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Automatic Watering System for Plants Using Raspberry Pi Pico

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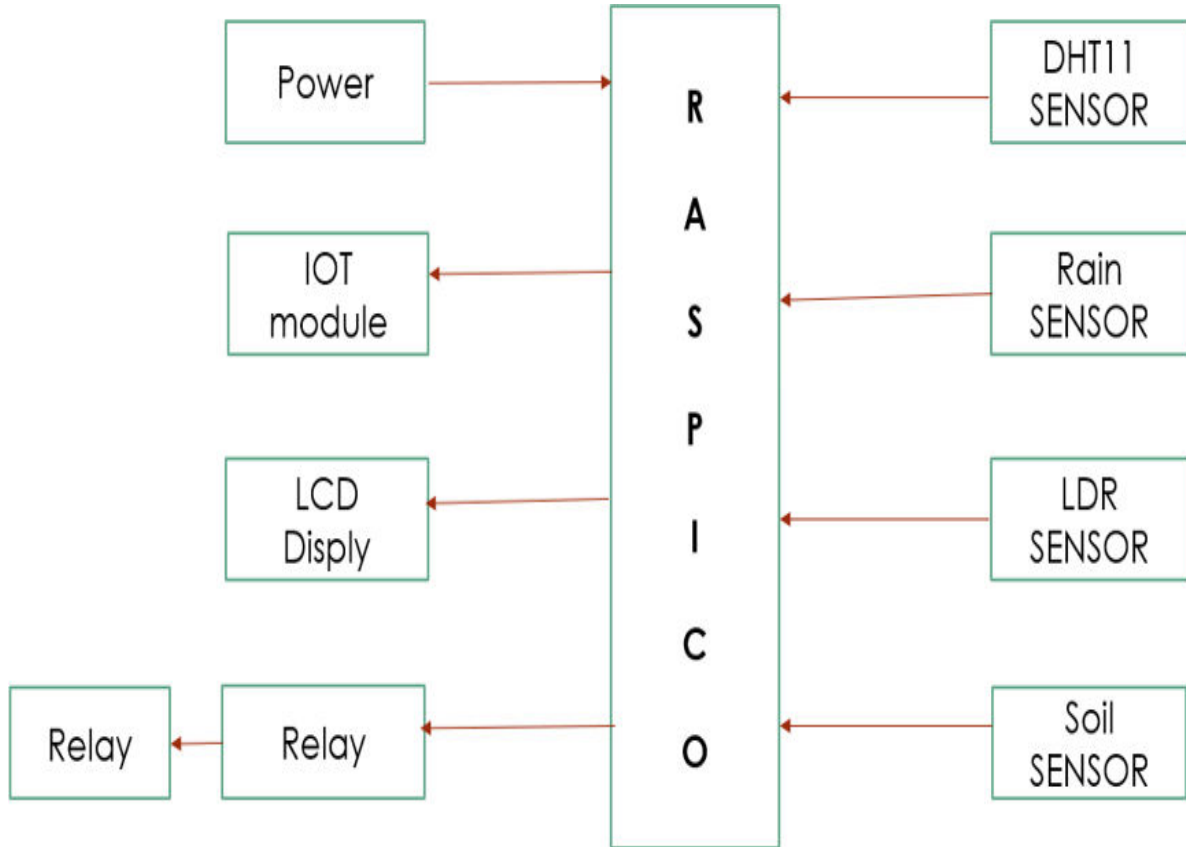
ABSTRACT: The main aim of this project is to ease the mechanism of watering the plants at home with the help of this automatic watering system which automatically switches the water pump ON and OFF depending on the moisture content of the soil, which continuously sensed by the soil moisture sensor. The entire process is controlled by RASPBERRY PI.

I. INTRODUCTION

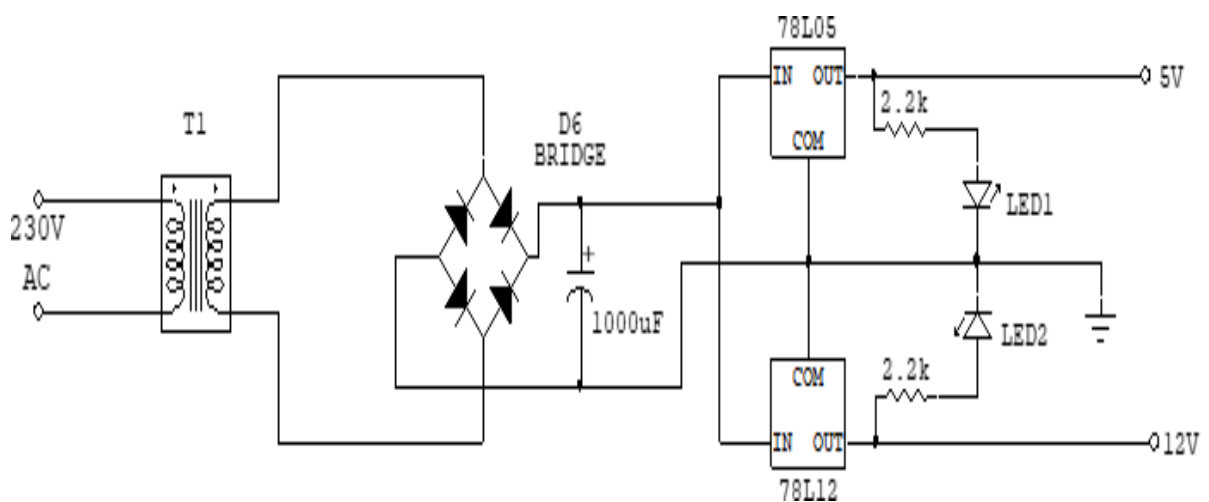
Plants are vital to our ecosystem, providing oxygen and purifying the air. While many enjoy cultivating them in their gardens, the hustle of modern life often leads to neglect, especially in watering. This task, though crucial in gardening and agriculture, can be demanding and is sometimes overlooked.

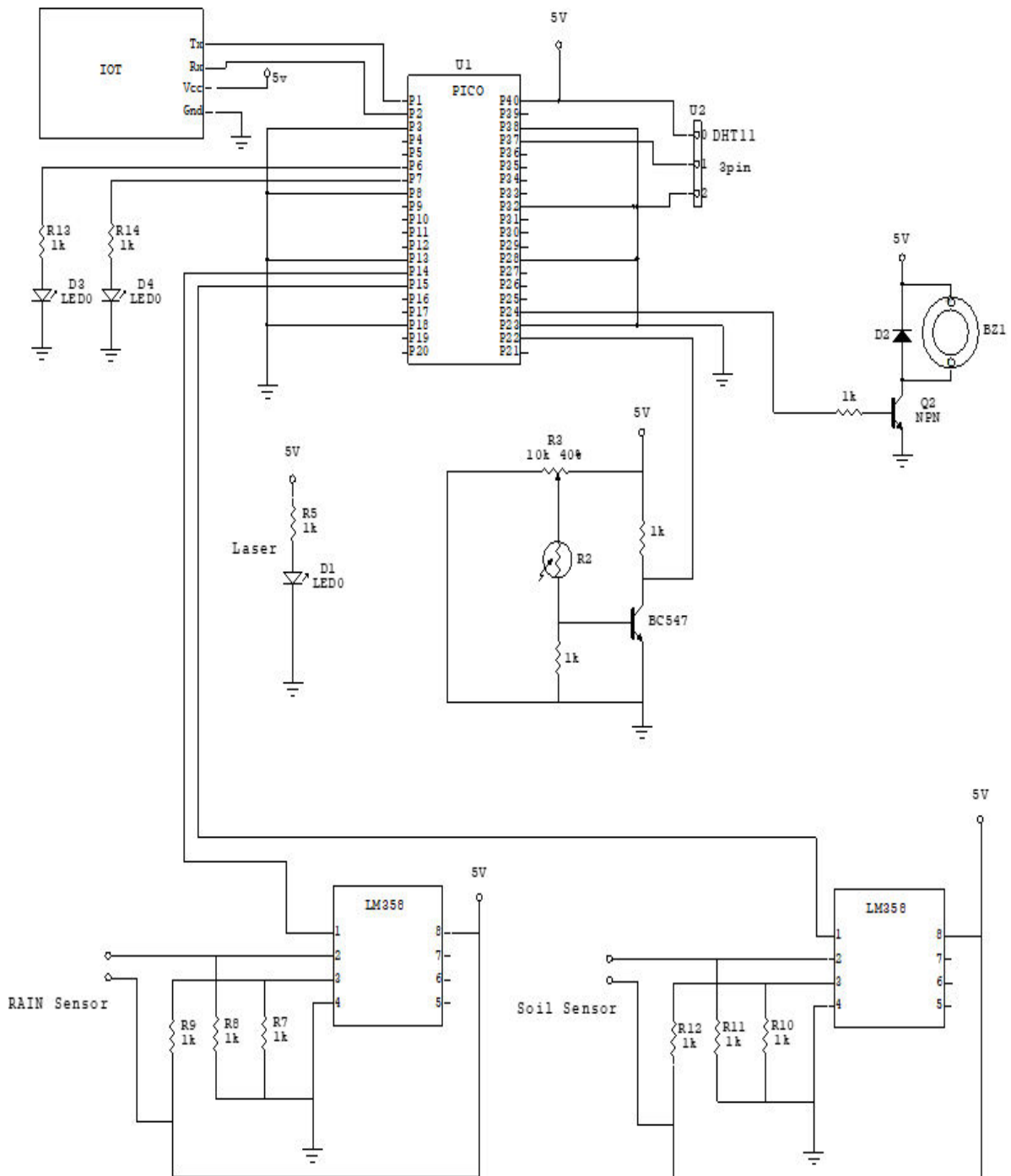
The project's goal is to streamline the home plant irrigation process using an automated watering system. It's designed to be a helpful tool that ensures plants receive adequate hydration at the correct times. Irrigation is the strategic application of water to plants at set intervals, which supports the growth of landscapes and the restoration of soils in arid areas, particularly during periods of low rainfall. It also plays various roles in agriculture, such as providing frost protection, managing weed growth in cereal crops, and preventing soil compaction. Additionally, irrigation systems are employed for purposes like cooling livestock, suppressing dust, disposing of sewage, and aiding in mining activities. Automated irrigation systems bring numerous advantages, simplifying water distribution for both extensive agricultural fields and personal gardens without constant human oversight. Various designs exist, from large-scale systems managed by a single operator to high-tech options employing GIS and satellite technology for precise water allocation to crops. Simpler methods also exist, such as using clay pots or bottle irrigation for manual watering. Plants offer immense benefits, purifying the air and producing oxygen. While many enjoy growing them at home, space constraints often lead to indoor gardening on windowsills, where plants rely on traditional care. However, the hectic pace of life can lead to neglect in watering, causing plant stress and death. Moreover, with water scarcity becoming a critical global issue, efficient water use in agriculture is of paramount importance. Contemporary irrigation technologies can be employed to ensure plants are watered as necessary. The key considerations for manual watering are timing and quantity. To alleviate the manual effort and facilitate the gardener's job, an automated plant watering system has been developed. Implementing such a system in gardens or fields not only supports optimal plant growth but also promotes water conservation.

II. BLOCK DIAGRAM



III. CIRCUIT DIAGRAM





IV. WORKING

The system is configured to automate the irrigation process by interfacing relays, a Raspberry Pi, and a pump. The Raspberry Pi is programmed to autonomously control the pump's operation. A submersible pump delivers the necessary water to the plants, and the setup is coded in C. The Raspberry Pi controller is tasked with monitoring the soil's moisture content, activating the pump when the moisture dips below a certain level, and continuing until it reaches the set threshold. The system is designed to periodically reassess the soil's moisture content and, if no watering is needed during the initial check, it will wait for 24 hours before repeating the process. The automatic plant watering system is structured as follows:

Soil Moisture Sensors: Embedded in the soil, these sensors gauge moisture levels to inform watering needs.

Raspberry Pi: This microcontroller serves as the brain of the operation, processing input from sensors and watering.

Relay and Pump Setup: Managed by the Raspberry Pi, this setup activates the pump when moisture is insufficient, ensuring precise irrigation.

Programmable Watering: The system's schedule can be tailored to specific watering requirements, avoiding both excess and insufficient irrigation.

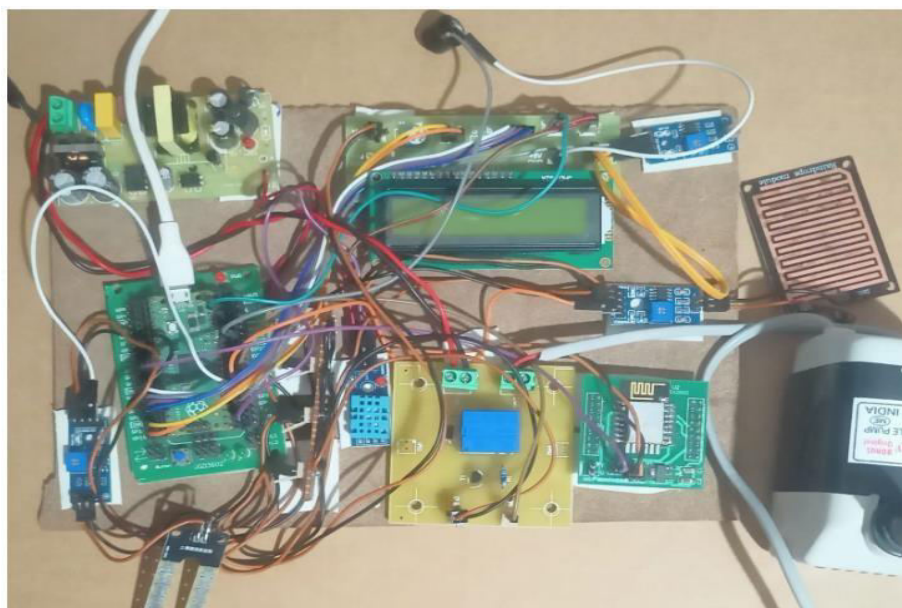
Remote Access: With internet connectivity, the system offers remote management, enhancing user convenience.

System Programming: Utilizing programming languages such as Python or C, the Raspberry Pi is configured to oversee the watering regimen.

V. METHODOLOGY

- The whole system can be classified into three main processes.
- First one, is the process of sensing the moisture content of the soil.
- Second one, is the process of determining the status of the soil: dry or wet?
- Third one, is the process of water pump control: turn ON or OFF.

VI. EXPERIMENTAL SETUP





VII. EXPERIMENTAL RESULT



```
Terminal
9:12:21.623
9:12:21.623
9:12:22.509 *****
*****
9:12:22.661 Automatic Watering System For Plants
9:12:22.661
9:12:22.661 Temperature:33.30
9:12:22.661 Humidity = 43.00
9:12:22.661 Soil : Dry Motor:On
9:12:23.661 Light : Yes
9:12:23.661 No Rain
9:12:23.661 *****
*****
9:12:23.798
9:12:23.798
9:12:23.798
9:12:25.112 *****
*****
9:12:25.115 Automatic Watering System For Plants
9:12:25.115
9:12:25.115 Temperature:33.30
9:12:25.115 Humidity = 43.00
9:12:25.115 Soil : Dry Motor:On
9:12:26.995 Light : Yes
9:12:26.995 No Rain
9:12:26.995 *****
```



VIII. ADVANTAGES

- Continuous monitoring of agriculture
- Monitoring and controlling of soil motor
- Remote monitoring plantation parameters.

IX. APPLICATIONS

- This system used agriculture applications
- Planation and
- Nursery applications
- Irrigation application
- Drip irrigation

X. CONCLUSION

The project has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

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