Smart Plant Watering Device Using Embedded Systems

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BACKGROUND/ INTRODUCTION

The Internet of Things (IoT) refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention [1].
An embedded system is a combination of computer hardware and software designed to perform a specific function. They function as part of a complete device, which is what makes them embedded. They are small computers that are nested in other mechanical or electrical systems [2].

Many people struggle to look after plants, due to certain factors such as work, study, and other commitments in their everyday lives, and so may forget to water their plants regularly. This may lead to plants wilting as they won't have enough water in their roots for them to grow. By making sure the plant is always watered correctly, it will be healthier and will live longer.

This system will help people take care of their plants by watering them to the correct level

AIMS AND OBJECTIVES

- To create a system to monitor moisture levels in the soil of a plant and dispense water from a water source as and when it is needed.
- Measure soil moisture levels in a plant
- Provide water when required by the system
- Notify end user when water source is low
- Use a raspberry pi as a monitoring system
- Program the device in Node-RED using Python

METHODS

The approach to creating the system included many different steps. Each step needed to be implemented separately, before being joined together at the end. The first step was setting up a stable internet connection using a router to make sure the raspberry pi could be controlled remotely. Next was the raspberry pi itself as it needed to be connected to a stable internet connection for it to be programmed and controlled remotely on a server. After this was the relay board, this needed to be setup for it to control a pump using a program. The last part was the soil moisture sensor, which was needed to get readings from the system. The final part included combining all the separate parts together using a circuit on a breadboard. This ensured that all the parts were working in collaboration with each other, allowing the entire system to perform its desired function which is to water a plant when the moisture levels drop below a certain level.

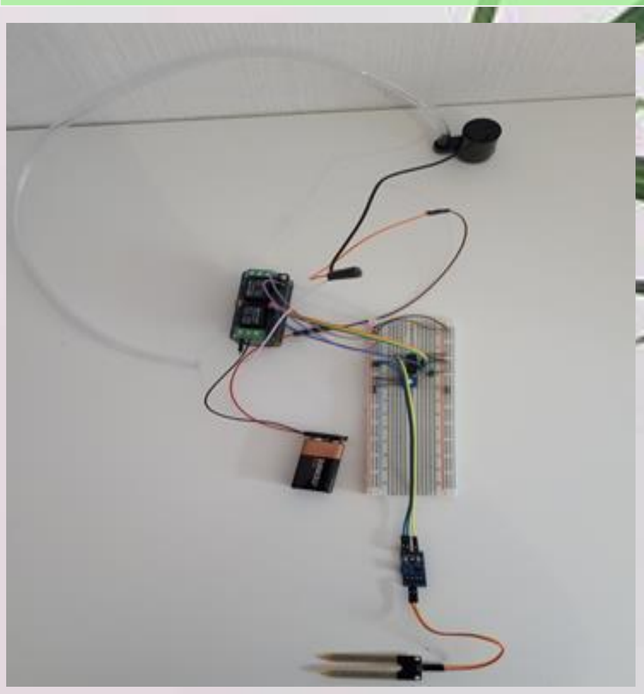

Figure 1: Fully Connected Plant Watering System

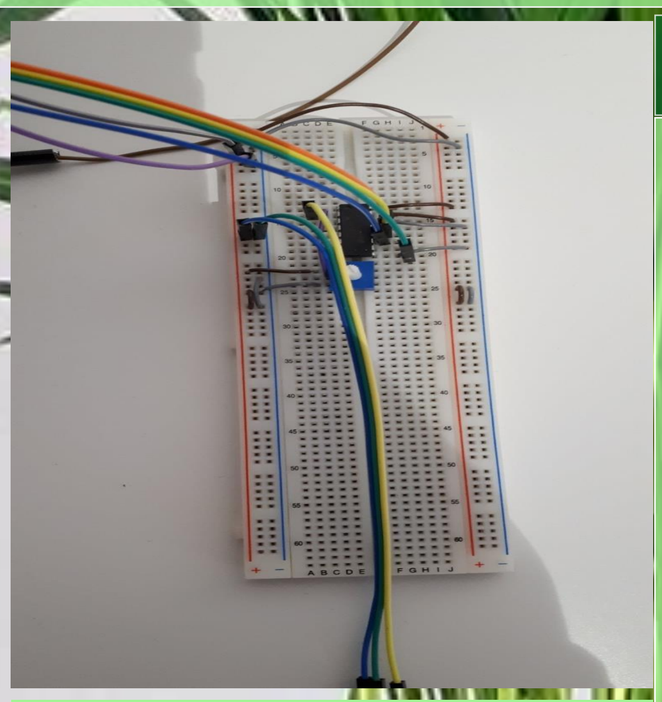

Figure 2: System Circuit Board

HOW IT WORKS

The system allows a user to take care of their plants by monitoring the soil moisture levels in the plant. While the program is running, if the soil moisture sensor detects the soil moisture level is below 60%, the pump is activated through the relay board and the plant is watered until the moisture level reaches 80%. Then the pump is switched off and the water stops. The soil moisture detector checks the soil moisture levels of the plant every hour to check the plant has enough water.

If the soil moisture level is at 60% or above while the moisture levels are being checked by the system, the pump remains off as there is already enough water in the plant.

TECHNOLOGY BEHIND THE DEVICE

Relay - An electrically operated switch used to control voltages
Raspberry pi – Low cost Linux based computer on a small circuit board
Pump – Uses a motor to move fluids
Soil moisture sensor – Measures the level of moisture in the soil of a plant

All of the components are connected together using multiple jumper wires, a breadboard, An MCP3008 microchip and a rotary potentiometer as shown in the diagram below, allowing the system to work

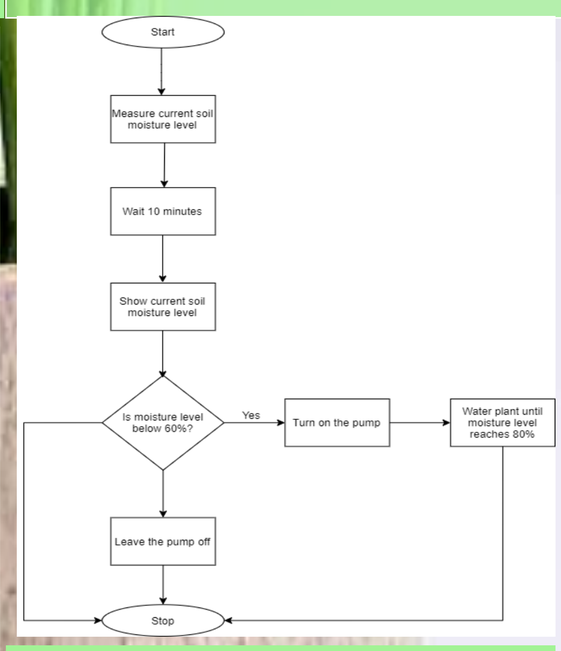

Figure 3: Flowchart of the System Process

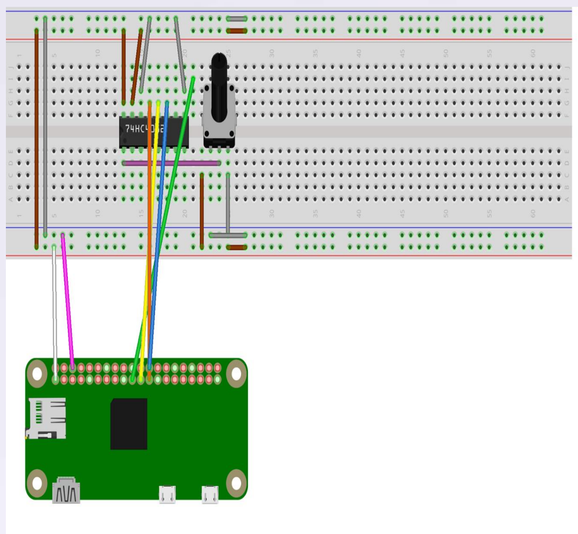

Figure 4: Diagram of Circuit Board and Raspberry Pi

CONCLUSION & FUTURE WORK

To improve the project, the system could work automatically so the plant waters itself instead of requiring a remote server (putty) to run. The system would therefore be more user-friendly, making it accessible for a wider consumer base.

The system could also be improved if the soil moisture sensor continuously monitored moisture levels in the soil and stopped watering the plant once the desired level is reached.

REFERENCES

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[3] BloomBox Club, Areca Palm, https://bloomboxclub.com/products/areca-palm-14cm-dypsis-lutescens?variant=32295350108243&currency=GBP&iadid=&isid=133979558&icid=online&iaid=shopify_GB_4707630514259_32295350108243&iagid=1213233464084&ipid=&gclid=CjwKCAiAkJKCBhAyEiwAKQBCkoQKMezI2NZAG9D01UtISTcKdYGaC2Y7mkePbCvKRBuOuQjEuxub3xoC2e0QAvD_BwE