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# Wireless Sensor Network for Effective Irrigation Control and Monitoring

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**ABSTRACT :** This project involves creating a wireless sensor network for monitoring and controlling the soil moisture and pump using two separate nodes, a sensor node and a relay node. The sensor node consists of a D1 mini and a soil moisture sensor, while the relay node consists of an ESP32 and a relay. Both nodes are connected to the internet through Wi-Fi and utilize the Adafruit IO cloud platform for data communication. The sensor node periodically measures the moisture level of the soil and publishes the data to the Adafruit IO cloud. The relay node subscribes to the moisture level feed and turns the relay on or off depending on whether the moisture level is above or below a predefined threshold value. Additionally, the system is highly scalable, allowing multiple sensor nodes to be deployed and controlled through a single relay node.

**KEYWORDS:** Irrigation, ESP32, Moisture sensor, D1 Mini, Wi-Fi, Adafruit IO Cloud

## I. INTRODUCTION

Agriculture plays a vital role in every country's economy. Generally agriculture uses 80 % of fresh water. This percentage will be dominant in water consumption because of population growth so this becomes very important to create a system which is based on science and technology for sustainable use of water. There are so many systems available to achieve water savings in various crops from basic ones to more technologically advanced ones. In one system plant water status was monitored and it is based on canopy temperature of the plant, another system was developed to arrange irrigation of crop water stress index. This paper uses a low cost wireless device for data communication. An automated irrigation system is developed with a low cost moisture sensor In environmental application, sensor networks have been used to monitor a variety of environmental parameters or conditions in marine, soil and atmospheric conditions. Applications in agriculture have been used to provide data for appropriate management, ranging from limited and low resolution devices with sensors and IoT.

The WSN based irrigation system makes use of technology for measuring the soil moisture and based on the parameter, the system on its own decides to switch on/off the pump. The solution uses the distributed Wireless Sensor Network with two nodes named by sensor node and relay node. The sensor node has a capacitive moisture sensor and power supply and The relay node has a switch for the system and water pump. The wifi module ESP32 used to communicate between the nodes around 500 meters. The IO cloud is used to store the data of the moisture level in the field and status of the switch in the relay node. Adafruit platform helps to monitor and control the field in remote access.

## II. RELATED WORK

There are several benefits in developing microcontroller-based circuits and incorporating new device technologies into agricultural applications. At present, labor-saving and water-saving technology could also be a key issue in irrigation. There are many existing irrigation systems available within the market and lots of researchers performing on it. This system uses the D1 Mini and ESP32 modules to provide automatic irrigation.



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The development of Wireless Sensor Network based on microcontrollers and communication technologies can improve the current method of monitoring to support the response appropriately in real time for a wide range of applications.

This system consists of Capacitive Moisture Sensor, Relay, ESP32, D1 Mini to monitor the minute status of the field to help the farmer to maintain his fields with better technology and increase his production value. The system is divided into three segments such as sensor node, relay node, and IO cloud.

The sensor node have a capacitive moisture sensor and power supply that helps to send the level of moisture in the soil and The relay node have a switch for the system and water pump and IO cloud used to store the data of the moisture level in the field and status of the switch in relay node we use Adafruit IO Cloud platform is helps to monitor and control the field in remote access.

### III. METHODOLOGY

The design process of the proposed system is divided into five level and they are follows

1. Requirement level
2. Architecture level
3. Component level
4. Integration level
5. Application level

#### A. Requirement level

It is a first level of the design process of a proposed automatic irrigation system, the requirements consist of technical details, data manipulation and processing, sensing and indication. The proposed system uses a sensing device to detect soil moisture. It uses an automatic indication to detect an automatic operation such as Motor Or Water Pump(ON/OFF).

#### B. Architecture level

The algorithm for the proposed design is shown in Figure 1. The sensor which is placed at the field station is powered up with DC power. At a particular area in the field the soil moisture is given by capacitive soil moisture sensor. The values are transferred to the base station in particular time intervals. The base station receives the data sent by the field station and correlated with predefined set points are programmed in the base station. When the collected value is higher than the set points the valve of the watering system is activated. The value monitored by the sensors is uploaded on the web by using D1 mini Wi-Fi module. Wherever the user, continuous monitoring of the behaviour of the soil is possible by IO cloud (Adafruit)with the technology of Internet of Things (IOT).

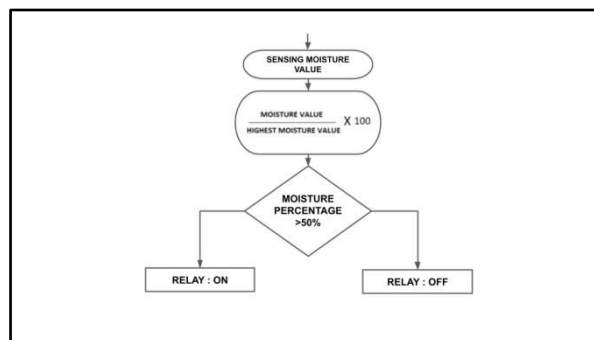


fig.1 Flow Chart

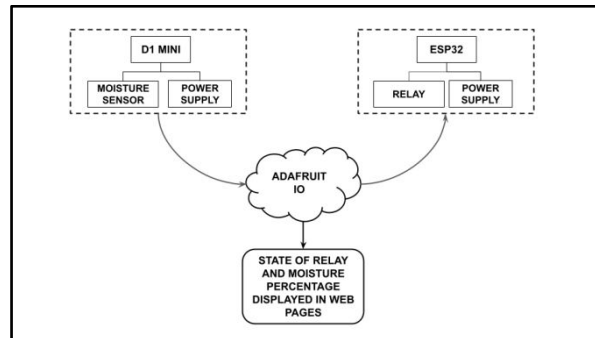


fig.2 Block Diagram

### C. Component level

It is an important and independent part of a system which performs the function in the architecture. It is the most important level for the design of the system. It consists of hardware and software components.

#### a) Hardware component

Hardware component is a physical device that is a part of the system which connects the other component, providing input and output to and from the application. The proposed system hardware components are Capacitive soil moisture sensor, WI-FI module (D1 mini and ESP32), Motor pump, Relay.

#### b) Software component

It is interfaced between the hardware and PC. The features inbuilt in a software application is called a software component.

### D. Implementation level

It implements the architecture level of the project, it works towards the integration of the software and hardware.

### E. Application level

The proposed system is applied in the agriculture field to detect the moisture, which will improve the quality and quantity of crop products.

## IV. EXPERIMENTAL SETUP

The farmer has the ability to monitor the sensor information at his/her home, the sensor information displays on the webpage we created, The capacitive moisture sensor senses the value of moisture in the soil and these values are compared with the threshold value.





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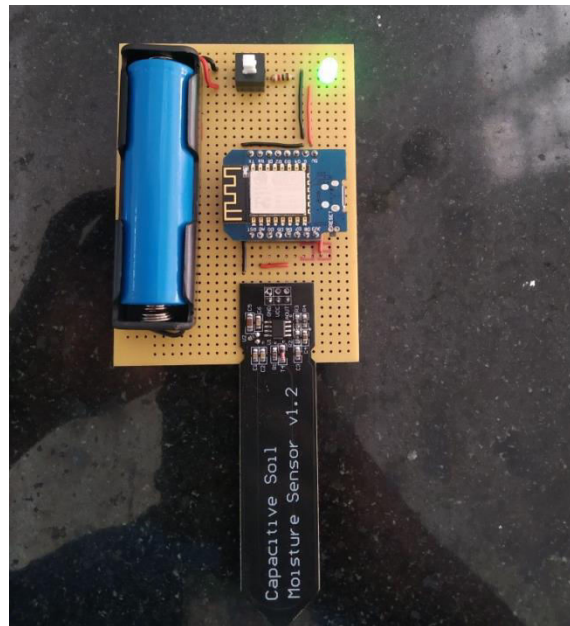


fig.3 Sensor Node

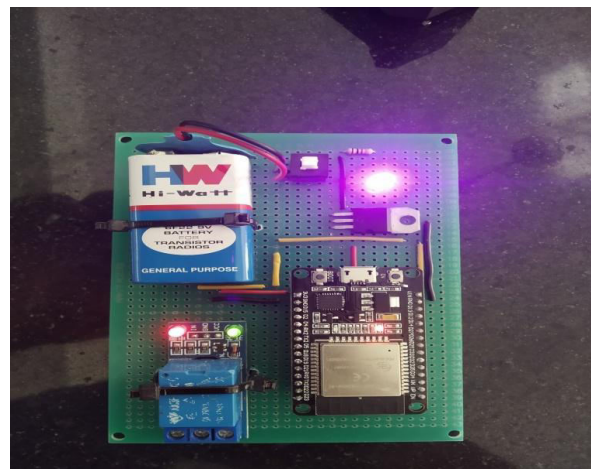


fig.4 Relay Node

## V. CONCLUSION

We have successfully developed a sensor based smart irrigation system with the capabilities of remote monitoring and controlling of water usage in the agriculture field using IoT.

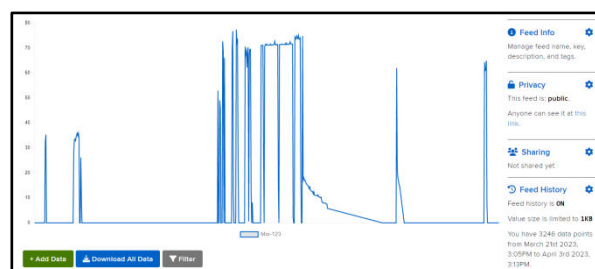


fig.5 Moisture level in Adafruit IO



## REFERENCES

- [1] S. Kaur and P. K. Singh, "Implementation of Wireless Sensor Network Using IoT and Adafruit IO," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kharagpur, India, 2020, pp. 1-6, doi: 10.1109/ICCCNT49239.2020.9225485.
- [2] A. Das, S. S. Sahoo, S. Mishra and S. Rath, "Design and Implementation of IoT based WSN for Real Time Temperature Monitoring and Controlling Using Node MCU and Adafruit IO," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kharagpur, India, 2020, pp. 1-6, doi: 10.1109/ICCCNT49239.2020.9225484.
- [3] A. R. M. Marzuki and M. A. M. Ramli, "Development of Wireless Sensor Network (WSN) Using Adafruit IO and ESP8266 for Greenhouse Monitoring System," 2020 IEEE 8th International Conference on Bio-Inspired Computing: Theories and Applications (BIC-TA), Shenzhen, China, 2020, pp. 237-241, doi: 10.1109/BIC-TA51268.2020.00054.
- [4] H. A. Abdullah, A. G. Ismail and H. S. Alsabbagh, "Smart Campus Environment Monitoring System Using IoT and WSN Technologies," 2020 IEEE 2nd Conference on Information and Computer Technologies (ICICT), Marrakech, Morocco, 2020, pp. 1-6, doi: 10.1109/ICICT50884.2020.9255422.
- [5] S. M. A. Shafie, H. K. Lee, K. H. Chua and R. Ismail, "Low-Power Wireless Sensor Networks for Air Quality Monitoring System: A Review," in IEEE Access, vol. 8, pp. 33731-33743, 2020, doi: 10.1109/ACCESS.2020.2977694



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