IOT BASED PLANT WATERING SYSTEM

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ABSTRACT_ The soil moisture sensor detects the moisture content of the soil, and if it is low, water is pumped into the soil; once the soil has enough moisture, the water flow stops. It employs a matrix method to reduce both water use and unnecessary pipelines. Thus, this is a complete advance over traditional agricultural irrigation systems as well as the previous automated method. Plants are well-known for their numerous benefits to humans. Plants help to keep the environment healthy by naturally cleansing the air and creating oxygen. Many individuals enjoy having plants in their backyard. However, due to urbanization and a lack of space, many people used to grow plants in a mould or mud pot and place them on their windowsills. These plants rely on traditional breeding methods, such as watering and providing adequate sunlight, to sustain life and growth. Many individuals forget to water their plants because of their hectic daily schedules, and as a result, these plants suffer from a variety of illnesses and eventually die. Furthermore, the world's most pressing concern in modern society is a lack of water resources; agriculture is a tough task that requires significant amounts of water. It is very important to utilize water resources in the appropriate way.

1.INTRODUCTION

An innovative answer to the age-old problem of keeping plants healthy is an IoT-based plant watering system. This system is a sophisticated combination of technology and nature. This system uses the Internet of Things (IoT) to automate and fine-tune the process of watering plants, meeting their specific requirements and reducing human effort at the same time. It continuously monitors crucial parameters like soil moisture levels, ambient temperature, and humidity through a network of sensors, actuators, and connected devices. The system is able to intelligently assess the plant's requirements using this real-time data and deliver precisely the right amount of water at the right time, maximizing growth and minimizing resource consumption. Users can conveniently adjust settings and monitor plant health from anywhere with the ability to be controlled remotely via smartphones or computers, ensuring that their greenery thrives even when they are not present. In a nutshell, an IoT-based plant watering system heralds a new era of smart gardening in which technology effectively and precisely cares for nature.

2.EXISTING SYSTEM

Existing technology that employs a sensor to detect soil moisture levels and activates a watering system to water the plants when the moisture level falls below a specified threshold. The existing system offers various advantages over manual watering methods, including increased plant growth, less water consumption, and lower labor costs. The system is also simple to install and use, making it an appealing alternative for both small-scale farmers and home gardeners. However, there are several limits to the current system.

The accuracy of the blynk sensor may vary depending on the type of soil and environmental factors such as temperature and humidity. The system may also require periodic calibration to ensure accurate readings. Overall, the existing automatic plant watering system using blynk is a promising technology that can help improve the efficiency and sustainability of agriculture and gardening practices.

3.PROPOSED SYSTEM

The IoT-based plant watering system was developed to continuously sense the soil's moisture and temperature. The system responds correctly by watering the soil with the exact amount of water required and then turning off the water supply once the required amount of soil moisture is reached. The reference amount of soil moisture is already input into the microcontroller. This reference soil moisture content was designed to be adaptable for the three most frequent soil types: sandy, loamy, and clayey.Moisture and temperature sensors were constructed with probes made of corrosion-resistant material that may be inserted into soil samples.

Voltage levels corresponding to the soil sample's wet and dry status were calculated by measuring the resistance between the moisture probes and comparing it to the output voltage of a comparator. A proposed IoT-based plant watering system would use advanced sensor technology to track soil moisture levels, ambient temperature, and other environmental conditions in real time. These sensors would be wired into a network and linked to a central control unit, such as an ESP32 microcontroller or a comparable device. This control unit collects and analyzes sensor data to determine the appropriate watering schedule and volume depending on predefined parameters and plant requirements.

The Blynk IoT platform's user-friendly interface or a custom mobile application would allow users to remotely check the health of their plants and modify watering settings as needed. Furthermore, the system could include features like automatic warnings and notifications to notify users of severe conditions or maintenance needs. The suggested system uses IoT technology to optimize plant care practices, preserve water resources, and promote sustainable gardening behaviors, resulting in healthier and more robust plant development.

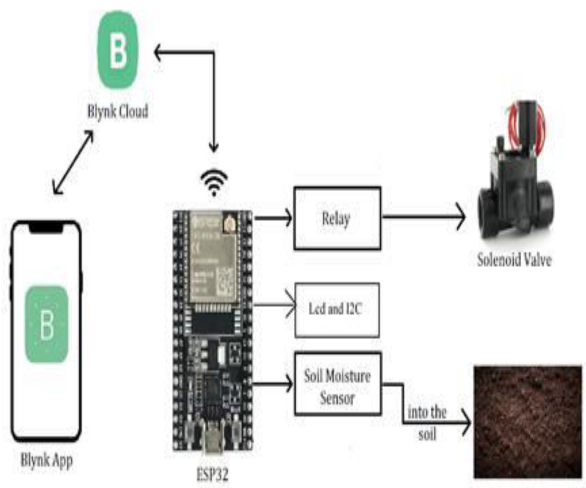

Fig 1:Block Diagram

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4. COMPONENTS USED AND DESCRIPTION

4.1 SOIL MOISTURE SENSOR:

This sensor measures the moisture content in the soil. It can be either resistive or capacitive. Resistive sensors measure the resistance between two probes inserted into the soil, while capacitive sensors measure the dielectric constant of the soil, which changes with moisture content. Soil moisture sensor measures the soil water content. Soil moisture probe consists of a plurality of soil moisture sensors. Soil moisture sensor technology, commonly used are:

•Frequency domain sensor, such as a capacitive sensor.

• Neutron moisture meter, characteristic of the use of water in the neutron moderator.

• Soil resistivity. In this particular project, we will use the soil moisture sensors which can be inserted into soil to measure the soil moisture content.

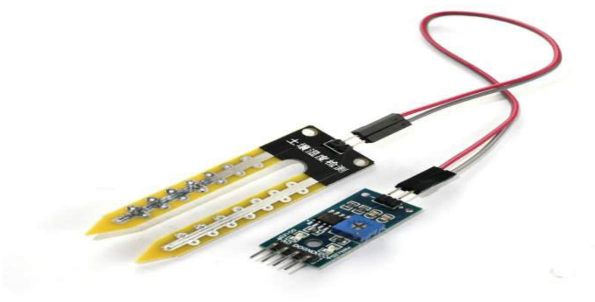

Fig 2: Soil Moisture Sensor

4.2 RELAY MODULE:

A relay module is an electrical switch powered by an electromagnet. It comprises of a coil that, when activated, generates a magnetic field that forces a switch (typically mechanical) to open or close. A relay is an electrically operated switch. Many relays for switching solenoid mechanisms are mechanically operated, however they can also be employed for various modes of operation. Relays were commonly employed in early computers to connect telephones and execute logical functions.

Fig 3: Relay Module

4.3 I2C MODULE:

I2C Module includes a PCF8574 I2C chip, which converts I2C serial data to parallel data for the LCD display.

These modules now come with a default I2C address of either 0x27 or 0x3F. To establish the version, look at the black I2C adaptor board on the module's underside. If there are three sets of pads designated A0, A1, and A2, the default address will be 0x3F. If there are no pads, the default address will be 0x27.

The module includes a contrast adjustment pot on the display's backside. This may require adjustment for the screen to show text properly.

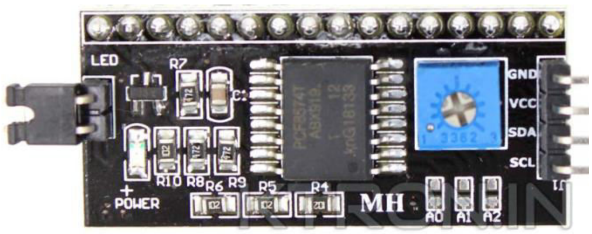

Fig 4: I2C Module

4.4 LCD MODULE:

An LCD (Liquid Crystal Display) module is a typical electrical component that displays text and graphics. It is made up of a grid of pixels, each of which contains a liquid crystal that can change its optical properties in response to an electric field. The module usually consists of a display panel, a controller, and a number of supporting components. The display panel is made up of several layers, including polarizers, electrodes, and the liquid crystal layer itself, all sandwiched between glass substrates. The controller is in charge of the display's operation, receiving input from a microcontroller or other source and translating it into impulses that control individual pixels. LCD modules are available in a variety of sizes and resolutions, making them suitable for a wide range of applications.

Fig 5: LCD Display

4.5 WATER PUMP

A water pump is a pump that combines mechanical and hydraulic principles to circulate water through a piping system and generate adequate force for future use. Because of early civilization, they were almost always in one structure or another. The primary function of a water pump is to convey water between two places and remove excess water. It is commonly utilized on construction sites, in tunnels, river beds, and in residential constructions. It uses an electric motor to spin an impeller, which is a revolving element having vanes or blades.

Fig 6: Water Pump

4.6 LI-ION BATTERY:

A lithium-ion battery is a rechargeable battery that charges and discharges when lithium ions move between the negative (anode) and positive (cathode) electrodes. (In general, rechargeable batteries are referred to as secondary batteries, while disposable batteries are referred to as main batteries.)

Because lithium-ion batteries can store high-capacity electricity, they are utilized in a wide range of applications, including consumer devices like smartphones and PCs, industrial robots, production equipment, and automobiles.

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Fig 7: Li Ion Batteries

5.**WOKRING :**

5.1 Modules and connections:

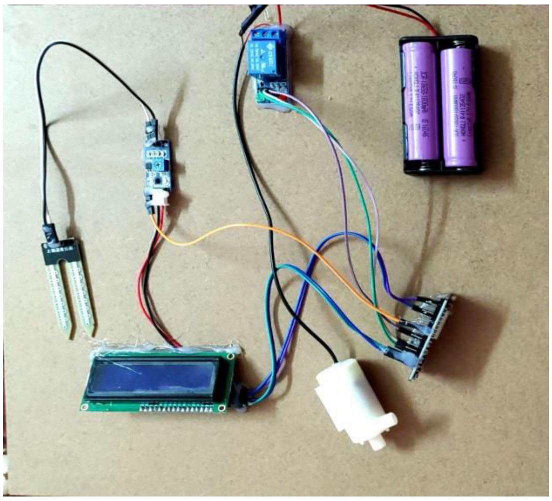

Fig 7: Circuit Connections Of Model

Designing a hardware configuration for an IoT-based plant watering system with the components you mentioned requires careful consideration of power management, sensor interfacing, communication, and actuation. Here's a basic outline of how you might design such a system:

1. **ESP32 Development Board**: The ESP32 will serve as the main controller for the system. It's chosen for its built-in Wi-Fi capabilities, ample GPIO pins, and processing power suitable for handling sensor data and IoT communication.

2. **Soil Moisture Sensor**: The soil moisture sensor will be connected to one of the GPIO pins of the ESP32 to measure the moisture level of the soil. Ensure compatibility between the sensor's output voltage levels and the ESP32's GPIO voltage levels.

3. **LCD (Liquid Crystal Display) with I2C Module**: Use an I2C-enabled LCD module to display relevant information such as moisture levels, system status, or any alerts. The I2C communication interface will require connecting the SDA and SCL lines to the ESP32's corresponding GPIO pins.

4. **Relay Module**: Connect a relay module to the ESP32 to control the water pump. The relay will act as a switch to turn the pump on or off based on moisture sensor readings.

5. **Li-Ion Batteries**: Use Li-Ion batteries to power the system. Ensure that the battery voltage is within the operating range of the ESP32 and other components. Incorporate a charging circuit to recharge the batteries when necessary.

6. **Motor Pump**: Connect the motor pump to the relay module. When the soil moisture sensor detects that the soil moisture level is below a certain threshold, the ESP32 will activate the relay, turning on the motor pump to water the plants.

7. **Voltage Regulation and Power Management**: Include voltage regulation circuits to ensure stable power supply to the ESP32 and other components. Implement power-saving features such as sleep modes to conserve battery life when the system is not in use.

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By carefully integrating these components and considering factors such as power management, sensor accuracy, and communication protocols, you can design a robust IoT-based plant watering system that effectively monitors and maintains the moisture levels of your plants.

6.RESULTS

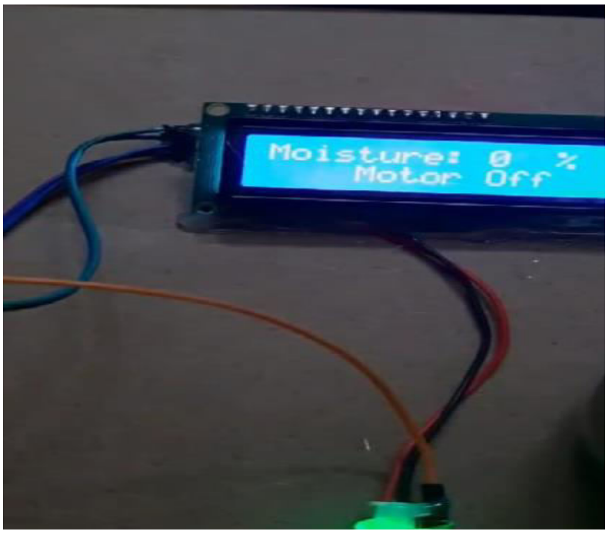

Fig 8: When motor off (Moisture level)

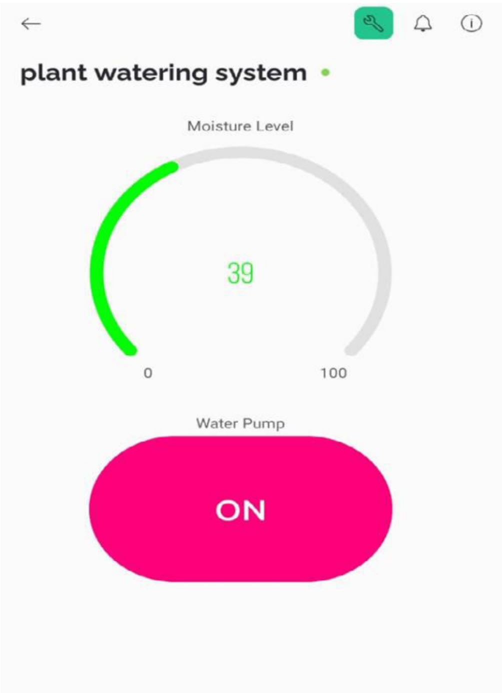

Fig 9:when switch on the motor

Fig 10: When motor on(Moisture level)

6.CONCLUSION

To summarize, the plant watering system provided in this project is an effective solution for automating the watering process and encouraging healthy plant growth. By using sensors to monitor soil moisture levels and operating a water pump accordingly, the system ensures that plants receive the right amount of water for their unique demands. The incorporation of a microcontroller unit enables intelligent decision-making and flexibility in scheduling watering cycles, as well as remote control via a smartphone application. Overall, this technology provides consumers with ease while optimizing water usage and promoting sustainable gardening practices. Additional sensor capabilities may be added as future improvements.

The ESP32 microcontroller's processing capabilities and connection features enable easy integration and intelligent control of watering operations. The soil sensor acts as a critical data collector, offering real-time insights into soil moisture levels and enabling accurate irrigation adapted to each plant's individual requirements. The relay module functions as an intermediate between digital commands and physical actions, allowing for effective water supply through the water pump.

REFERENCE

- Y. C. Manurung, A. S. Hanafiah and P. Marbun, 2015, Pengaruh Berbagai Kadar Air Tanah Pada Efektivitas Mikoriza Arbuskular Terhadap Pertumbuhan dan Serapan Hara Bibit Karet (Hevea brassiliesi Muell.Arg. di Rumah Kasa, Jurnal Online Argoekoteknologi, Vol.3, No. 2, hal 465-467. [Online]. Available: https://bit.ly/2B2xo1z

- T. Pranata, B. Irawan and Ilhamsyah, 2015, Penerapan Logika Fuzzy Pada Sistem Penyiraman Tanaman Otomatis Berbasis Mikrokontroler, Jurnal Coding Sistem Komputer Untan, Vol. III, No.2 hal 11-22. [Online]. Available: https://bit.ly/2Qjc5mW

- E. Nasrullah, A. Trisanto and L. Utami, 2011, Rancang Bangun Sistem Penyiraman Tanaman Secara Otomatis Menggunakan Sensor Suhu LM35 Berbasis Mikrokontroler ATMega8535, Electrician – Jurnal Rekayasa dan Teknologi Electro, Vol. 5, No. 3, hal 182 - 192. [Online]. Available: https://bit.ly/2G4EVTe

- M. Fadhil, B. D. Argo and Y. Hendrawan, 2015, Rancang Bangun Prototype Alat Penyiram Otomatis dengan Sistem Timer RTC DS1307 Berbasis Mikrokontroler Atmega16 pada Tanaman Aeroponik, Jurnal Keteknikan Pertanian Tropis dan Biosistem, Vol. III, No. 1 hal 37 – 43. [Online]. Available: https://bit.ly/2zMc8gQ

- J.Waworundeng, C. Yapian, H. Pandean, 2017, Sistem Pengontrolan Suhu dan Intensitas Cahaya pada Rumah Walet Berbasis Mikrokontroler, E-Proceeding Konferensi Nasional Sistem &Informatika,Bali,Agustus10.[Online].Available:https://bit.ly/2PseF4S

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