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IOT BASED IRRIGATION MONITORING SYSTEM

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***Abstract*— Typically, plant irrigation depends entirely on rainwater, which leads to uncontrolled and excessive water consumption , it cause unhealthy growth. Furthermore, existing farming systems require well ordered control and monitoring to support efficient crop growth. Much effort has been put into producing plant irrigation control and monitoring systems in recent decades, resulting in important high tech improvements in the agricultural sector.This paper explores the expansion of an internet of things-based irrigation control and monitoring system . A monitoring system that could remotely control the irrigation system was placed in the plantation area. User or a person who work with the system through a user interface platform which is developed with the help of Blynk io. Hence, real-time sensor data which is detected by various sensors were detected with the user interface platform and illustrate in an easy-to-interpret manner. The consequences show that the irrigation system can also control the quantity of water used, to take care of efficient plant growth.**

Keywords: IOT, Irrigation Monitoring System, SoilMoisture, NodeMCU, Sensors.

I. INTRODUCTION

The Irrigation Monitoring system is a real-time monitoring system that tracks soil moisture level and motion . It permit remote control of variant field operations from anywhere at any time with the help of internet of things. This model presents a modern style of living where particular person can handle their electronic devices using a smartphone, artistic efficient energy use. Its application extends across different industries, including smart agriculture, smart parking, smart buildings, environmental monitoring, healthcare, transportation, and many others. .

An irrigation monitoring system is a project that enables farmers to monitor and control the water supply to their crops. It helps farmers to avoid wastage of water and improve the quality of crop in their fields by irrigating at the correct times, minimizing runoffs and other wastages, and determining the soil moisture levels accurately. This system will not only permit us to control the water supply but also if there is any animal activity inside the farm then the system will send notification to the user's web-dashboard.

IoT devices such as node micro-controller units (NodeMCU) and sensors can also track farms in real-time and gather crop information remotely without human interferrence. The costs of these systems are convenient and manageable; the main objection would be properly using some various type of sensors and other instruments. This technology is used to forecast a field's irrigation needs with the help of ground parameter sensing such as soil moisture, environmental conditions, along with motion.

Today, irrigation systems are an essential part of make sure high plant productivity in the agricultural industry.

HARDWARE REQUIREMENTS

I.I PIR SENSOR

Fig 1.1 PIR Sensor

A Passive Infrared (PIR) sensor is a type of electronic device that catch, detects infrared (IR) radiation emitted by objects within its field of sight. PIR sensors are generally used for motion detection applications, such as security systems, automatic lighting control, and occupancy sensing. A passive infrared (PIR) sensor is a motion detection device that identifies infrared radiation emitted by objects within its scope. It functions on the principle that any object with a temperature above absolute zero emits infrared radiation.

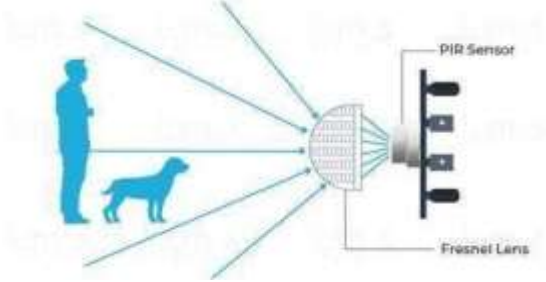

Fig 1.1.1 Working of PIR Sensor

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The below image shows a typical pin configuration of the PIR sensor, which is quite simple to understand the pinouts. The PIR sensor consist of 3 pins,

I.II NODEMCU (ESP8266)

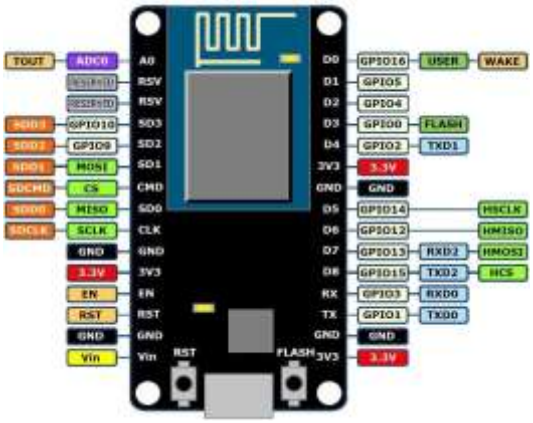

Fig 1.2 NodeMCU

The NodeMCU is a highly preferred microcontroller for IoT projects, it has flexible features. It supports Real-Time Operating Systems (RTOS) and has a variable clock frequency from 80MHz to 160MHz. Equipped with 128 KB of RAM and 4MB of Flash memory, the NodeMCU offers sufficient space for storing data and applications. It operates within a voltage range of 2.5V to 3.6V and consumes an average current of 80mA, ensuring consistent performance in temperatures ranging from -40°C to 125°C. The NodeMCU enables firmware updates through UART downloads or Over-The-Air (OTA) programming via the network. It also features a Software Development Kit (SDK) for custom development and integration with cloud servers. To initiate with NodeMCU, one must configure the firmware with the required modules, flash it to the chip, and then proceed to upload the code to the device.

I.III SOIL MOISTURE SENSOR

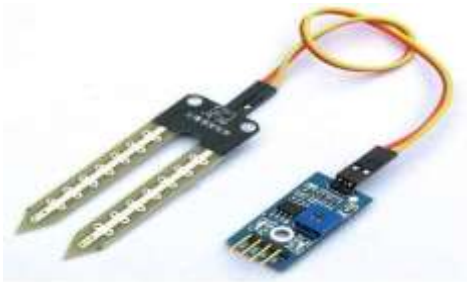

Fig 1.3 Soil Moisture Sensor

- Soil moisture sensors functioning by:
- Assessing moisture levels instant in soil!
- Employing a duo of probes for gauging water volume content.
- Identify diversification in soil qualities linking to water presents.
- Using capacitance for gauging the dielectric permittivity of close medium that correlates with water content.

II LITERATURE

It helps to watering the crops at the right time with the right amount of water. The traditional irrigation system uses a large amount of water and supplies uneven water to crops . This affects the quality of crops and there is a chance to get the crops and there is a chance to get the crops damaged. This project is an excellent solution for such kind of problems . Many irrigation systems exists such as ,Monitoring of rice crops using GPRS and wireless sensors for efficient use of water and Electricity; Wireless Sensor Networks Agriculture: For Potato Farming. Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS.

Noerhayati et al., (2020) : Noerhayati et al, did research on Design of plant watering equipment with automatic pumps for a drip irrigation system on dry land. He contributed automated tool that can help overcome the shortage of water in the dry season on dry land, − Scientific knowledge in automation watering drip irrigation systems using pump solar energy as renewable energy.

Saputra, (2020) : Soil moisture monitoring through the Telegram application based on the results of watering plants. Saputra introduce with Measure soil moisture levels of plants, Send messages about soil moisture conditions in the form of Telegram messages . Experimental results demonstrate, Watering plants.

Ren et al., (2020) : Ren et al, present Gardening smart system for web-based orchid plant care. The paper introduces Soil moisture content (pH) can be controlled automatically. Apart from the automatic mode, users can use the manual mode by turning it on and off pump via online irrigation system.

Fauziah et al., (2022) : Fauziah et al, present Horticultural plant growth control and monitoring system in a smart garden. The paper introduces with Design of a smart garden system based on LoRa, Design of a smart garden based on LoRa technology for automatic watering of kale plants.

III METHODOLOGY

- Soil Moisture Sensormeasures the moisture level of the soil.
- NodeMCU processes the moisture data and display it on 16*2 LCD display module.
- User can control the supply of water for maintaining moisture level below 30% is considered as dry and most prefarable moisture level for plants is 55%-65%.
- NodeMCU controls the relay module and relay module drives the water pump , water pump will control the water flow.

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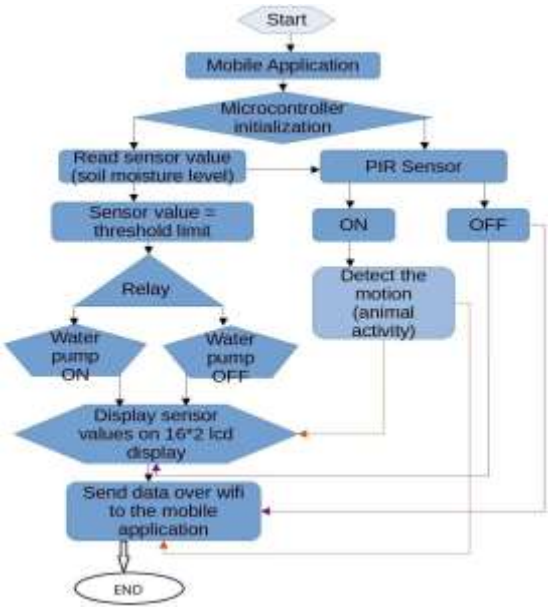
- PIR sensor if there is any animal activity then PIR sensor will detect the movement and sends the notification to the user also blinks the (red coloured) LED on user's web-dashboard.

Fig 3.1 Flow Chart



Study of process of different technologies used in the system.
NodeMCU ESP8266 : A versatile WiFi enabled microcontroller.
Soil Moisture Sensor : Measures soil moisture content.
PIR Sensor : Detects animal Movement.
Water Pump : Controls water flow.
Relay Module : Drives the Pump.

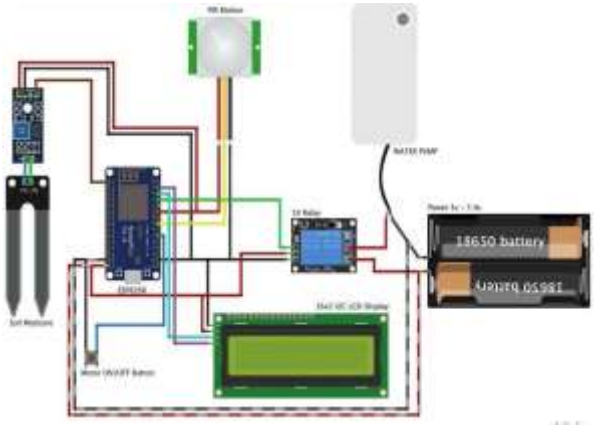


Fig 3.2 Circuit Diagram

Applications : The primary applications for this project are for farmars. Agriculture ; precision farming, crop management, and greenhouse cultivation. Landscaping irrigation ; Lawn and garden maintenance for homes and public spaces. Commercial Plant Nurseries ; Ensuring Optimal conditions for plant growth. Sports field irrigation. Golf course irrigation.

Problem Statements : Water Efficiency: Create a system that can accurately assess the moisture levelsin the soil and deliver water to plants only when necessary, minimizing water wastage. Cost-effectiveness: Strive to keep the system affordable and consider the long-term economic benefits of water savings and increased crop productivity.
Soil Moisture Monitoring: Develop sensors and data collection mechanisms to continuously monitor soil moisture levels in the agricultural field.

IV RESULT

A mobile application and a desktop application were developed using Blynk.io (see Figures 4.1 and 4.2), appropriately. Therefore, users could monitor the soil moisture and then supervise its irrigation system accordingly. Gauge were used to show
the soil moisture. When the soil moisture level goes low, Switches in the form of on/off button gadgets were used to activate and deactivate the pump.

Fig 4.1 :(Desktop) Interface development based on blynk

Fig 4.2 :(Mobile) Interface development based on blynk

In this project we can control the motor in the field based on moisture level. The Moisture level of soil is sensed by the soil moisture sensor. These values are converted into digital form and applied to nodemcu (ESP8266).

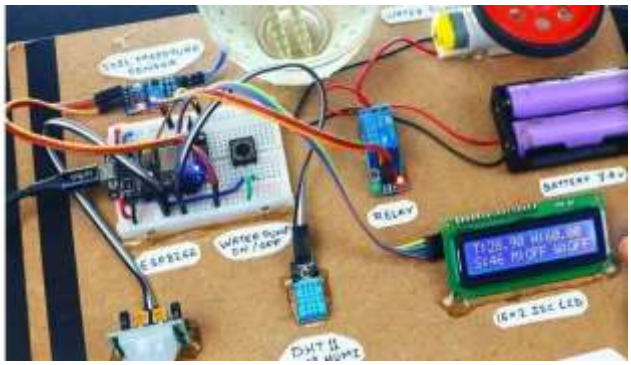


Fig 4.3 : Experimental Setup

If the moisture levels of soil dropped down then we can turn on the motor to supply the water. Also in manual mode we can control the motor. PIR motion sensor detects the animal activity and send notification to the user on application.

V. Conclusion

The Irrigation Monitoring System, powered by IoT, has undergone rigorous analytical testing to validate its effectiveness. By constantly monitoring soil moisture levels and enabling remote control of field motors via the internet, the system ensures timely irrigation. Additionally, granting users access to real-time field parameter analysis from anywhere.This capability empowers users to adjust and maintain field conditions promptly. To minimize wastage of water. To reduce human dependency for watering plants at home. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmers effort, water and time. Irrigation management is a complex decision making process to determine when and how much water to apply to a growing crop to meet specific management objectives. In conclusion, the Irrigation Monitoring System surpasses traditional scheduled irrigation methods in efficiency and effectiveness.
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