SMART AGRICULTURE MONITORING SYSTEM USING IOT

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ABSTRACT—*Agriculture forms the backbone by generating enormous revenue for India. As simple monitor of environmental conditions doesn't prove to be the complete solution for increasing the yield of crops. The best possible solution to save time, power and money for farmers is by agricultural automation. Human intervention can be diluted in irrigation by automated unremitting sensing and monitoring the crops by converging a set of sensors with Internet of Things (IOT). This fairly improves the awareness of crop's growth and hence yields higher productivity. This project is step forward to integrate several sensors like temperature, humidity, moisture and ultrasonic sensor for collecting the field data and process them using IOT.*

Keywords:— *Smart Farming, Internet of Things, Arduino, GSM, Temperature, Moisture level and Humidity content.*

1 INTRODUCTION

People were doing agriculture from ancient ages. It is the art and science for rowing plants. It is the reason for development that rise in human civilization. It was done with man power from ancient ages. Now the world is rapidly trending towards new innovations and techniques, agriculture sector also necessary to drift up with technology and inventions. The world population is constantly increasing at a intimidating pace which throws a great face in providing the basic necessities of modern life. Also the old & traditional farming methods show insufficient for provided that food in bulk quantities. As a part of advances in the trending new technology in the area of agriculture, several researchers recommended the adoption of wireless sensor networks to collect data and other details for various devices like sensors and forwarded via the protocol. Thus, Smartness for the agriculture monitoring system is an emerging technology concept where data are collected using smart electronic sensors, directly send the collected data to a central server in real time by using IOT. Since the whole system is automated for data collection, the data integrity is assured and implemented for higher efficient monitoring system.

2 LITERATURE SURVEY

"Smart farming using IoT", [1] Several developing countries in present world are using traditional methods for farming. To increase the yield of crops, a novel design approach includes monitoring the environment temperature, humidity in air, soil moisture condition and accordingly supply water to the field is developed with the help of IOT.

"AGRISYS: A smart and ubiquitous controlled environment agriculture system"[2]. An agriculture environment range from single plant in a house, a backyard garden, a little farm to a large farming capability. The computerized agricultural systems helps in maintaining protected environment. Here, a smart agriculture system (AgriSys) is proposed that can examine an agriculture environment and interfere to maintain its adequacy. It also deals with universal agriculture challenges like temperature and humidity. Addition to these parameters, system deal with challenges such as sandy soil, dust, constant wind etc. It uses computer interfacing tools from National Instruments and programmed by LabVIEW.

"Smart Agriculture IoT with cloud computing", [3] IoT is a innovative technology that represent future of computing and communication. Agriculture sensor monitoring system is used to measure Agriculture related information like soil moisture, temperature and humidity, etc. With IoT, farmers can tenuously monitor crops. This paper deals with some typical applications of agriculture using IoT sensor monitoring network technology using cloud computing as the backbone.

"IOT application for implementation of smart agriculture system", [4] using smart farming techniques, crop yield can be enhanced, But as farmers are ignorant of the latest technologies and innovations. This paper project a novel wireless mobile robot using IoT, planned and implemented for performing a variety of operations on fields. wireless robot is equipped with sensors for measuring a number of environmental parameters. It also includes Raspberry pi 2 model B hard ware for executing the desired process. This robot has been tested in the fields and readings has been monitored and satisfactory results are observed, hence prove to be much useful for smart agricultural systems.

"Smart Farming- A prototype for field monitoring and automation in agriculture", [5] here the focus is to improve crop productivity in India, which slowly declining due to devastation of crops by a range of natural calamities. The main theme is on the ways by which we could protect crop during an unavoidable natural disasters by implementing technology induced smart agro environment, which helps the farmers manage large fields with less efforts by helping farmer to monitor and control different activities through mobile via GSM. So based on the status of the agricultural parameters, the farmers can take decisions.

ISSN: 2278-4632
VOL-10 ISSUE-6 NO. 11 JUNE 2020

3 PROPOSED WORK

The smart agriculture monitoring system is a combination of hardware and software. The Hard ware includes Arduino Mega that displays reading from hardware sensors like Temperature, Humidity, Moisture and Ultrasonic sensors. The data collected with the aid of sensor are sent to Arduino AT Mega 2560. The collected information is displayed on LCD display. A GSM and an IOT module along with the Arduino are used to update the farmers about the field in regular intervals and also save the data for future use. The proposed system is shown in figure 1.

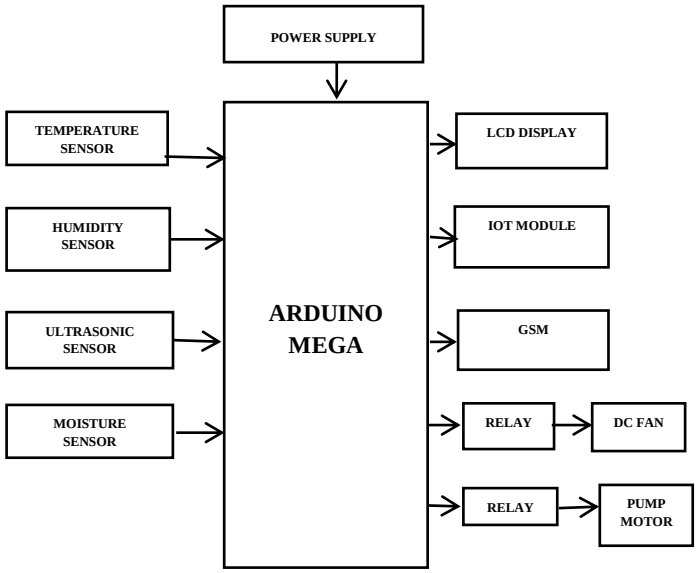


Fig 1. Proposed System

4 HARDWARE USED

The Smart Farm Monitoring System contains hardware and software. The hard ware part includes embedded system and software program in Arduino IDE. The Arduino IDE displays interpretation from sensors which are inserted to it. The particular sensors used are temperature & humidity sensor, and soil moisture sensors. The information collected from sensors are sent to the Arduino. The collected information is displayed in an Arduino screen. The GSM module is connected to Arduino to facilitate messaging service to user, which updates the farmers once in every 10 seconds approximately based on climate conditions. The proposed system consists of dissimilar sensors, communication medium and microcontroller to help farmers in improving crop yield. The Arduino UNO microcontroller ATmega328 is shown in figure 2.

Fig 2. Arduino Mega

Arduino is an open-source electronic platform based on hardware and software. The Arduino Mega 2560 is a microcontroller board that uses AT Mega 2560, designed to implement more complex projects. It comes with various number of pins categorized as

ISSN: 2278-4632
VOL-10 ISSUE-6 NO. 11 JUNE 2020

input and output pins. The input pins will accept both digital and analog data. It has 54 digital I/O pins and 16 analog inputs. It operates at 5V. It also has a USB port and a 16 MHz crystal oscillator. Temperature and humidity sensor is shown in figure 3.

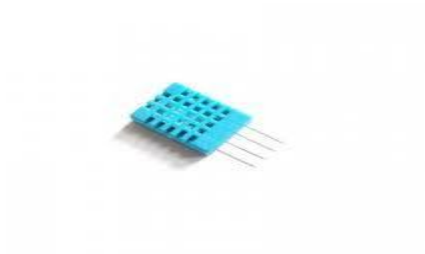


Fig 3. Temperature and Humidity Sensor

The DHT11 features a blend of temperature and humidity sensor with a calibrated digital signal output that can be used for prolonged time period. It regularly sends information to Arduino AT Mega by being reliable on nature and gives quick response. Ultrasonic sensor is shown in figure 4.

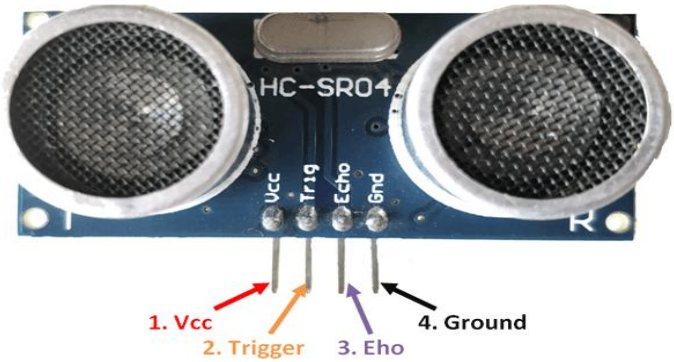


Fig 4. Ultrasonic Sensor

The Ultrasonic Sensor module is used for water level detection i.e., it measures the distance to an object using ultrasonic sound waves. It uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High frequency sound waves reflects from borders to produce different echo patterns. Moisture sensor is shown in figure 5.

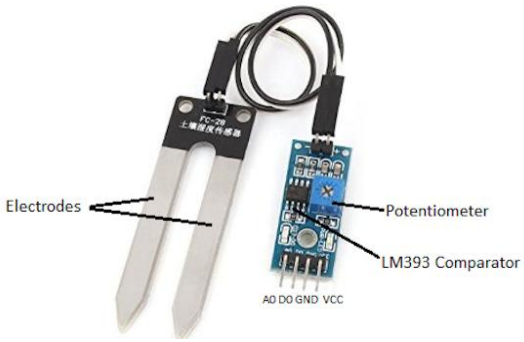


Fig 5. Moisture Sensor

The Moisture sensor is used to test the moisture level of the soil based on the principle of open and short circuit. It consists of together form of outputs of digital and analog formats. The output in digital form is permanent and the threshold for the output in analog form can be adjustable. It detects water content in soil and senses the analog signal that can be displayed digitally. LCD display is shown in figure 6.

ISSN: 2278-4632
VOL-10 ISSUE-6 NO. 11 JUNE 2020

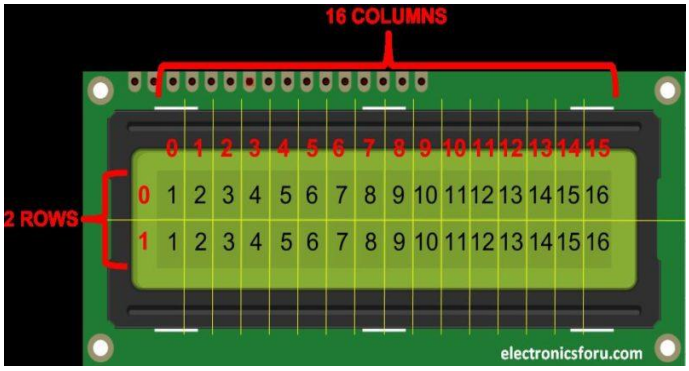
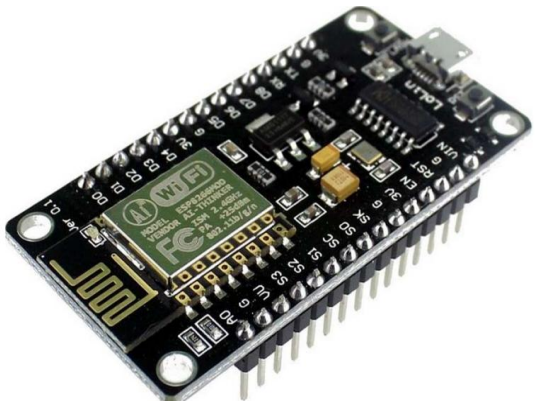


Fig 6. LCD

A 16 X 2 LCD is an electronic display module which is economical, easy to program and can display even custom characters, animation, etc. The format for the display is the ASCII character value on the LCD. The GSM module is shown in figure 7.

Fig 7. GSM Module

The GSM is used as a mode of communication i.e., to send text message to the farmer's phone about the crop parameters by using a SIM with a specific number that must be owned by the farmer. It uses protocols for sending data packets. IoT module is shown in figure 8.



ISSN: 2278-4632
VOL-10 ISSUE-6 NO. 11 JUNE 2020

Fig 8. IOT Module

The Internet of Things (IOT) is the network which enables the object to collect and exchange data. The Global Standards Initiative on Internet of Things (IOT-GSI) forms the basis as the infrastructure for IOT. IOT performs sensing and controlling the objects over network infrastructure in remote purpose.

5 RESULTS AND IMPLEMENTATION

IOT based smart system for monitoring agriculture uses wireless sensor networks to obtain information over diverse sensors implemented at different points and send information through the wireless application protocol. This system uses IOT power-driven by Arduino, water level sensor, Temperature sensor, Moisture sensor, DC motor and GSM module. Initially system starts checking the humidity, water level and moisture content. It passes various messages like SMS alerts for the mobiles on the levels of parameters. Sensors starts sensing the threshold of water when water downs below the cutoff value, to pump the water automatically. All the process is displayed on the LCD display module as shown in figure 9. (a). The process in IoT architecture displays the minutely basis values of moisture, humidity and water holding level with respect to time as shown in table 1. Separate button is provided to stop the motor manually in the IoT setup. It is necessary for a farmer to implement this kind of system in their fields as it accurately senses and sends the data if the farmer is equipped with a phone and a working SIM. It is very easy to use and maintain as it has low maintenance cost but incurs only the development investments. The sensors detect the surroundings around and send information to the Arduino board processes the data and is displays on Arduino IDE and sends the same message to GSM module.

Fig 9. (a) Output: LCD Data

As soon as when a change in the values of temperature, humidity, etc are detected, the LCD displays the current value accordingly in a delay of 2s. If the ultrasonic sensor indicates the low level of water in the tank, the LCD displays, “Water is filling”, and the water starts filling the tank. According to the moisture content present in the soil, LCD displays “Field is Wet” or “Field is Dry” respectively. In IoT module, information regarding temperature and moisture sensors are uploaded and saved for future use.

Table 1. Sensor Data

DATE &TIME	TEMPERATURE(°C)	MOISTURE
14/03/2020_12:18	36	35
14/03/2020_12:20	39	34.1
15/03/2020_15:20	38	37.24
15/03/2020_15:23	40	35.37
16/03/2020_12:10	36	38.51
16/03/2020_12:13	39	34.7

ISSN: 2278-4632
VOL-10 ISSUE-6 NO. 11 JUNE 2020

The GSM module, conveys the information regarding temperature and moisture sensors to the user's mobile in the form of SMS as shown in figure 9. (b).

Fig 9. (b) Output: GSM Data

6 CONCLUSION

Smart Farm Monitoring System using IoT shall be used in agriculture for better productivity. It would be a useful for farmers since it decreases the need of manual efforts. The proposed set up may be used to turn on/off the water sprinkler in keeping with soil moisture levels. Thus, the irrigation automation technique is ingesting activities for farming. The device makes use of statistics as of soil moisture sensors to irrigate soil. Similarly, Live knowledge of Temperature, Moisture in farm readings are observed. This system helps farmers to increase the average crop yield, and plant quality through smart farming.

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