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The Overview of the Smart Irrigation System

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ABSTRACT: ***Agriculture has been practiced since the dawn of time. The earliest agricultural settlements were established in the Indus Valley, where humans began to cultivate crops. The conventional approach has been followed since then. As we all know, water is the most important resource for growing crops, and the current situation is deteriorating the water percentage day by day. Farmers did not know how to monitor the precise temperature of the water while using earlier irrigation systems, therefore they poured a huge quantity of water. To address this issue, this article proposes a smart irrigation and automated approach that minimizes the additional water loss caused by the prior method. This innovative method uses a soil moisture monitoring equipment to determine how much water is in the soil, and then irrigation is done appropriately.***

KEY WORDS: ***Internet of Things (IOT), Optical Light Emitting Diode (OLED), Digital Humidity and Temperature sensor (DTH), Direct Current (DC)***

1. INTRODUCTION

Agriculture is derived from two Latin Words Ager and Culture. Wherein Ager symbolizes "field/soil" and Culture symbolizes "cultivation" [1]. Agriculture engaged in the production of plants, crops along with animal husbandry, poultry, dairy farming, fishing and even forestry. India is an agricultural country. However, it plays an important role in the life of an economy. It is the backbone of our economic system, it not only provides food and raw material but also provides employment opportunities to a very large proportion of the population. Two-third of the population is dependent on agriculture directly on industry [2], [3]. The major significant of agriculture are:

- Contribution to national income
- Source of revenue.
- Source of foreign trade.
- Industrial development.
- Main source of food
- Transport
- Economic development
- Source of saving

One of the agricultural techniques is called "Irrigation". It is any means used by humans to bring water to the land. It can be as simple as using a garden hose to water a flower bed or as complex as a system of pipes and canals that can be designed to bring moisture to the desert. Irrigation is used wherever the rainfall is either inconsistent or does not provide enough natural water to grow crops.

It is estimated that about half of the world's land is irrigated. Humans have been using irrigation for thousands of years. The ancient Egyptian used the "Nile" annual flooding to water their farmland[4]. The Persians were one of the first civilizations who knew to use the series of wells and tunnels to move naturally occurring groundwater to specific parts of soil. There are many modern types of irrigations but three most common are:

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- Flood (furrow) irrigation technique: When water is pumped through or otherwise carried to fill and allowed to flow over the ground[5].

- Drip irrigation technique: When water is centered on crops through pipes they have holes in them. This method uses about 25% less water than flood irrigation. Since less is lost to evaporation[6].

- Spray irrigation technique: It is a technique in which water is pumped through the pipe with high pressure through a nozzle. Though it requires electricity and waste a significant amount of water it is becoming less popular[7].

Irrigation systems are vital components of the global food supply. We get the greatest results in agriculture by using various irrigation methods. In today's agriculture industry, there are many ways for using technology. The Internet of Things (IoT) is being utilized in the agricultural development process. The sensor unit as well as the main station are the two primary components of smart irrigation.

The detecting device might be on the lawn, and the main station could be a long distance away. The data is sent back and forth between these two blocks. The effective use of water and labor is critical in every irrigation method. We can make better use of water and labor by using the Zig-Bee method. Wireless gadgets are extremely simple and efficient to maintain. The efficient use of water throughout the irrigation process is critical. In agriculture, water is very important. In the area of agriculture, six different kinds of sensors are used to monitor the condition of the land. We can provide time-to-time water delivery to the fields by utilizing certain electrical equipment, and the gadget is known as the Electromechanical Integrated Intelligent Device. It is based on the concept of closed loop systems that operate automatically.

Per the power source, the suggested algorithm. The detectors will begin to function after the arduino board is connected to it. The DHT11 sensor detects the temperature and relative humidity of a specific location. On one hand, the plant's root zone, and on the other, the soil moisture the sensor is also connected to the microcontroller unit, which transmits the data. For each microcontroller unit, the appropriate values 5 minutes. The microcontroller unit's primary function is to check for errors. The data values sent by the sensors and analyzed as compared to the set predefined threshold in the microcontroller's module when the sensor data value does not match the expected value. If the value is higher than the threshold, the microcontroller is activated. These values are shown on the LCD display. Whenever it's higher If the value is greater than the threshold, the microcontroller unit transmits the text message is sent to the phone of a distant owner area.

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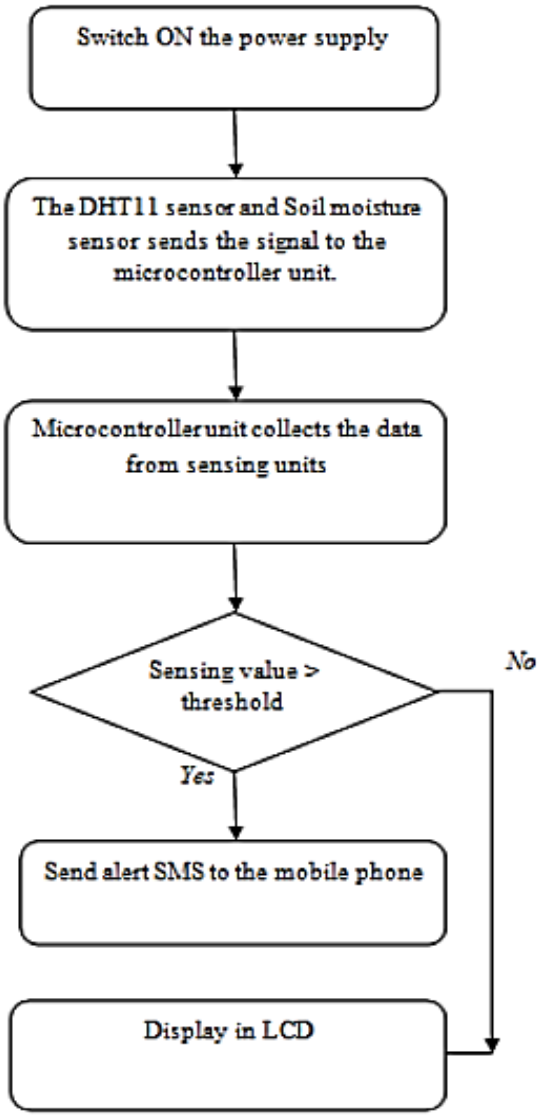

Figure 1: The DHT11 Sensor Detects the Temperature and Relative Humidity of a Specific Location.

Figure 2 shows a block schematic of a GSM/GPRS modem implementation for an automated irrigation system. The control module and the sensor unit make up the automated watering system. The control unit is made up of a microcontroller that directs the operation, while the sensing unit is made up of various sensors such as the DHT11 sensor and a soil moisture sensor. The ATMEGA328 microcontroller was the microcontroller utilized in this project. The ATMEGA 328 microcontroller unit is incorporated into the Arduino board.The Arduino uno is connected to the DHT11 sensor and soil moisture sensors. Every 5 minutes, the sensing devices transmit the appropriate data values to the ARDUINO board. To use an LCD display that is also interfaced to the board, the board shows the current temperature and humidity of a specific root zone.

The data values from the sensing devices are sent to the ARDUINO board, which compares them to a preset threshold set in the microcontroller unit. When the data values of the specific sensors exceed the threshold, the ARDUINO board sends an SMS to the mobile phone of the user who is at a distant place. The SIM900A module, which is connected to the ARDUINO board, is used to transmit SMS messages.This method includes AT instructions to interact with the microcontroller.

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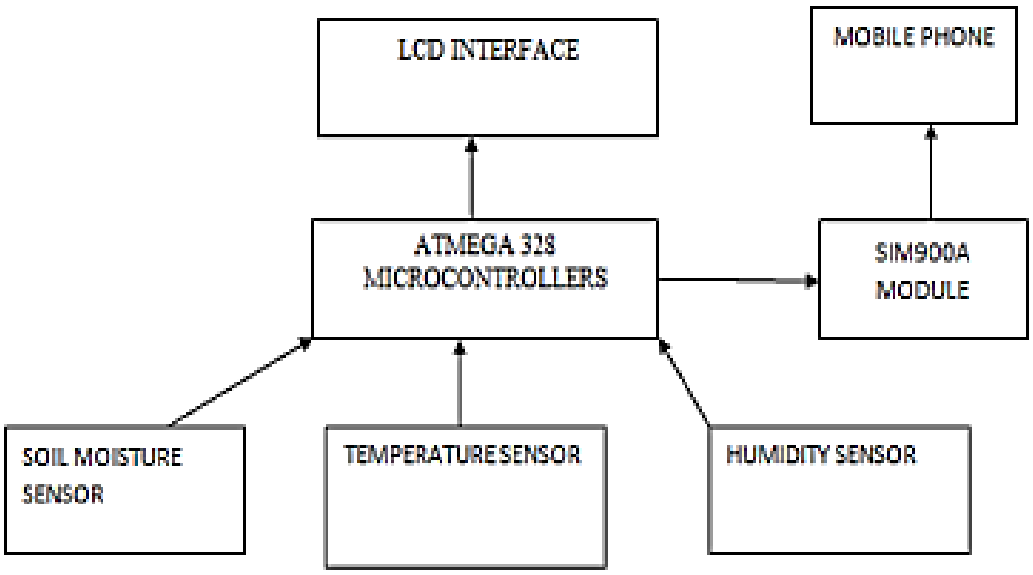

Figure 2: Block schematic of a GSM/GPRS modem implementation.

Although irrigation is necessary but it also causes a lot of problems, it uses a lot of water. About 84% water in India is used to grow crops and it is a major expense for the farmer[8]. The excess water which runs off through irrigation contributes copulation by carrying dissolved salt and pesticides residues into the local water supply. India is estimated to have 1.7 billion people by 2050 and the current situation of food itself is not sufficient enough to feed the people, so in the future by 2050 it will be very difficult to feed them with the traditional methods of crop production.

Though there is an ample amount of land but this old method of production will lead to the degradation of crops. Now it becomes necessary to involve the developing technology in the field of agriculture to perform smart farming. With the launch of "Digital India" concept India is growing with tremendous increase in data transmission, fastest internet speed, large storage system, fastest communication technique and one of the developed technologies called internet of thing is leading with various applications in almost every field of making India digital. Digital technology internet of things is driving change in agriculture wherein IOT refers to devices or things that are embedded with sensors, so that they can measure and transmit data in a varied network [9].

Essentially IOT means this physical device can send and receive information by the internet. On farms IOT allows devices across the farms to measure old data remotely and provide this information to the farmer in real time. IOT devices can gather information such as soil moisture, chemical application, dam level, enlarged calves as well as monitor fences, vehicles and whether. Information generated by IOT devices allows farmer to track farm operations and preformation, make better informed decision to improve farm productivity in yield and respond more quickly to the condition so that they can saving time and money.

If putting the data behind the all-important farmer "gut instinct", whether that be knowing winter check on water supply to a trough, how much feudal should be applied to a crop and which used to check during lambing. The Victorian government is committed to driving the up taken detailed technology including IOT in agriculture. IOT infrastructure is being set up in four trial region to enables farmers in sheep, cropping, dairy and horticulture. To work with technology providers to investigate how IOT technology can benefit farmers an

application is introduced which a moisture measuring device which will indicate the motor to work the irrigation system according to the need of the soil.

Soil moisture sensor is connected to an inner tough node MCU, DHT11 is connected to D4 pin of the MCU, the motor is connected to the relay wherein the relay is controlled using D5 pin of node MCU and an OLED display is connected to 12C pin of node MCU. Here in this application a capacitive moisture sensor is used to measure the moisture present in the soil, a DHT11 humidity temperature sensor is used to measure the air temperature and humidity. Using the 5v power relay the controlling of the water pump will be done. Whenever the moisture quantity is low in the soil the motor automatically turns on and hence the irrigation is done automatically. Once the soil is wet the motor automatically turns off.

2. LITERATURE REVIEW

There have been many papers published in the field of irrigation with the help of internet of things among all the paper a paper titled “A Study on Smart Irrigation Systems For Agriculture by Dr. J. Jegathesh Amalraj, S. Banumathi, J. Jereena John discussed the proper use of water needs to be regarded as most urgent problem in the currentscenario of water declining and the drying up of tanks and rivers. To come across this issue from this the use of sensors such as temperature and humidity at the level of relevant positions have been introduced for crop monitoring. Established and implemented an algorithm with a threshold the beliefs. The values of the threshold are added to the temperature using the micro controller-based gateway for soil moisture and soil moisture Water Quantity Control. It is possible to power the machine and have Cellular interface communication connection that enables data Scheduling control and irrigation via a web page. THE Innovative device of latest techno technologies.

A research paper titled “A Study on Smart Irrigation System Using IOT for Surveillance of crop field by Ashwini B V discussed the internet of things based irrigation systems in which explains the use of Arduino and its different application, explains automated irrigation system using WSN and GPRS, crop monitoring system based on WSN, automatic drip irrigation system using WSN and data mining algorithm, soil moisture sensor, Temperature and humidity sensor, Bluetooth wireless technology also explains system architecture. All components related with the smart irrigation system explained such as Arduino, sensors and internet of things[10].

3. DISCUSSION

This paper discusses about the agriculture which is a combination of the Latin words ager and culture. Where Ager represents field/soil and Culture represents "cultivation. Agriculture includes plant and agricultural cultivation, as well as animal husbandry, poultry, dairy farming, fishing, and even forestry. India is mostly a farming nation. It does, however, play a significant part in the economic life of a country. It is the foundation of our economic system, providing not only food and raw materials, but also job possibilities for a significant part of the people. Agriculture is directly reliant on industry for two-thirds of the population.

"Irrigation" is the name of the agricultural method. It refers to any method that people employ to deliver water to the land. It may be as simple as watering a flower bed with a garden hose or as complicated as designing a system of pipelines and canals to deliver moisture to the desert. Irrigation is utilized when rainfall is inconclusive or there is insufficient natural water to produce crops.

Irrigation is essential, but it also creates a slew of issues and consumes a lot of water. In India, over 84 percent of water is utilized to produce crops, and it is a significant cost to the farmer. Excess irrigation water helps to copulation by transporting dissolved salt and pesticide residues into the local water supply. India is expected to have 1.7 billion people by 2050, and the present food situation is insufficient to feed them, making it very impossible to feed them using conventional agricultural production techniques in the future.

IoT devices provide information that enables farmers to monitor farm operations and performance, make better-informed decisions to increase farm productivity and output, and react more rapidly to changing conditions, saving time and money.

When it comes to putting facts behind the all-important farmer "gut sense," whether it's understanding how much feudal should be applied to a crop in the winter, or which used to check during lambing. The Victorian government is dedicated to accelerating the use of advanced technologies in agriculture, particularly IoT. Farmers in sheep, crops, dairy, and horticulture will benefit from IOT infrastructure being built in four experimental regions. An application with a moisture measuring device is presented to work with technology providers to explore how IOT technology may help farmers. This will suggest the motor to operate the irrigation system according to the requirement of the soil.

4. CONCLUSION

This paper presents a farming management and smart irrigation system based on IOT. IOT technology makes the irrigation system smart with an automatic working mechanism and encourage a better way to use water for irrigation purpose. This application comprises a soil moisture sensor to measure the moisture present in the soil, a DHT11 to measure the temperature and humidity present in the air. Once both the sensor detects the respective presence then the output display on the OLED display module and the motor automatically start irrigation process. This motor gets ON and OFF as per the moisture present in the soil. To perform this entire task an algorithm program is uploaded in the node MCU board which make the smart irrigation work and the output data can be monitored from anywhere worldwide using thing speak serve with the referred id and password. The main aim of this system is to produce a user-friendly application and perform the task as per real time entity. With this innovative system farmer can easily identify the real condition of the field and crops.

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