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Smart Irrigation System

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Abstract: *This research aims to carry out a systematic review of the available literature about smart irrigation systems. Nowadays, evolving technologies have contributed significantly to enriching the field of agriculture. The automation process is integrated to drive devices to work independently and communicate by including smart technologies and devices with which a multitude of tasks are executed without a human hand. Thus, this work introduces an automatic irrigation system based on smart sensors that can be used in a moderate and economic way to monitor the mint or any kind of plant by integrating some connected electronic devices and other advantageous instruments widely used in the field of IOT. This system includes a soil moisture sensor placed in the root zone of the plant, a temperature sensor, and a water flow sensor connected to the valve of the water pumping motor. These sensors are integrated with an Arduino UNO microcontroller, relay module, DC pumping motor, and power battery. In other words, the behaviour of this automated system is encapsulated in detecting the soil moisture and the temperature level and automatically switching the pumping motor to ON or OFF in relation to the soil moisture state at a controlled timing. The sensed data is transmitted to a computer to be included in the CSV dataset from which graphs are generated for analysis during one day of recording. Generally, this kind of automated irrigation system could be easily applied to small gardens, nurseries, or greenhouses. Recently, innovative solutions have been incorporated for reducing costs, saving time, and optimizing the use of resources.*

Keywords: Microcontroller, Smart Irrigation, Soil Sensing

I. INTRODUCTION

Irrigation is considered an artificial utilization of the water on the soil using different methods such as pumps, tube sand sprays. Usually, the need for irrigation appears in places where the rainfall is irregular, in dry times, or in places where dehydration is regular . Too many irrigation systems are available with different types according to the environment of the soil. The water used in irrigation has many resources ,such as underground water, through wells or springs; the surface water, from lakes, rivers; or other several sources ,for example, the treated wastewater or desalinated seawater Therefore, Therefore, farmers have to save and protect their agricultural water sources by minimizing the potential of diseases. Since with any groundwater extraction, users of irrigation water need to be careful not to drain ground water with a rate greater than it is being regenerated . There are two methodologies of modern irrigation systems ,the traditional irrigation methodologies and the intelligent irrigation methodologies . Traditional irrigation is such as surface irrigation, drip irrigation and sprinkler irrigation.

II. EXISTING SYSTEM AND LIMITATIONS

l) Primary investigation is administered under the subsequent stages, like Understanding the existing approaches, Understanding the wants, developing an abstract for the system. Soil moisture sensor, temperature and humidity sensors placed at roots of a plant and the data is given to android app. The value of soil moisture is given to micro controller to control water quantity.

2) Temperature, humidity and soil moisture values are displayed on the user's device. Smart Irrigation System on Sensing Soil Moisture, intension is to create an automated irrigation process which turns the water motor ON and OFF on detecting moisture percent of the earth. Smart irrigation system developed for the irrigational use of agriculture, which is placed at the remote location and required water provides for plantation when the moisture of the soil gets low

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than the set-point value. This smart irrigation system made use of GSM to control the system which may cost more. A wireless application of drip irrigation automation supported by soil moisture sensors in this smart irrigation is carried out using soil moisture values. Butnthis IOT smart system displays temperature and humidity values.

LIMITATIONS:

- Most effective with smooth, level topography.
- Water with high salt content can't be used.
- Requires adequate water supply throughout growing season.

III. PROBLEM STATEMENT

Irrigation of plants is usually a very time- consuming activity, to be done in a reasonable amount of time, it requires a large amount of human resources. Traditionally all the steps were executed by humans. Nowadays some systems use technology to reduce the number or workers or the time required to water the plants. With such systems, the control is very limited, and many resources are still wasted. Water is one of these resources that are used excessively. Many irrigation is one method used to water the plant. This method represents massive losses since the amount of water given is in excess of the plants needs. The excess water is evacuated by the holes of the pots in greenhouses, or it percolates through the soil in the fields. The contemporary preception of water is that of a free renewable resource that can be used in abundance. It is therefore reasonable to assume that it will soon become a very expensive resource everywhere. In adition to the excess cost of waterm labour is becoming more and more expensive.

As a result, if no effort is invested in optimising these resources, there will be more money involved in the same process. Technology is probably a solution to reduce costs and prevent loss of resource, this project can be a strong way to tackle such a situation.

IV. LITERATURE SURVEY

It is a simple project more useful in watering plants automatically without any human interference. We know that people do not pour the water on to the plants in their gardens when they go to vacation or often forget to water plants. As a result, there is a chance to get the plants damaged. This project is an excellent solution for such kind of problems. Many irrigation systems exits.

Automatic plant watering systems are devices that can water plants automatically based on the soil moisture level, without human intervention. They can be used for various applications, such as indoor gardening, outdoor landscaping, greenhouses, farms, or big agriculture fields. Automatic plant watering systems can offer several benefits, such as saving water, enhancing plant growth, preventing overwatering or underwatering, avoiding soil erosion or salinization, and reducing human errors or efforts. However, designing and implementing an automatic plant watering system is not a trivial task. It involves various aspects, such as hardware components, software code, sensors, actuators, power supply, communication, and control.

In this literature survey, we review the existing works or studies on automatic plant watering system using Arduino Uno, a low-cost and easy-to-use microcontroller board that can be programmed to perform various tasks. Arduino Uno is a popular and widely used platform for hobbyists, students, and researchers who h4nt to create interactive projects or prototypes. Arduino Uno can be interfaced with various sensors, actuators, and modules to build an automatic plant watering system that can sense the soil moisture level and control the water pump accordingly ,

V. SCOPE OF PROJECT

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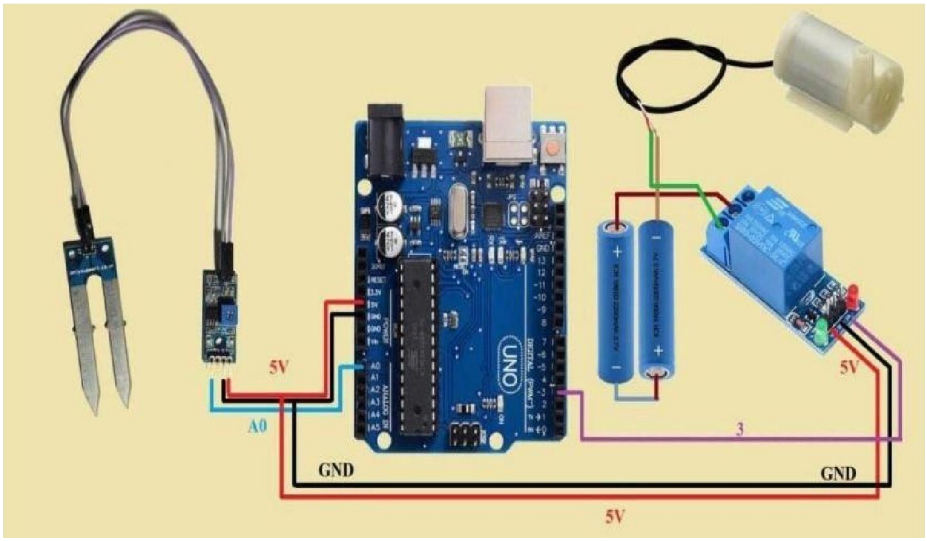
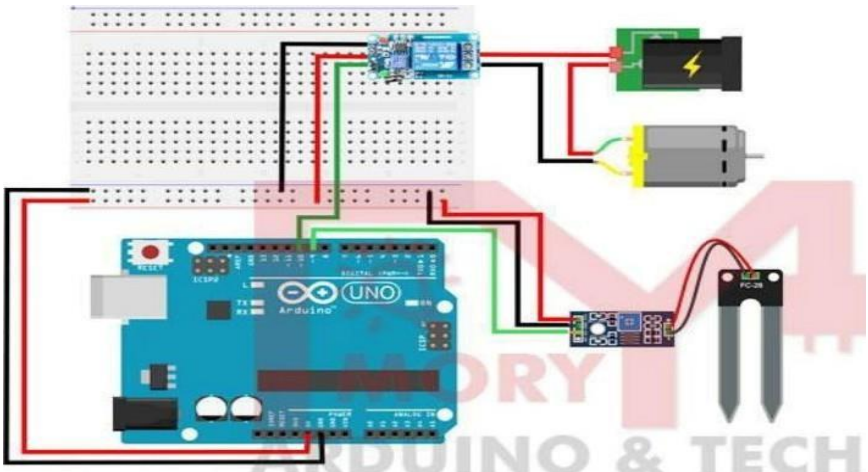
VI. SCHEMATIC DIAGRAM





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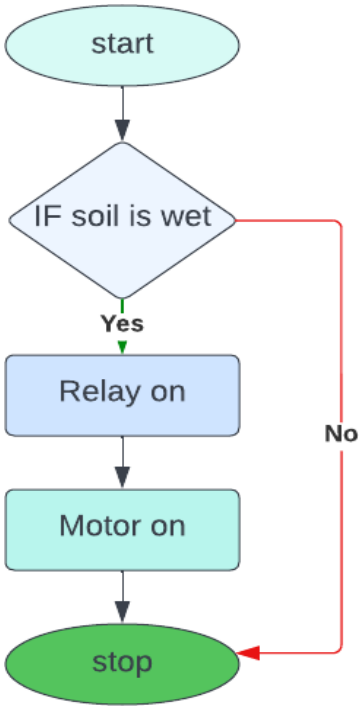
WORKING:

A smart irrigation system operates by leveraging sensors to collect real-time data on soil moisture levels and weather conditions, such as temperature, humidity, and rainfall. This data is transmitted to a central controller, which analyses the information to determine when and how much water is needed for optimal plant health. If irrigation is required, the controller activates valves to deliver water through sprinklers or drip irrigation systems, targeting specific areas efficiently. Users can monitor and manage the system via a mobile app or web interface, allowing for manual adjustments and real-time alerts about system performance.

Additionally, historical data is stored for analysis, helping to optimize future irrigation schedules. Powered by solar panels, batteries, or AC power, smart irrigation systems not only conserve water and reduce costs but also promote healthier landscapes through precise watering tailored to actual needs.

FLOWCHART



PROGRAM:

```
int water; //random variable void setup()
{
pinMode(3,OUTPUT); //output pin for relay board, this will sent signal to the relay pinMode(6,INPUT); //input pin coming from soil sensor
}

void loop()
{
water = digitalRead(6);  // reading the coming signal from the soil sensor if(water == HIGH) // if water level is full then cut the relay
{
digitalWrite(3,LOW); // low is to cut the relay
}
```

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```
else
{
digitalWrite(3,HIGH); //high to continue proving signal and water supply
}
delay(400);
}
```

VII. HARDWARE COMPONENTS DESCRIPTION

Female to Female Connecting Wires /Jumper Wires (Set of 10)

This is a set of 10 rainbow colour male to male jumper wires. They can be used for interconnecting electronic components on breadboard Or berg strips. The wires are 20 cm long. Both the side of the wire has female pins. The colour of all four wires will be different but the exact colour might vary from that of the picture.

Male to Male Connecting Wires

These male-to-male jumper wires are of good quality, reusable and has an approximate length of 20cm.

Specifications of Male to Female Connecting Wires

- 1 x 20cm male to female breadboard connecting wires
- Easy to plug in
- Durable, Flexible
- Multiple Colours
- Jumper wire size : 26 AWG
- Current Rating : up to 1 A
- Insulation Type: PVC

Breadboard (GL-12 840 Points)

The most commonly used tool when designing new circuits. This GL-12 Breadboard is a high-quality breadboard with 830 Points. The board has welldesigned holes that snug in components smoothly and enables high re-usability.
The board also has an adhesive tape behind it which can be used if you wish to mount the board permanently to a place. It also has projectors around it which can be used to club the board with other breadboards of the same size to get more points when working on complex circuits

Arduino

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contams everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Single Channel Relay

Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.

- Supply voltage — 3.75 V to 6V
- Quiescent current: 2mA
- Current when the relay is active: 70mA
- Relay maximum contact voltage - 250VAC or 30VDC
- Relay maximum current — 10A

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DC PUMP

This is a low cost, small size Submersible Pump Motor which can be operated from a 3 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it.

- Operating Voltage : 3~6V
- Operating Current : 130~220mA
- FlowRate : 80~120 L/H
- Maximum Lift : 40~110 mm
- Continuous Working Life : 500 hours

VIII. CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation.

As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use and chemical leaching. Recent advances in soil water sensing make the commercial use of this technology possible to automate irrigation management for vegetable production. However, research indicates that different sensor types perform under all conditions with no negative impact on crop yields with reductions in water use range as high as 70% compared to traditional practices.

REFERENCES

[1]. K.Prathyusha, M. Chaitanya Suman, "Design of Embedded System for the Automation of Drip Irrigation". IJAIEM (2319-4847), vol 1, Issue 2, October 2012

[2]. Prathyusha.Kl, G. Sowmya Bala2, Dr. K. Sreemvasa Ravi, "A real time irrigation control system for precision agriculture using WSN in Indian agricultural sectors" International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol.3, No.4, August 20.

[3]. Akyildig, I.F., 2005. A survey on Sensor Networks [J].IEEE Communications Magazine, 2002(8):725-734.

[4]. Luis Ruiz-Garcia, Loredana Lunadei l, Pillar Barreiro I and Jose Ignacio Robla 2 "A Review of Sensor Technologies and Applications in Agriculture and Food Industry: State of the Art and Current Trends" Sensors 2009, 9, 4728-4750; doi: 10.3390/90604728

[5]. Klute, A. (ed.), 1986: Methods of Soil Analysis, Part l : Physical and Mineralogical Methods. American Society of Agronomy, Madison, Wisconsin, United States, 1188 pp.