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SMART FARMING SYSTEM

[1]K. Madhumitha, [2]S. Edel Josephine Rajakumari

[1]MCA, [2]Assistant Professor, PG Department of Computer Applications, Holy Cross College (Autonomous), Tiruchirappalli

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Abstract

India is predominantly a farming country. 16% of India's GDP and 10% of its exports are derived from agriculture. Water is the main resource used in agriculture. Irrigation is one way to supply water, albeit there may occasionally be severe water waste. IoT is an innovative technology that represents the direction that computers and communication will take in the future. Smart homes, smart cities, and smart traffic management are just a few of the industries that are using IoT. IoT may be applied in various industries and has a vast range of potential uses. This paper discusses the use of IoT in agriculture. The enhanced quality and quantity of agriculture, resource management, cost-effective farming, crop monitoring, field monitoring, and other duties are made easier by the Internet of Things (IoT). This paper aims to conserve water and time. A range of sensors, such as LDR sensors that sense various soil parameters and sensors for temperature, humidity, and soil moisture, are used in the proposed system. The user's Android application will display these sensed parameters along with the ideal crop production.

Keywords: Internet of things (IoT), Agriculture, Irrigation, Temperature sensor, Humidity sensor, Moisture sensor, LDR sensor

1. INTRODUCTION

The main source of food grains and other essential resources is agriculture. The basis of life for the human species is thought to be agriculture. It is critical to the growth of the country's economy. Additionally, it provides ample opportunity for employment. For the country's economic circumstances to improve, the agriculture sector must develop. Crop and fruit yields are unfortunately decreased by the fact that many farmers still cultivate their land with antiquated methods. All throughout automation, however, where labor- intensive manual labor has been replaced by mechanical machinery, the yield has increased. IoT is revolutionizing the farming sector and equipping farmers with the means to meet the immense challenges they face. The agricultural sector needs to tackle the increasing scarcity of water, land, and meet the growing needs of the world's population in terms of consumption. New and innovative IoT applications are solving these issues and increasing the quantity, quality, sustainability, and affordability of agricultural products. Therefore, the agricultural sector needs to apply modern science and technology in order to increase production. Monitoring the environment is not a sufficient or adequate way to boost agricultural productivity. Numerous other factors also play a major role in productivity. As a result this paper suggests a flexible system that can be used to manage field activities and track field data. This paper's major goal is to make agriculture smarter by utilizing automation and Internet of Things technologies. This paper is noteworthy for its automated irrigation systems that monitor temperature changes, humidity, light-duty ratio, and moisture sensors surrounding the crop area to precisely know when to turn on and off the motor. Automate by human to avoid human error and confirm the soil moisture content. Additionally, a communication component on the micro controller will transfer data from the sensors to the user's device. A more sophisticated communication device, such as a Bluetooth module, will be used. The processed data is converted into meaningful data by the core module and sent to the user. The data can be viewed by the user through an application. These sensed parameters as well as the optimal crop production will be shown on the user's Android application.

2. LITERATURE REVIEW

Researchers found that agriculture's yield is continuously decreasing after conducting research in the field of farming. However, technology adoption in agriculture is crucial for increasing

yield while decreasing the need for additional labor. Certain research projects are designed to help farmers by providing them with tools that can boost crop yields.

A distributed wireless sensor network based remote sensing and control irrigation system was developed by Y. Kim [1] with the goal of optimizing productivity while minimizing water usage. It includes real-time in-field sensing, variable rate irrigation, and site-specific precision linear move irrigation system control. The system offered details on real-time field sensing and control, wireless sensor networks, and variable rate irrigation design and instrumentation when the required software was installed. The entire system was developed using five in-field sensor stations. These sensor stations collect data and transmit it via GPS to the base station, which controls irrigation by using the system's database to determine what needs to be done.

According to R. Nageswara Rao and B. Sridhar [2], crop cultivation involves the methodical use of as little water as possible. Most farmers spend a lot of time in the fields, focusing on the water that plants have access to at the appropriate time. Water management should be improved while system circuit complexity is kept to a minimum. Using the sensor data, the system determines how much water is needed. Two sensors take daily readings of the soil's temperature, humidity, and amount of sunlight and send the data to the base station. These factors should be used in suggested methods to estimate the quantity of irrigation water. The primary benefit of Precision Agriculture (PA) lies in its systems integration with cloud computing, which raises crop yields, reduces the need for water and fertilizer, and helps with field weather condition assessment.

A system developed by G. Sushant and S. Sujatha [3] uses sensors to monitor temperature, humidity, and even animal movement that could have an impact on crops in agricultural regions. In the event of a discrepancy, the system will notify the farmer via Wi-Fi/3G/4G via an app and SMS on the farmer's smartphone. The system's duplex communication link, which is based on a cellular Internet interface, enables data inspection and irrigation schedule modification with the aid of an Android application. Because of its low cost and power independence, the device might prove useful in sporadic and isolated areas.

2. METHODOLOGY

A Bluetooth module collects the data and transmits it to the SMART FARMING app. Temperature, moisture, humidity, and LDR data are all provided by the app. The LCD display may also be used to display the data.

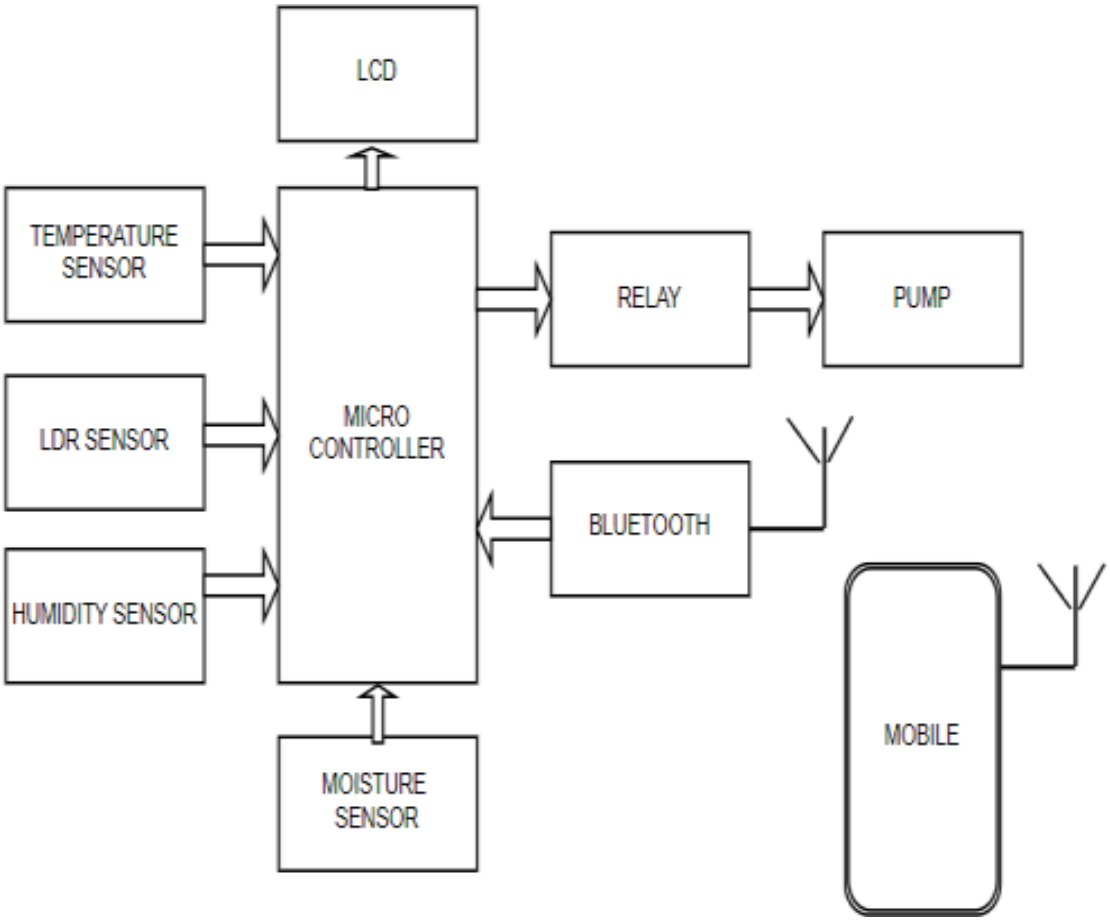

Fig 1 Block Diagram of Smart Farming

A Bluetooth module collects the data and transmits it to the SMART FARMING app. Temperature, moisture, humidity, and LDR data are all provided by the app. The LCD display may also be used to display the data. The information from humidity and moisture sensors can be used to irrigate the area and calculate the optimal crop yield. Thus, boosting crop productivity and satisfying demand are made easier with the help of an intelligent irrigation system. This project measures and records soil moisture levels remotely to make sure crops get the best available water resources. Additionally, it notifies the user when the water pump

system needs to be turned on in order to address the soil's low moisture content and avoid crop loss or damage. This idea will control crops and boost crop productivity.

Major benefit is the substantial reduction in the need for manual labor, as the system automates data collection and transmission. The remote monitoring capability enables farmers to access real-time information about their crops, allowing for timely decision-making and intervention. This, in turn, contributes to increasing crop yield and enhancing overall production efficiency. By leveraging data from humidity and moisture sensors, the intelligent irrigation system facilitates optimal water resource management, thereby reducing water consumption while ensuring crops receive the required moisture levels. The incorporation of an LCD display further enhances accessibility to the data. Additionally, the system proactively notifies users when the water pump system needs activation, minimizing the risk of crop loss or damage due to insufficient moisture in the soil. In summary, this innovative approach not only streamlines agricultural processes but also addresses critical aspects of water management, leading to improved crop productivity and a more sustainable farming ecosystem.

MICRO CONTROLLER

The system's brain, or micro-controller, will keep an eye on the input and adjust the output as needed. A PIC16F877 micro-controller is used in the system to collect input data and measure the soil's moisture content using a sensing setup. After obtaining the signal, the PIC microcontroller produces an output that activates a relay and turns on the water pump.

RELAY

Using an external power source, the relay is utilized to activate the power pump. Plants receive the necessary amount of watering when the moisture and humidity sensor detects low soil moisture and humidity. This activates the relay.

TEMPERATURE AND HUMIDITY SENSOR(LM35)

Similar to other living organisms, including humans, plants have evolved to be sensitive to variations in humidity and temperature. Plants adjust for the worst or blossom with fruits and blooms in a manner similar to how people prepare for the upcoming seasons. Therefore, when crops and fruits will begin to grow or produce, temperature and humidity are important factors.

This variable is measured using a digital sensor called the DHT11, which also measures humidity and temperature.

MOISTURE SENSOR

The volumetric water content of the ground is detected by the moisture sensor, which outputs the moisture level of the soil. In order to average the water content, the sensor considers both the propelled yield and the length of the soil environment. A soil moisture sensor determines the soil's water content. It utilizes the electrical resistance of the soil. Variations in temperature, soil type, or electric conductivity can affect the calibration of the relationship between the measured property and soil moisture. Its function is to sense moisture in the field and communicate that information to the microcontroller, which then uses it to control the ON/OFF switch of the water pump.

LDR SENSOR

A light-dependent resistor (LDR) is also known as a photo-resistor cadmium sulfide (CDs) cell. It is also referred to as a photoconductor. Using the photoconductivity principle, it performs essentially the same functions as a photocell. The passive component is essentially a resistor; its resistance value decreases with increasing light intensity. In the agricultural industry, LDR is an additional component that is utilized to collect sensor data and transmit it to a microcontroller. This data is displayed using the application as well as the LCD.

LCD DISPLAY

The primary operating system for a particular kind of flat panel monitor is liquid crystal (LCD). which compiles all sensor data and displays it on an LCD screen to allow an evaluation of the agriculture land and crops current conditions.

4. RESULT

As seen in the below image, the microcontroller board is connected to a water pump, LCD, humidity, moisture, and temperature sensors in addition to other sensors and an LDR. The microcontroller uses the data from the sensors to make decisions about how to operate the devices. In addition, the microcontroller sends the sensor data to the user's smart device via the internet, where it is subsequently shown on the LCD display. The program displays all the

data and also shows the optimal crop yield that can be achieved in the field. The test results show that when the temperature exceeds the current threshold, the cooling fan turns on automatically in auto mode. When both the moisture and humidity levels on the farm drop below a certain threshold, the relay alerts the user (farmer) to turn on the water pump. In manual mode, the microcontroller uses Bluetooth to receive the relay's controlling signals and responds appropriately.

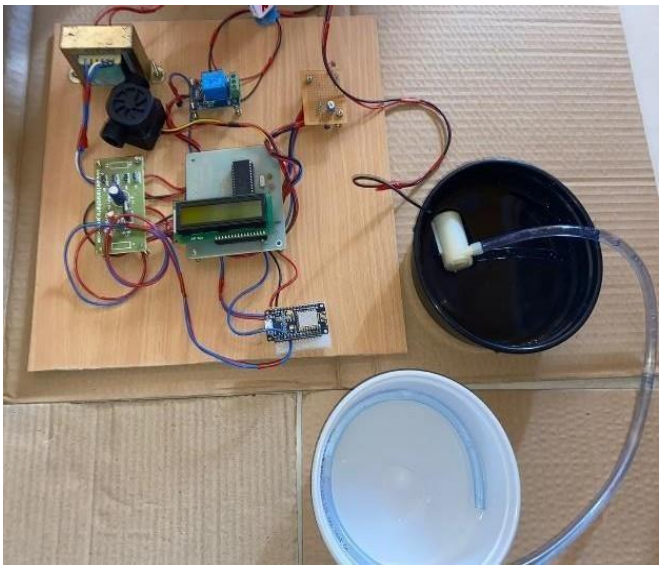

Fig 2 Overall implementation of Smart Farming Kit

5. CONCLUSION

IoT-enabled smart agriculture will, therefore, transform the farming sector, boost productivity, improve quality, and possibly even save farmer lives. There is an immediate need for a technique that makes farming easier for farmers and gets rid of obstacles. Because of recent technological advancements, India's economy, which is totally based on agriculture, now needs to increase the output of annual crop production. Consequently, growers and related companies can quickly and simply monitor the condition of their fields from anywhere.

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