Smart Irrigation System Using IOT

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Abstract - *Because of the large population, human requirements are also growing daily. The issues are growing at the same time. Water scarcity is one of the most significant issues, and it has an impact on agriculture. It consumes a lot of water. Consequently, a system that uses water in the required amount efficiently is needed. An example of this kind of system is a "SMART IRRIGATION SYSTEM." It is built on the Internet of Things, or IOT. Both water and labour are saved by this approach. According to the needs of the crops, water will be delivered in this method. The soil moisture sensor will detect moisture for this autonomous system, and the outcome will be passed to the ESP8266 Wi-Fi.*

Key Words: **Wi-Fi Module, Soil Moisture Sensor, Submersible Water Pump, Relay**

INTRODUCTION

One of the industries that generates revenue for our nation's economy is agriculture. According to their motto, "agriculture is life for more than 85%," the government has increased funding for technology development to boost agricultural output. In drylands, conserving water is the most crucial issue. It is crucial for the survival of the plants as well. We made the decision to attempt and increase the effectiveness of water consumption in irrigation systems in light of these facts in order to address a portion of the issue. Recent technology advancements can improve or replace traditional water distribution methods. We intend to use it to increase the effectiveness of water distribution, simplify the process of managing irrigation, and offer simple programming.

1.1 Problem Statement

Traditionally, humans carried out each stage. Nowadays, some systems make use of technology to cut down on labour costs or plant-watering times. Such systems have extremely limited control, and a lot of resources are still being squandered. Water savings are not taken into account when using standard irrigation systems. Because the water is applied directly to the soil, plants are put under a lot of stress by changes in soil moisture, which reduces plant look. There are currently rising global water crises, and it is now a significant responsibility to manage the scarcity of water. Countries with a lack of water resources and weak economies can observe this expansion. Therefore, this is a significant issue for agriculture.

1.2 Objective

The key goal is to use the system to improve the soil's health, which will benefit the plant as a result. Recently, farmers have come to rely on remotely controlled integrated irrigation systems in order to save energy, time, and money.

2. Need of Smart Irrigation System

Compared to conventional irrigation systems, smart irrigation systems have a number of benefits. By taking into account factors like soil moisture, intelligent irrigation systems can adjust water levels. Wireless moisture sensors are used for this, which assist the system determine whether or not the landscape requires watering by communicating with the smart irrigation controls. Your landscape and irrigation demands will be easier to manage thanks to the smart irrigation system, and you'll also have peace of mind knowing that it can make decisions on its own if you're not there. Your smart irrigation system will optimize resources so that everything gets what it needs without causing unnecessary waste, which will result in significant savings on your water bills.

3. Literature Survey

Alagupandi et al. (2014): propose a simple and cost-effective smart irrigation system. The system is modelled in an outdoor environment using Tiny OS-based IRIS motes to measure the moisture level of the paddy field. Moisture sensors measure the soil moisture level. The system sets a threshold value, and if the voltage exceeds that threshold, then it represents the driest soil. The proposed system has a better visualization and monitoring GUI. The motor automatically switches on by pressing the button on the visualization panel. AIS works with the help of the MOTEWORKS visualization tool. The visualization tool optimizes the use of water and fertilizer and maintains soil moisture.

Vidadala et al. (2015): The implementation of agricultural automation systems using WEB and GSM technologies. This embedded project is to design and develop a low-cost system that is based on an embedded platform for agricultural automation. Optimum usage of water is the main objective of this system. This project uses soil moisture sensors and temperature sensors to detect the water quantity present in agriculture, and a water level sensor is used to detect the water level in a tank. In this system, we monitor the status of

the sensors through Web and GSM technologies. Here, temperature, soil moisture, and water level can be monitored on a web page through a microcontroller, and information will be sent by SMS. This page contains all the information about the status of the sensors. This information will be viewed at a remote location using GPRS technology.

Rayala et al. (2016): found the system to be feasible and cost-effective for optimizing water resources for agriculture production. These systems can be adjusted to a variety of crops and improve maintenance. This system is feasible for all types of crops. We can use these systems for large-scale greenhouses and open fields.

In short, in the existing system, we can only turn on and off the motor through the GSM module or using Wi-Fi. They can also get the current status of the field through GSM technology.

4. Proposed System

The major goal of our "Smart Irrigation System," which we proposed, is to lessen water wastage. It is possible to use this technology for drip irrigation. The Android app is used to deliver water to the field in a smart irrigation system. In the Android app, we have the option to select a certain crop, and the crop has already set a water level, or the amount of water needed for that specific crop. As a result, the roots of plants will only receive the necessary amount of water. The motor will shut off whenever the water quantity reaches a certain threshold, and the app will show the current state. With the aid of this technology, the farm can supply water without having to go there.
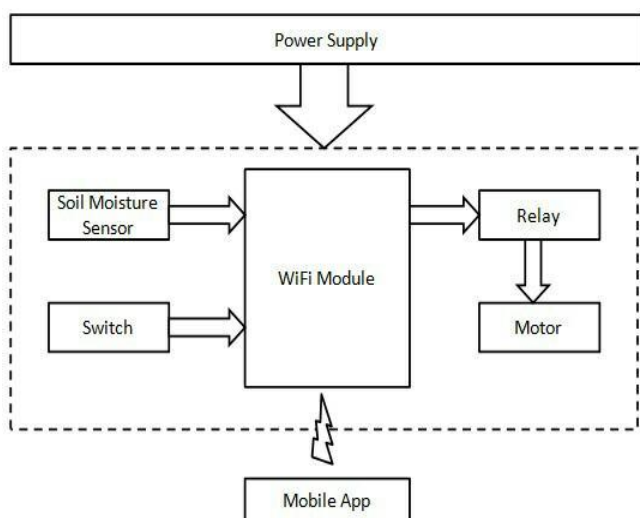
4.1. Smart Irrigation System

Fig 4.1: Smart Irrigation System

(Use an image from Google)In the block diagram above, after providing electricity, the ESP8266 Wi-Fi module receives the

instructions to turn on the motor via the app or manually using a switch. A comprehensive and self-contained Wi-Fi network solution that can transport software programmes is the ESP8266 Wi-Fi module. A relay will be used to turn on the motor in accordance with the programme that was burned into the Wi-Fi module. A relay is an electromagnetic component that connects two electrically isolated circuits magnetically.

The ESP8266 Wi-Fi module receives input from the soil moisture sensor. The farm's moisture level was detected using the soil moisture sensor. Once it reaches the soil, it determines the amount of moisture there is.
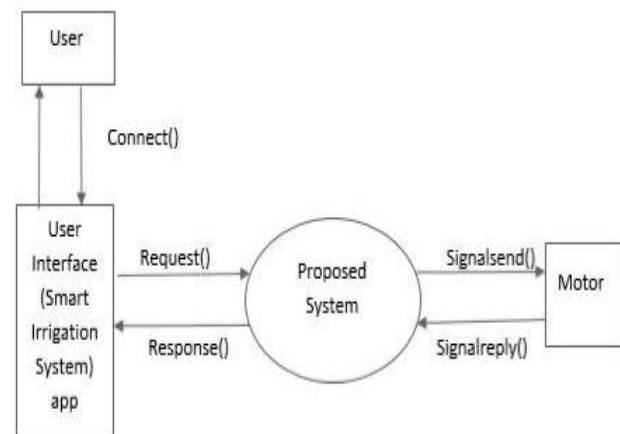
4.2. Data Flow Diagram

Fig 4.2: Data Flow Diagram

(Use an image from Google)A data flow diagram (DFD) models the process features of an information system by graphically depicting the "flow" of data through it. A DFD is frequently used as a first step to develop a system overview without going into great depth that can then be developed. DFDs can also be used for structured design, which visualises data processing. Data flows in Fig. 4.2 begin at the user interface. The suggested system is linked to the user interface. A request () is sent to the suggested system whenever users provide instructions through the user interface. The signal is sent to the motor in response to the request, and the motor serves as an output device. An alert is given to the target to process the command.
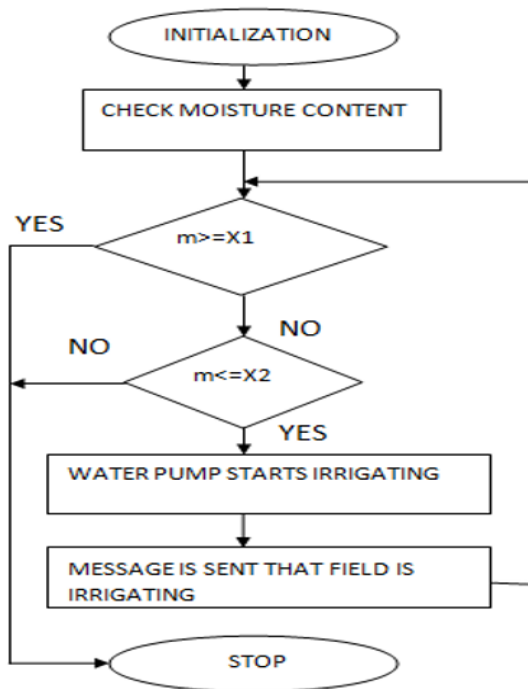
4.3. Flowchart

Fig 4.3: Flowchart

(Use an image from Google)A diagrammatic illustration of a solution model for a specific problem is shown in Figure 4.3. In many different industries, flowcharts are used for process analysis, design, documentation, and programme management.

In a flowchart, the two most frequent box kinds are: i) a processing step, which is typically referred to as an activity and is shown by a rectangular box; and ii) a choice, typically represented by a diamond. The user needs configure the Wi-Fi hotspot before the process can begin because it depends on their connection. After username and password configuration is complete, the user can use the app to choose the necessary crop and start the engine. The user should try again if the Wi-Fi hotspot generates an error due to improper configuration.5. Details of Implementation

5.1. System Implementation

The Hardware and Software utilised in this project are explained as follows:

5.1.1. Hardware Equipment

5.1.1.1 ESP8266 Wi-Fi module

5.1.1.2. Soil moisture Sensor

5.1.1.3. Relay

5.1.1.4. Submersible water pump.

5.1.1.1. ESP8266 Wi-Fi module

Fig.5.1.1.1:ESP8266 Wi-Fi module

(An image from Google)The ESP8266 is a comprehensive and self-contained Wi-Fi network solution that can run software applications or disable all Wi-Fi networking features using a different application processor. When the device is mounted, the flash memory can be started straight from an external Move and is the only application of the application processor. System performance will be enhanced, and memory requirements will be decreased, thanks to built-in cache memory. Another instance is when a Wi-Fi adaptor performs the function of wireless internet access. Any microcontroller-based design can incorporate it, and connecting to it is straightforward using an SPI/SDIO interface or a central processor AHB bridge interface. GPIO ports, sensors, and other application-specific hardware enable the ESP8266's powerful component to incorporate processing and storage capability.
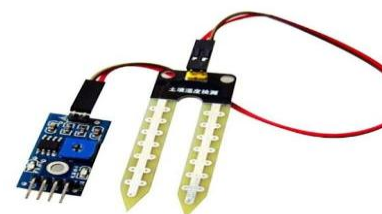
5.1.1.2. Soil Moisture Sensor

Fig.5.1.1.2: Soil Moisture Sensor

(An image from Google)The soil's wetness can be measured using this sensor. The output of the module is high when there is a water scarcity in the soil; otherwise, it is low. One can automatically water the flower plant or any other plant that needs automatic watering by utilising this sensor. Modules have three different output modes: simple digital output, accurate analogue output, and precise serial output.

5.1.1.3. Relay
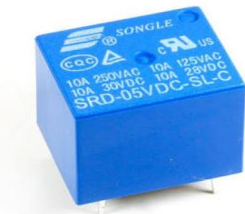
Fig.5.1.1.3: Relay

A relay is an electromagnetic switch that can turn on or off a considerably greater electric current and is driven by a relatively modest electric current. An electromagnet, which is a coil of wire that turns into a temporary magnet when electricity passes through it, is the brain of a relay. Relays fill in the space, allowing smaller currents to activate bigger ones. As a result, relays have two different functions: switches (which turn things on and off) and amplifiers (which increase small currents). (An image from Google)

5.1.1.4. Submersible Water Pump

Fig.5.1.1.4: Submersible water pump

An electric submersible pump (or subs pump, for short) is a machine with a hermetically sealed motor that is tightly attached to the pump body (see figure d). The entire assembly is dipped in the liquid that has to be pumped. This type of pump's primary benefit is that it avoids pump cavitation, a problem brought on by a significant elevation difference between the pump and the fluid surface. Unlike jet pumps, which must drag fluids, small DC submersible water pumps push fluids to the surface. Jet pumps are less effective than submersibles. It typically runs on voltages between 3 and 12.

5.1.2. Software Equipment

1. Arduino IDE

2. Blynk app

5.1.3. Application of project

- Depending on the crop and kind of soil, the system must be able to control every last drop and determine the actual amount of water needed. This is a highly useful feature that enables waste-free water conservation.

- Both small and large fields can be used with this technique.

- A trustworthy and effective method for monitoring environmental parameters;

- Easy and convenient garden maintenance.

6. Future Scope

In the future, a wireless component like a wireless soil moisture sensor can take the place of a wired network. RFID technology can also be used to create wireless systems. At each phase, we can add an electric solenoid valve that can be automatically controlled by an Arduino board or by an ESP8266 Wi-Fi module.

7. Conclusion

With the help of a soil moisture sensor and a Esp8266 Wi-Fi module, the "Smart Irrigation System" project optimises the use of water in agricultural fields without the need for human intervention from farmers. The motor is turned on and off in accordance with commands from an Android app. Only the necessary amount of water is provided to each crop in this method, and the Android app displays the field's present condition.

References

[1]Smart irrigation system survey in the International Journal of Engineering Sciences and Research Technology (IJESRT) Dr. P.H. Zope and H.N. Kamalaskar ISSN: 2277-9655

[2]Sensor Based Automated Irrigation System With IoT: A Technical Review by Karan Kanasura, Vijal Zaveri, Babu Madhav Institute of Technology, Uka Tasadia University, Bardoli, and Gujarat, India.

[3]Automatic Irrigation Based on Soil Moisture for Vegetable Crops, Rafael Muoz-Carpena and Michael D. Dukes, IFAS Extension, 2005.

[4] VeenaDivya K. IACSIT1, 2, 3, and 5 member. a real-time implementation of a drip irrigation methodology-based automated irrigation control system. Instrument Technology Department, R. V. College of Engineering, Bengaluru, Karnataka. 2013; 4(5). ISSN: 2229-5518

[5]R. Suresh, S. Gopinath, K. Govindaraju, T. Devika, and N. Suthanthira Vanitha, "GSM based Automated Irrigation Control Using Raingun Irrigation System," International Journal of Advanced Research in Computer and Communication Engineering, Volume 3, Issue 2, February 2014.