JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

SMART AGRICULTURE USING IOT

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Abstract: In India, people's primary source of income is agriculture. The economy of a nation benefits greatly from it. Environmental monitoring is not the only effective strategy for boosting agricultural output. Installing an autonomous irrigation system allows farmers to save time, money, and energy. The traditional farmland sprinkling methods demand physical disruption. Human intervention can be reduced using the automatic sprinkling system. Crops may be continuously sensed and observed using the Internet of Things (IOT) and sensors, and farmers can be periodically informed of crop growth and harvest time. For the gathering and analysis of field data, this project uses sensors like temperature sensors, humidity sensors, soil moisture sensors, and rain detectors. To remotely manage and analyzed sensor data, these sensors are integrated with ordinary technologies to create a wireless sensor network.

Keywords: IOT, smart agricultural, GSM module, applications, and humidity sensor.

I. INTRODUCTION

Because of the declining cropping rate, food prices are consistently rising. This is a result of a variety of issues including water waste, poor soil productivity, improper composting, disease outbreaks, and climate change. Agriculture needs to be effectively interfered with, and IOT in conjunction with a wireless sensor network is the answer [1]. The Internet of Things (IOT) is a new technology that allows anything to be connected to the internet; it connects disparate items (such as houses, cars, electrical gadgets, etc.) that are not currently interconnected. IOT's key goal is to make sure the right information is sent at the right moment to the right peoples. Agriculture requires sprinklers since monsoon rains are inconsistent [2]. This project applies IOT technology to agriculture by gathering crop growth environmental parameters in a fixed location to assist farmers in identifying problems early. Agriculturists offer advice with detailed information to increase farmers' revenue and assist in the prevention and management of crop diseases and pests [3]. By the creation of mobile phone apps, it has been incorporated with marketing, farm technology, and an online FAQ.

II. LITERATURE SURVEY

This study describes a system that consists of several sensors linked to an app using a mesh network. The device monitors and even regulates several variables including humidity, temperature, and wetness. It employs "IOT thing language," which gives characteristics of the IOT sector by establishing a reliable or authentic standard for the items utilized in wireless sensor networks. As a result, this study describes actual example of how the Internet of Things (IOT) is used in Indian agriculture. With regard to our traditional agricultural operation, we have provided a system for how the Internet of Things notion is employed [1]. In this study, a solution is improved with an Android app that uses hardware and components to measure temperature, humidity, moisture content, and animal identification. Several sensors, an ADC converter, a buzzer, a relay, a microcontroller, and a GSM module are all found on a single board [2]. A remote-controlled robot with three nodes built with various sensors and microcontrollers and connected to the Wireless Sensor Network is used to address difficulties with sprinklers, on-field operations, and warehouse storage (WSN). As a result, the system has both hardware and software interface and provides an easy-to-use Android mobile application. This study examines how the Internet of Things (IOT) is reviving agriculture's appeal to farmers by utilizing a wide range of methods, including accuracy and stable farming, to meet field issues. By giving data on conditions like atmosphere, environment temperature, and soil production, harvest web observing capture area of tea, level of water, bug detection, animal interference in the field, change improvement, and farming, IOT development aids in social affairs. As a result, sites of interest like water and work sparing began using sensors that operated after they were updated. It is easy to put this concept of farming modernization into practice [3]. In this study, we demonstrate how the development of wireless sensor networks has made observed and control of greenhouse parameters possible for precision agriculture (WSNs). IOT-based smart farming will employ sensors to automate the sprinkler system and observe the agricultural land's conditions (humidity, temperature, soil moisture, etc.) [4]. From any place, farmers can keep an eye on crop or field problems. IOT-based smart farming is incredibly effective and recommended when compared to conventional access.

3. PROPOSED WORK

SMART AGRICULTURE SYSTEM

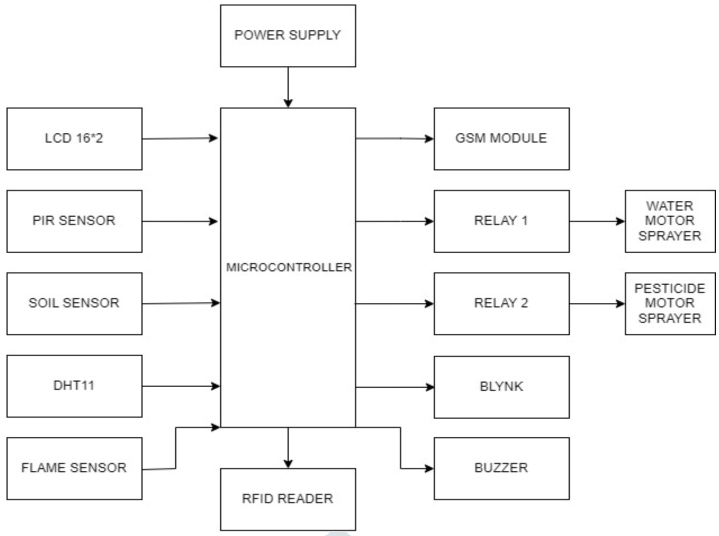

FIGURE 1: SMART AGRICULTURE USING IOT

3.1 MICROCONTROLLER

Except a few exceptions at the bottom, the pinout of the ESP32 Development Boards' 30-pin and 36-pin versions is relatively identical. Six GPIO pins (GPIO6 to GPIO11) are used for the SPI flash IC in the 36-pin version. They shouldn't thus be utilised in other ways. Lastly, there is only one additional pin (GPIO0—Pin 23).

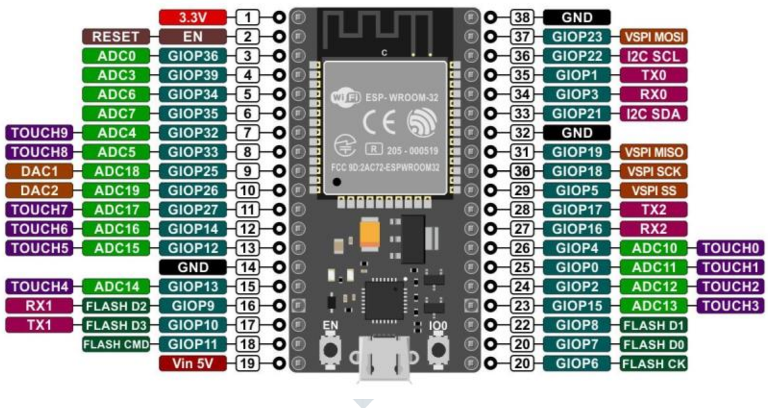

FIGURE 2: MICROCONTROLLER

3.2 SOIL MOISTURE SENSOR

A sensor that measures the moisture level of the soil is soil moisture. The sensor can detect digital and analogue output.
While the digital output is fixed, the analogue output threshold is adjustable. It functions according to the open- and short-circuit theory. The soil will function as an open circuit once it has dried out because the current won't be able to flow through it. The output is hence characterised as extreme. When the soil is wet, the circuit is said to be shorted, the current will be flowing from one terminal to the other, and the output will be zero.

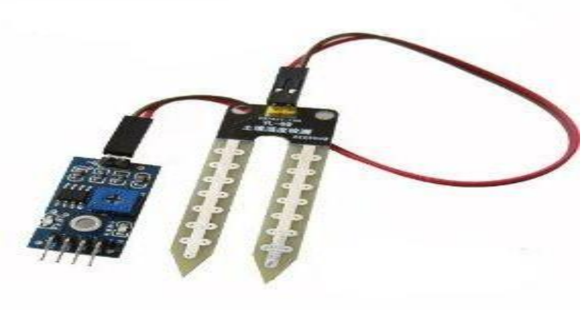

FIGURE 3: SOIL MOISTURE SENSOR

Soil moisture sensors (SMSs), when placed and used correctly, measure the soil moisture at the root zone and control the existing traditional irrigation timer, resulting in significant water savings. A unique soil water content criterion is established in order to suit both dry and wet soil conditions.

3.3 DHT11 (DIGITAL HUMIDITY TEMPERATURESENSOR)

The DHT11 humidity sensor shows a humidity sensor complex with its calibrated digital signal output. Using the special digital-signal-acquisition technique as well as temperature and humidity sensing technologies ensures high reliability and remarkable long-term stability. There is a resistive humidity sensor on this sensor. components of measurements. Farmers and other agricultural professionals can use the Smart Humidity Sensor to learn how much water is used overall by sprinkler, week, month, and season. It offers real-time data to assist farmers and growers in lowering their labor, hence lowering expenses and environmental effect.

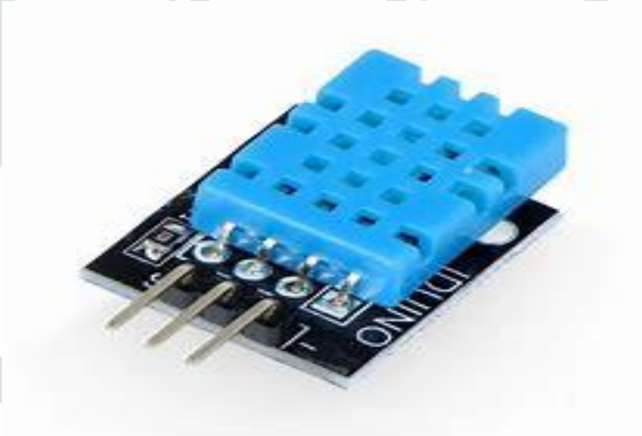

FIGURE 4: DHT11 HUMIDITY SENSOR

3.4 RELAY

A relay is employed as a user-operated electrical switch. Both a set of functional contact terminals and a variety of input terminals for one or more control signals are present. The switch also has a variety of contacts that can be used to make or break connections. In order to maintain the crop's moisture level, a relay is employed to activate the water pump.

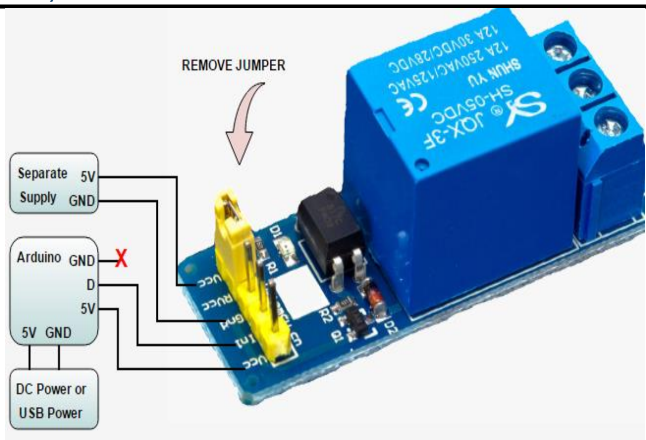

FIGURE 5: RELAY

The electromagnetic attraction theory underlies its operation. The electromagnetic field is energized and produces the short- term magnetic field when the fault current is detected by the relay circuit.

3.5 PIR SENSOR:

An electronic sensor called a passive infrared sensor (PIR sensor) measures how much IR light is emitted by objects in its field of vision. In PIR-based motion sensors, they are frequently utilized. In autonomous lighting and security alarm applications, PIR sensors are frequently employed.

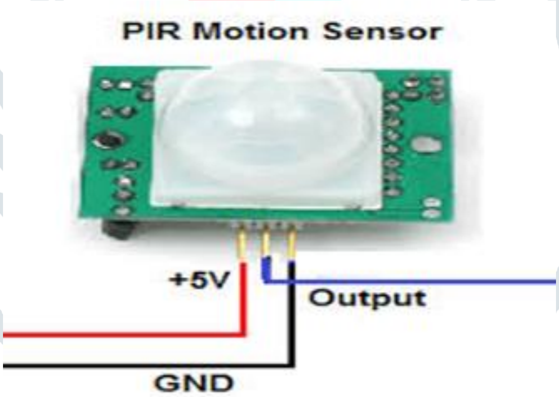

FIGURE 6: PIR SENSOR

The passive infrared sensor doesn't release any energy into the universe. It detects the body's infrared radiation to sound the alert. Anything with a temperature emits infrared radiation continually into the environment. Receiving infrared radiation from the human body, which has a surface temperature between 36°C to 27°, sets off the alert. Anything with a temperature constantly emits infrared radiation to the environment. The body's surface temperature is between 36 and 27 degrees Celsius, and the majority of its radiant energy is concentrated between the wavelengths of 8 and 12um.

3.6 FLAME SENSOR

"Flame sensors" are sensors that are most responsive to ambient light. Because of this, flame alarms employ this sensor module. In addition to detecting flames, this sensor also picks up light from sources with wavelengths between 760 and 1100 nm. High temperatures are potentially capable of damaging this sensor. As a result, this sensor can be placed at a particular distance from the flame. A detection angle of 600 allows for the detection of flames from 100 cm. This sensor produces a digital or analogue signal. These sensors act as a flame alert in firefighting robots.

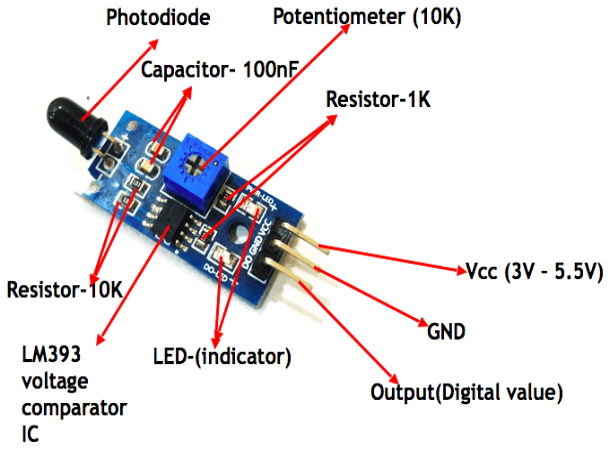

FIG 7: FLAME SENSOR

3.7 ACTIVE PASSIVE BUZZER:

We can add sound characteristics to our project or system by using buzzers, which are a small yet effective component. Actually that it has a relatively small and compact 2-pin construction makes it simple to utilise on perf boards, breadboards, and even PCBs, making it a common component in most electronic applications.
Buzzers come in two main varieties that are frequently found. The buzzer that is being demonstrated is a straightforward model that, when activated, emits a "continuous beeeeep" sound; the other variety is referred to as a "readymade buzzer," which will be larger in appearance and emit a beep. It produces a beeping sound as a result of the internal oscillating circuit. But, due to its versatility, the one displayed above is the most widely utilised.

FIGURE 8: ACTIVE PASSIVE BUZZER

3.8 16X2 LCD

The majority of embedded projects use 16x2 LCD modules, it is widely used because of their affordability, usability, availability, and accessibility to educational resources.

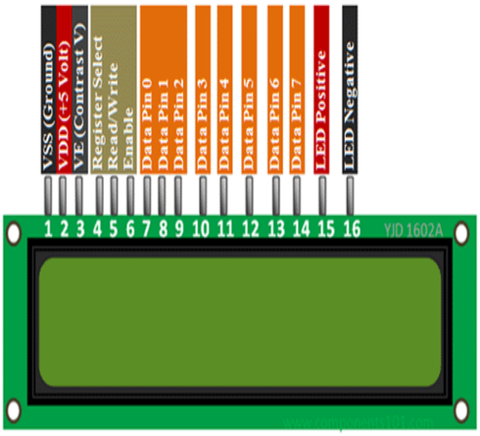

FIGURE 9: LCD 16X2

3.9 GSM MODULE

"Global System for Mobile Communication," or GSM (GSM). The mobile communication chip GSM is used. In mobile communication networks all across the world, it is frequently used. Bell Laboratories was where the GSM was created in 1970. GSM is an open and digital cellular technology used for data services and mobile voice transmission, and it operates at the 850 MHz, 900 MHz, and 1800 MHz frequency bands.

Time division multiple access (TDMA) communication methods were used to create the GSM technology as a digital system. A GSM digitalizes, compresses, and sends the detail information along with two other streams of client data, each in its own time slot. Data speeds of 64 kbps to 120 Mbps might be carried by the digital system.

FIGURE 10: GSM MODULE

III.RESULT

Our project's major objective is to connect contemporary technologies in necessary industries like agriculture.

This method uses IoT technologies in agriculture to make monitoring agriculture simple. The benefits as mentioned like water saving, labor saving, and most importantly storing the crops from bad weather are required to expand in the current agricultural state of affairs. Thus, using the sensors in the agriculture field makes things easier. The user receives the sensor's information via the cloud. As a result, any changes in the field may be easily detected, which allows for early action. The developed hardware kit of our proposed work is shown in Figure.

The temperature and humidity levels are observable in the Blynk application. The amount of moisture in the soil will also be apparent. The LED will not glow if there is water in the soil. We can also observe the water level in the Tank and accordingly refill it. We also have two motors here, firstly the supplier motor is required to distribute water in the farming field if the water level is less in the field and the Tank Motor is to refill the Supplier tank if the water level is at a low level and vice versa.

IV. CONCLUSION

IOT will boost farmers' ability to practice smart farming. The sprinkler system can be observed, watched, and managed by the system using IOT analysis of the soil moisture content and humidity. IOT helps improve time management, water management, crop monitoring, soil management, and pesticide and insecticide control in many aspects of farming**.** This approach also lesser the need for human work, makes farming methods simpler, and promotes smart farming. Together with the advantages this method offers, smart farming also has the potential to quickly expand the market for farmers. The agriculture farm can be upgraded by incorporating the WSN and IOT. With the use of these systems, we can monitor the soil's quality and the growth of the crop there. Farmers can also use these systems to address issues with irrigation, temperature, humidity, and other factors.

Population growth has led to more stringent food requirements today, making farming practices crucial to supplying the needs of the general public. Smarter and more effective farming practices must be followed. Many young people are becoming interested in agriculture and selecting it as a career due to the development of modern practices for improving agricultural productivity and handling.

They can raise their future expectations with the aid of IOT technology. In addition to the gadgets already described, we also use Bluetooth, the cloud, and other wireless sensors. There are explanations of various farming techniques and how successfully they conserve resources. In conclusion, monitoring the farm is essential for improved cultivation and reducing resource waste associated with Internet of Things technology.

V. FUTURE SCOPE

Indian agriculture has enormous potential that hasn't yet been realized. Farmers will gain significantly from the adoption of this programme. The project's vast scope includes system development, user-friendliness improvement, and the incorporation of new system features like:

1. The system can be equipped with a webcam to take images of the crops and send the information to the database server.
2. For users who are less literate, a speech-based alternative can be added to the system.
3. Weather data for gardens and agricultural fields can be combined with GPS (Global Positioning System) to give the farmer's exact location.
4. To make things simple for the farmers who only speak their regional language, a regional language option can be implemented.

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