*ECE 1000 Final Report: Automatic Plant Watering System*

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*Abstract*—The automatic plant watering system was created to water plants so that people would not accidentally kill their plants by watering them too much or too little. It uses a moisture sensor to determine if the plant needs water and a pump to supply it with the water if it needs it.

Keywords—Raspberry Pi Pico, Soil Moisture Sensor, Water Pump, Automatic

# Introduction

The group was motivated to create the automatic plant watering system by the problem of overwatering or underwatering that many people with plants face. With the project, people’s plant would be much less likely to die of overwatering or dehydration. The group who completed the project was made up of Connor Ketron and Gabe Emery, both electrical engineering majors.

# Background

The group used code written by JCWilliams1003 for the soil moisture sensor [1]. A webpage on instructibles.com by Collin Chidiac was used to assist in wiring the system[2]. A video by Core Electronics on YouTube was used to wire the relay into the system [3]. ChatGPT was used sparingly to assist in debugging the code for the water pump[4].

# Project Description and formulation

The components used in the project were a Raspberry Pi Pico, a single channel relay, a soil moisture sensor, a five volt submersible water pump. The sensor was wired to the 3v3 pin of the Pico, the ground pin, and pin 27. The relay was wired to the same pins, with the output being wired the VBUS pin on the Pico and the positive side of the pump, with the pump’s other side wired to the ground pin. The VBUS pin supplied the relay and the pump with 5V directly from the microUSB cable that powers the Raspberry Pi and allows it to run the code via the connected laptop. The pump was submerged in a coffee cup filled with water, with a plastic tube that led into the plant’s soil. Of course, the system would do nothing without its code. The first half of the code defined the moisture levels measured by the soil moisture sensor. The other half told the Pico to continually read the pin that the sensor was connected to and to turn on the Pico’s LED and activate the relay when the moisture was below 27%.

**System Diagram**

**A diagram of a wiring diagram

Description automatically generated**

**Picture of the System**

A table with wires and a plant

Description automatically generated

# IV. Discussion and results

The system functioned as intended. If the group had more time, they would have 3d-printed an enclosure for the electronics and added a display so that the user could see the soil’s moisture percentage. The aspects of the project most enjoyed by the team were the problem solving when something went wrong and the process of wiring everything together. Gabe wrote the code and bought the plant and Connor wired it together and wrote the report.

# V. Conclusion

This project was begun with the goal of creating a device that could assist people in caring for their plants and to remove the need to guess when a plant needs to be watered. In the end, this goal was achieved with flying colors. The members of the project team gained important skills while developing this project, such as experience working with the Raspberry Pi Pico, problem solving, and programming in micropython.

# References

[1] JCWilliams1003. “ECE\_1000\_Soil\_Moisture\_Sensor\_ Example.py”. https://github.com/JCWilliams1003/ECE-1000-Spring-2024-Final-Project-Insert-Project-Name/blob/main/Example%20Micropython%20Codes/ECE- 1000\_SoilMoisture\_Sensor\_Example.py (Accessed Dec. 3, 2024)

[2] Chidiac, Collin. “Automatic Raspberry Pico W Watering System”. *AUTODESK Instructables,* https://www.instructables.com/Automatic-Raspberry-Pico-W-Watering-System/. (Accessed Dec. 3, 2024)

[3] Core Electronics. “How To Use A Relay With Raspberry PiPico”.*YouTube*.https://www.youtube.com/watch?v=mj2kMD0LCR4&t=233s. (Accessed Dec. 3, 2024)

[4] OpenAI, *ChatGPT.* https://chatgpt.com/. (Accessed Dec. 3, 2024)