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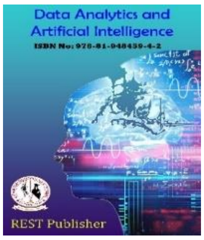

Micro Irrigation System Using IOT

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Abstract: *IOT is used to send data to users by connecting gadgets to the internet. The main tools required in the current world to conserve water and provide plants the right amount of water are micro-irrigation systems. Devices having sensors, processors, software, and other technologies that communicate and share data with other devices and systems via the Internet or other communications networks are referred to as Internet of Things (IoT) devices. Electronics, communication, computer science, and engineering are all included in the Internet of Things. The term "Internet of Things" has been deemed misleading since items merely need to be individually addressable and connected to a network, not the general internet. Drip irrigation, sprinkler systems, and ditch irrigation are examples of classic irrigation techniques. The uncontrolled irrigation methods, waterlogging, soil erosion, water waste, and constant human involvement of traditional irrigation systems result in increased electricity consumption and inconsistent plant development. With the introduction of IoT technologies, crop productivity can be precisely watered, resulting in minimal maintenance, efficient use of resources, and the ability to foresee future harm. By connecting one mother/feeder pipe to multiple child pipes, which in turn covers the entire region for watering, a novel, complex method minimises the issue. The control valve boxes with IoT capabilities are installed throughout a half-kilometre radius. Because the system runs on solar power, it doesn't need an extra battery that can withstand bad weather.*
Keywords: *Smart control valve, solar operated, cloud computing, mesh networking, nutrients control, wireless technology, harm prediction.*

1. INTRODUCTION

Imagine a network of real-world objects, such as gadgets, cars, buildings, and other things, that are able to gather and sharedata because they are embedded with sensors, software, electronics, and networkconnectivity. The Internet of Things (IoT), with its enormous potential, is a machine- to-machine, machine-to-infrastructure, andintelligent system. The Internet of Things envisions a world in which nearlyeverything is networked and capable of intelligent communication. Put anotherway, the physical world is merging intoone massive information system thanks to the Internet of Things. One of the newest and most promising technologies in the world, IoT, has a wide range of practical real-time uses. The technology has a wide range of applications and could rank among the most advanced of the modern era. Large areas are covered in agriculture, making it challenging to keep an eye on every angle that could result in an unequal sprinkler system. Different locations have experienced water shortagesas a result of the decreased rainfall. Such difficulties can be tailored using certain strategies. Using an irrigation system thatis digitally smart controlled is one method of resolving this issue. With the help ofthis method, crops may be precisely watered, saving water and increasing output, requiring less upkeep, and predicting potential damage. For farmers and large-scale irrigation project managersthat have to work with varying soil moisture and nutrient levels, Internet of Things (IoT)-based technology providesolutions. These systems are designed to maintain and track water flow automatically in agricultural farms so that the precise amount is obtained with theleast amount of human intervention. IoT real-time data will assist in identifying agricultural zones at risk of germination or with inadequate irrigation, allowing for prompt remedial action. While a number of IoT devices allow their communications with various protocols, none of them are optimal for contemporaryapplications. The system makes it possible to continuously monitor the water flow in order to determine the precise amount while also maximising efficiency. LoRa turned out to be the perfect answer to handle the growing bandwidth, low-cost requirement, longer data transmission distance, and lower power consumption.From the application server to the end devices, LoRa provides extremely secure connection and provides simple, effective, adaptable, and affordable IoT solutions. Using a moisture sensor, an intelligent automatic plant irrigation system focuses on routinely watering plants without human supervision. A comparator

Op-amp (Operating Amplifier)and a timer that activates a relay to turn on a motor are the main components of the circuit. A hardware component used by thesystem is susceptible to variation based on external factors. Why smart irrigation isnecessary might be a question. The amountof water that crops or plants require is not checked when irrigation is done by hand. Water is still present in the soil even when it is sufficiently damp. This water is wasted because the plants do not absorb it. Thus, a system is in place to keep an eyeon the water requirements. This prototype keeps an eye on the temperature and moisture content of thesoil. Depending on the type of soil or crop,a predetermined range of temperature and soil moisture can be adjusted. The watering system is turned on or off if the soil's temperature or moisture content varies from the designated range. Whenthe soil temperature is high and the soil is dry, the irrigation system will be triggered,sending water to irrigate the plants. It is advised to use this technology for effective automated irrigation systems, as it could offer a useful tool for water conservation and irrigation scheduling thatcan be applied to other crops that are comparable. Using a servo motor to distribute the water evenly ensures that theplant absorbs the maximum amount of it. By keeping an eye on soil moisture, this system also makes it possible to regulate how much water is given to the plants at the appropriate time, depending on the type of plant. This project can be applied in sizable agricultural areas where minimising human labour is necessary. Software allows for the customization and fine-tuning of many system components to meet plant requirements.

2. EXISTING SYSTEM

The threshold value of moisture is typically ignored in current systems, resulting in erratic irrigation schedules thateither over- or under-irrigate the field, which ultimately impacts crop productivity. There are situations where a fixed moisture threshold results in an additional drawback. Different crops require different growing environments, and when the system's moisture content is fixed, the conditions might not be right for the development and yield of the crop. A technique is suggested to track the moisture content of the soil, and irrigation is only carried out when the moisture content falls below a predetermined level.

3. PROPOSED SYSTEM

The soil moisture sensor senses the amount of moisture content in the soil which is uploaded to the Arduino board. The Arduino board transfers the controlover the system to the relay module which is responsible for switching operations. The relay module ensures proper irrigationof the field turning it on when the value of moisture is below the threshold value and turns off the supply when the moisture content is sufficient for the crop or plant thereby preventing under irrigation or overirrigation. The state of the relay module is indicated by the LED. A simple process flow representation of the system is shownin figure 1. From the representation, it is clearly understood that the working of the system is simple and can be controlled easily.

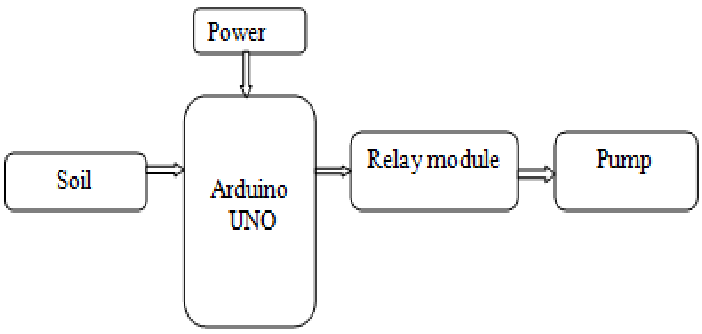

FIGURE 1. Working of the System

4. WORKING

The system consists of varioushardware components that are put together to sense and irrigate the fields automatically. Each of these components has unique function to perform and the system attains full efficiency when each ofthese components work properly.

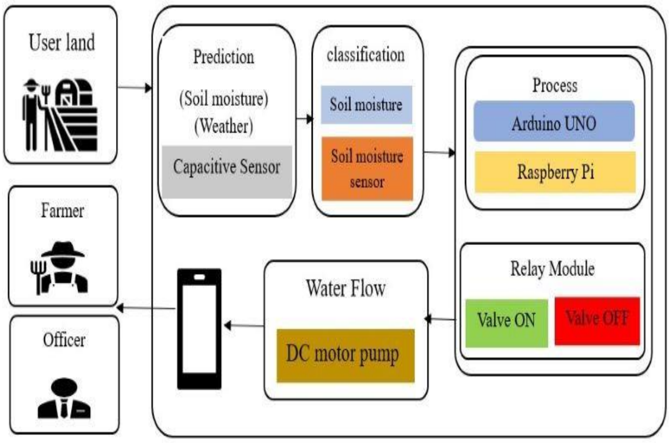

FIGURE 2. Consists of Varioushardware Components

5. CONSTRUCTION

To continuously measure the moisture content of the soil, a soil moisture sensor isplaced in the field. Depending on the type of sensed information, the sensor's sensed data can be either digital or analogue, and both are connected to the Arduino board. The Analogue Digital Converter (ADC) and the relay module receive voltage from the Arduino. The ground pin of the Arduino is linked to the relay module's ground. The output from the Arduino is given tothe relay module. The other side of therelay module is connected to the water pump through a 12V power supply. One end of the water pump is kept inside awater source and the other side is kept in the soil. Each of the components in thesystem is connected properly to ensure proper working of the system in order to make sure that it gives the best efficiency.

6. WORK FLOW

The embedded soil moisture sensorcontinuously measures the soil's moisture content and relays the information to the Arduino. The moisture threshold value is contained in the Embedded C programme that has already been uploaded to the Arduino. To protect the crop from harm, the moisture level must always be within the range. The relay module, which handles the switching process, receives control of the system when the sensed value is determined to be less than the value specified in the code, i.e., if the soil'smoisture content is less than the threshold value. The switch that permits the water to flow is now activated by the relay module. The water is supplied at regular intervals because the sensor senses the moisture regularly making it have the maximum efficiency of the system.

7. OUTCOMES

A garden plant was used to test the intelligent irrigation system. The Arduino code set the moisture range to 40%–100%,which created the ideal environment forplant growth. Additionally, this system shows to be efficient and economical in terms of conserving water and minimizing waste. The programme source codespecifies a delay time that determines when this moisture display occurs on a regular basis. The relay module, which turns on and off the irrigation or waterflow, is in charge of controlling this.

8. CONCLUSION AND FUTURE SCOPE

Nowadays, farmers irrigate their land using a manual control method that involves regular intervals of watering. There appears to be more water wastedduring this process. Moreover, irrigationbecomes challenging in arid regions with little rainfall. Therefore, we need an automated system that can precisely track and manage the field's water requirements.Installing a smart irrigation system guarantees water conservation and savestime. Additionally, this architecture makes use of Arduino, which promises to extend system life by consuming less power. Additionally, it lessens the need for humanintervention, requiring less effort from the farmer. Less water is released for the plants if rain is expected. Additionally, a GSM module may be added to allow smartphonecontrol of the system by the user. To estimate the amount of water used for irrigation and subsequently provide a cost estimate, a water metre can be installed. The amount of water flow can be adjusted with a solenoid valve. By connecting the sensors and changing the project's source code, it is also possible to monitor additional growth or soil parameters. Additionally, by lowering the quantity of additional hardware components required for the system, this integration can lower the system's overall cost. The data on the cloud will be sent by the systemcontinuously. Moreover, these data are accessiblethrough an Android app that uses Bluetooth. The farmer can operate the semiautomatic system using the app if there is no internet connection. Farmerscan benefit greatly from being able to measure the pH content of the soil, which can help identify the plant's growth earlier.Early knowledge of the crops that can be grown in the field benefits the farmer.

REFERENCES

[1]. Nandhini, R., Poovizhi, S., Jose, P., Ranjitha, R. and Anila, S., 2017, March. Arduino based smart irrigation system using IoT. In 3rd National Conference on Intelligent Information and Computing Technologies (IICT '17) (pp. 1-5).

[2]. Kansara, Karan, Vishal Zaveri, ShreyansShah, Sandip Delwadkar, and Kaushal Jani. "Sensor based automated irrigationsystem with IOT: A technical review." International Journal of Computer Science and Information Technologies 6, no. 6 (2015): 5331-5333.

[3]. Pawar, S.B., Rajput, P. and Shaikh, A., 2018. Smart irrigation system using IOT and raspberry pi. International Research Journal of Engineering and Technology, 5(8), pp.1163-1166.

[4].Kumar, Amit, Praful Ranjan, and Vaibhav Saini. "Smart irrigation system using IoT." In Agri-Food 4.0: Innovations,Challenges and Strategies, pp. 123-139. Emerald Publishing Limited, 2022.

[5]. Rao, R.N. and Sridhar, B., 2018, January. IoT based smart crop-field monitoring and automation irrigation system. In 2018 2nd International Conference on Inventive Systems and Control (ICISC) (pp. 478-483). IEEE.

[6]. Obaideen, Khaled, Bashria AA Yousef, Maryam Nooman AlMallahi, Yong Chai Tan, Montaser Mahmoud, Hadi Jaber, and Mohamad Ramadan. "An overview of smart irrigation systems usingIoT." Energy Nexus (2022): 100124.