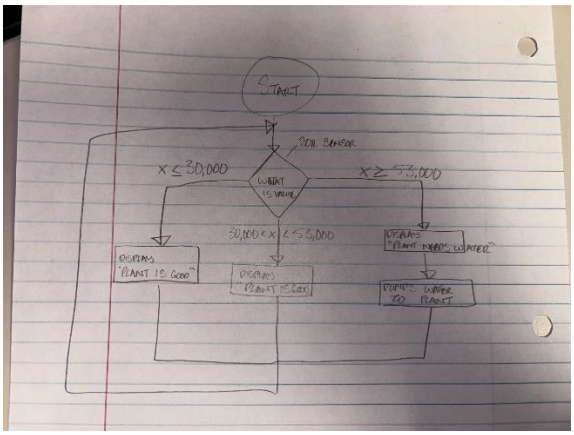


Figure 2: Hand-drawn diagram of circuit wiring

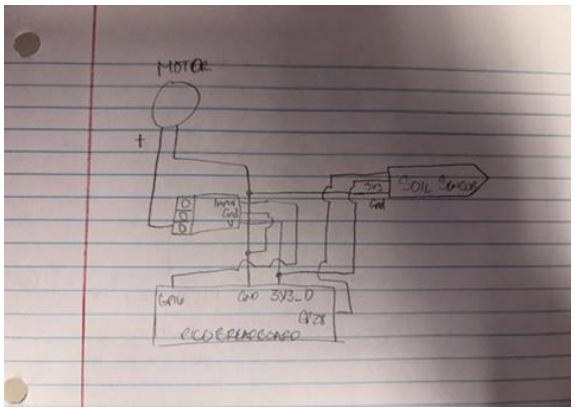
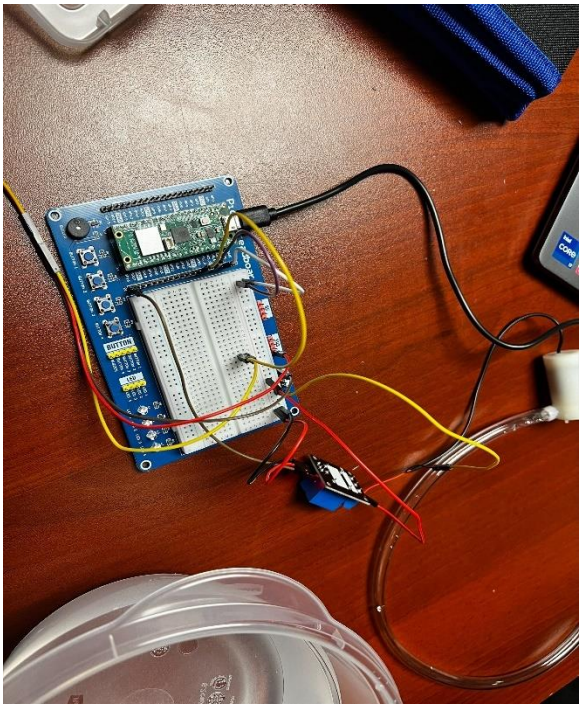


Figure 3: Physical wiring of the project



Functionality:

The project mainly functions through the Raspberry Pi Pico. The moisture sensor and water pump both use outputs from the RPPs GPIO (General Purpose Input/Output) pins.

The moisture sensor also utilizes one of the RPPs ADC (Analog-Digital Conversion) pins. This concerts the analog output from the sensor and turns it to digital so the RPP and PC can use it. Along with ADC, the sensor uses a threshold defined in the written code to tell whether the soil is moist, dry, or in between.

The project repeats the sensing, reading, pumping over and over again so that the plant always has the correct moisture levels.

IV. DISCUSSION AND RESULTS

The automatic plant watering system project had successful results, as the device watered the plant based on the set parameters. However, there was a small issue that presented itself, but we were informed by our TA (Teaching Assistant), Storm Johnson, that the issue is due to the pump trying to draw too much power, so the RPP focuses on that and sets aside smaller tasks like the printing of moisture level. Another small setback that didn't affect the project is we wanted to design a 3D object to distribute the water more evenly over the soil. Due to time constraints, we were not able to get it printed in time.

For individual contributions:

All members -- Created python code for RPP, researched circuit examples for inspiration

Tyler Beerman -- Researched, wired, and troubleshooted the capacitive moisture sensor and water pump

Dominic Duong -- Researched, wired, and troubleshooted the relay. Created 3D design for water distribution system.

V. CONCLUSION

Using various materials, including a Raspberry Pi Pico, we created an automatic plant watering system that reads moisture level from soil and activates a water pump based on the level of moisture.

For our uses just watering a single plant is enough, but the project can be scaled up to have uses in agriculture and development of farming practices in other countries.

References

[1] *Automatic Raspberry Pi W Watering System*. (n.d.). Retrieved November 19, 2024, from https://www.instructables.com/Automatic-Raspberry-Pico-W-Watering-System/

[2] *How to Set Up a 5V Relay on the Arduino*. (n.d.). Retrieved November 19, 2024, from https://www.circuitbasics.com/setting-up-a-5v-relay-on-the-arduino/