Smart Agriculture Monitoring System Using IOT

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Abstract **- Agriculture is basic source of livelihood People in India. It plays major role in economy of country. Hence Automation must be implemented in agriculture to overcome the problems. The Traditional agriculture techniques require manual intervention. Continuous sensing and monitoring of crops by convergence of sensors with Internet of things (IOT) and making farmers to aware about crops growth, harvest time periodically and in turn making high productivity of crops and also ensuring correct delivery of products to end consumers at right place and right time. So, to overcome this problem we go for smart agriculture technique using IOT. This Project includes sensors such as temperature, humidity, soil moisture and water level of the tank for collection the field data and processed.**

Index Terms **- ESP32 (Wi-Fi module), Temperature Sensor, Humidity Sensor, IOT, Relay.**

I.INTRODUCTION

Agriculture is major source of income for the largest population in India and is major contributor to Indian economy. In past decade it is observed that there is not much crop development in agriculture sector. Food prices are continuously increasing because crop rate declined. There are number of factors which is responsible for this it may be due to water waste, low soil fertility, Fertilizer abuse,
climate change or diseases etc. It is very essential to make effective intervention in agriculture and the solution is IOT in integration with wireless sensor network. Internet of things (IOT) is a method of connecting everything to the internet- it is connecting object or things (such as car, home, electronic devices, etc. ...) which are previously not connected with each other main purpose of IOT is ensuring delivery of right information to right people at right time. In agriculture irrigation is the important factor as the monsoon rain falls are unpredictable and uncertain.

II. LITERATURE SURVEY

Experts have analysed collected data for finding correlation between environment work and yield for standard work [1]. They are concentrated on crop monitoring information of temperature and rainfall is collected as initial spatial data and analyzed to reduce the crop losses and to improve the crop production. An IOT Based Crop-field monitoring an irrigation automation system explains to monitor a crop field [2]. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system [3] automated. By using wireless transmission, the sensed data forwarded towards to web server database. If the irrigation is automated, then that means if the moisture and temperature fields fall below the potential [4] range. The user can monitor and control the system remotely with the help of application which provides a web interface to user.

III. PROPOSED WORK

Block Diagram of proposed work

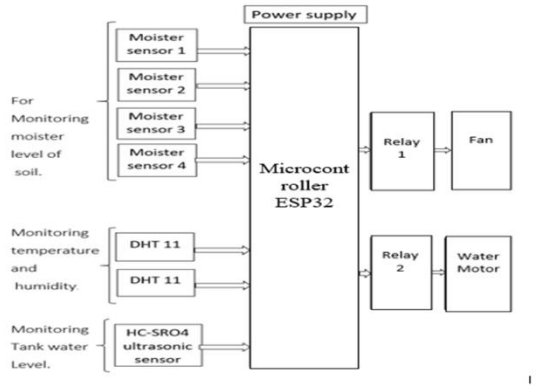

Figure 1. Block Diagram of Smart Agriculture monitoring system

1. Sensor data acquisition: The sensor is interface with Arduino Uno such as DHT11 Temperature, Humidity, Soil moisture and ultrasonic sensor is used.
2. Wireless data transmission: The data acquired from sensors are transmitted to the web server using wireless transmission (WIFI module ESP32).
3. Data processing and Decision making: The data processing is the task of checking various sensors data received from the field with the already fixed threshold values. The motor will be switched ON automatically if the water level of tank falls below the threshold and vice- versa. The farmer can even switch ON the Motor from mobile using mobile application.
4. Mobile Application: The mobile application helps to monitor and control field from anywhere.

IV. METHODOLOGY

The basic building blocks of an IOT is Sensors, Processors, and applications. So, the block diagram above is the proposed model of our project which shows the interconnection of these blocks. The sensors are interfaced with Microcontroller, data from the sensor is displayed on the mobile application of the user. Mobile application provides an access to the continuous data from sensors and accordingly helps farmer to take action for fulfilling the requirements of the soil. When the data of different sensors is acquired that is sent to the mobile application of the user. This IOT based Agriculture monitoring system make use of wireless network that collects data from different sensors deployed at various nodes and send it through the wireless protocol. This smart agriculture system is powered by microcontroller ESP32, it consists of Temperature sensor, Moisture sensor, DHT11 ultrasonic sensor, motor, and DC fan. When the IOT based agriculture monitoring system starts it checks the water level, humidity, and moisture level. Sensors sense the level of water if it goes down, it automatically starts the water pump. If the temperature goes above the threshold, fan starts automatically. This all is displayed on the Mobile application where it shows the values of Humidity, Moisture, Temperature, and water level of the tank. Temperature can be set on a particular level and is based on what type of crops are cultivated. An automatic agriculture system thereby saves time, money, and power of farmer.

V. HARDWARE USED

1. Soil Moisture Sensor: Soil moisture sensor is a sensor which senses the moisture content of the soil. The sensor has both analogy and digital output. The digital output is fixed, and the analogy output threshold can be varied. It works on the principal of open and short circuits. The output is high or low indicated by the LED. When the soil is dry the current will not pass through it and so it will act as open circuit. Hence the output is said to be maximum. When the soil is wet, the current will pass from one terminal to the other and the circuit is said to be short, and the output will be zero.

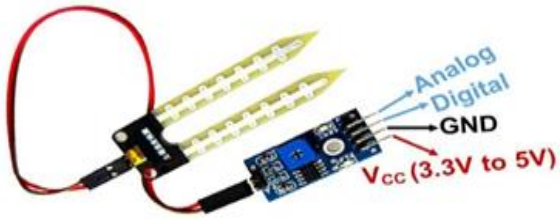

Figure 2. Soil Moisture Sensor

2. DHT11- Temperature and Humidity Sensor: The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So, if you are looking to measure in this range then this sensor might be the right choice for you.

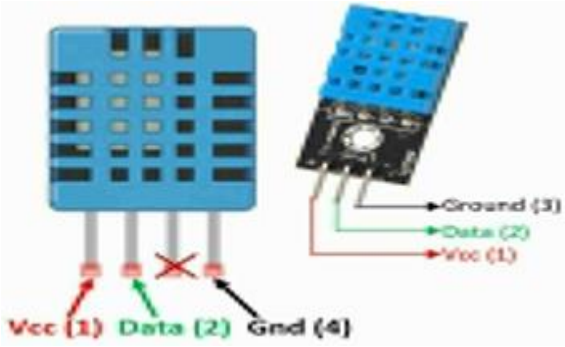

Figure 3. Temperature and Humidity Sensor

3. HC-SR04 Ultrasonic Sensor: HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino, ARM, PIC, Raspberry Pie etc. Power the Sensor using a regulated +5V through the Vcc and Ground pins of the sensor. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the microcontroller. This action will trigger an ultrasonic wave at frequency of 40Hz from the transmitter and the receiver will wait for the wave to return. Once the wave is returned after it is getting reflected by any object the Echo pin goes high for a particular amount of time which will be equal to the time taken for the wave to return back to the sensor. The amount of time during which the Echo pin stays high is measured by the MCU/MPU as it gives the information about the time taken for the wave to return back to the Sensor. Using this information, the distance is measured as explained in the above heading.

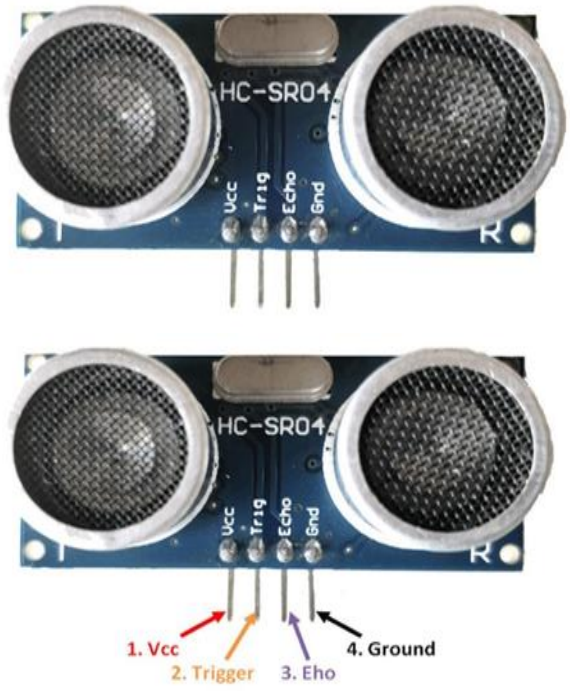

Figure 4. Ultrasonic Sensor

4. Microcontroller ESP32: ESP32 is in the series of low power and low cost on chip microcontroller. It comes up with already integrated dual mode Bluetooth and Wi-Fi. It is especially aimed to provide versatility, robustness and reliability in a large number of applications. ESP32 comes up with a USB port so we can say that it is a plug and play device i.e. just plug in cable and your device is turned on and you are able to program it just like Arduino development boards. The native platform to program ESP32 is the ESP-IDF, but most beginners use Arduino IDE since it is easy to use. Arduino IDE can be used for programming of this board. But we have to install some drivers and libraries in order to make it compatible in Arduino IDE and ready to use just like we use other Arduino boards in Arduino IDE.

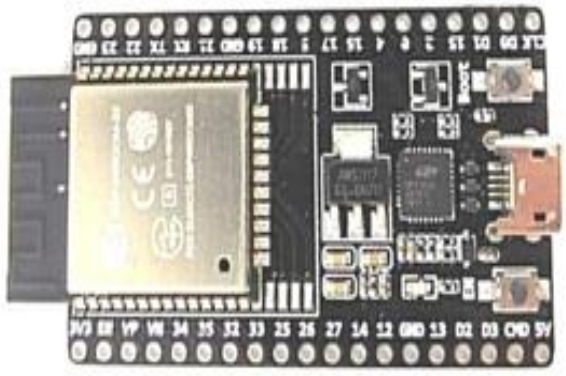

Figure 5. ESP32 Microcontroller

VI. RESULT

Based on the image and screenshot of the proposed working model presented in Section III the advantages and salient features of the system are discussed in this section. It is very necessary and crucial for a farmer to have and implement this system in their fields. The system along with the sensors perform accurately. The hardware is interfaced with all the sensors in the board. The hardware components include the microcontroller, a water pump, temperature, and humidity sensors, DHT11 ultrasonic sensor and the soil moisture sensor is interfaced, and power supply has provided. In the field, sensors are deployed like soil moisture, temperature, and humidity. The data collected from these sensors are sent to the Database via the mobile application. In control section, the system is turned on using the application. Also, the motor and fan will be switched ON automatically if the water level of tank falls below and temperature of the atmosphere increases than the threshold and vice-versa. In manual mode, there is a manual switch in the field to make sure that if the system fails, one can turn off the water supply manually.

Figure 6. Pictorial view of proposed model

Figure 7. Blynk Mobile Application

VII. CONCLUSION

This paper describes automated agriculture system using IOT. Internet of things and cloud computing collectively makes a system that control agriculture sector effectively. This system will sense all the environmental parameters and send the data to the user via cloud. As we are using number of sensors so, it will provide precise data. The Ultrasonic sensor will detect the exact water level of the tank and the motor will switch on/off accordingly and it will help in using the water very effectively and will increase overall cost cutting. User will take controlling actions accordingly and this will be done by using actuator. This asset allows the farmer to improve the cultivation in a better way. It leads to higher crop yield, prolonged production period, better quality, and less use of protective chemicals.

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