Iot Application in Agriculture for Smart Farming

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Abstract

This project mainly focuses on modernising the agricultural monitoring procedure; The system attains the importance in upgrading the rural environment to overcome the difficulties in traditional farming. The agricultural activities comprise of field watering, checking the water level of land, motor on-off time, and rainfall in the area, sunlight in the area, humidity and temperature of surrounding areas. In our project controlling of agricultural activities such as field watering and monitoring the parameter values is carried by both automatic and manual way. In an automatic mode, sensors that are attached to field area gives the sensed value to Arduino then controller controls the relay and corresponding devices and also it send sensed values to farmer mobile using blynk(IoT server) through internet connection provided by wifi enabled modem but in the manual mode of control, farmers can also able to monitor the field from anywhere using internet camera and Control it through (IOT) enabled device and also farmers can get a notification by email when there is any wrong in the field by using third party web server(blynk) . The main aim of this project is to reduce the problems faced by farmers and increase the crop yield by proper irrigation using emerging technology. We have also focused on this project to reduce the effects caused by a rat and insects, using suitable repellent circuits. A solar panel provides a power supply for pump and control units; field area is install with a lamp for monitoring in dark conditions.

Keywords: Smart Farming, IOT, Solar system.

I Introduction:

India's major source of income is from the agriculture sector, and 70% of farmers and common people depend on the agriculture. In India, most of the irrigation systems operated manually. Semi-automated and automated techniques can replace these old technologies. The available traditional methods are like ditch irrigation, terraced irrigation, drip irrigation, sprinkler system. The global flooding scenario is categorised by increased demand for higher agricultural productivity, poor performance and decreased the availability of water for agriculture[1]. These problems can appropriately rectify, if we use an automated system for irrigation. The primary influencing parameter of Indian economy is agriculture. Also in agriculture, the most important factor is Irrigation and climatic condition. Irrigation must be in time for a better crop yield. Farmers also face many problems due to climatic changes, in this project I designed an embedded system which is control by sending data from the web through a mobile phone or by a computer, and internet camera can monitor it and send to user mobile through the internet [2, 3]. This embedded device can control maximum eight devices By using this proposed system a farmer can monitor power on/off, voltage supply level from home or anywhere using a mobile phone as well as he can switch on or off the motor from anywhere on the actual field.

Studies shows that current scenario of the agriculture with various problems like decreasing water tables, drying up of rivers and tanks, unpredictable environment present an urgent need of proper utilization of water resources and human resources. Due to the various problems some of the advancements need to be implemented in the field of agriculture[4].

After the research in the agriculture field, researchers found that the yield of agriculture is decreasing day by day. Technology in the field plays important role in increasing the production as well as in reducing the extra man power efforts. Some of the research attempts are done for betterment of farmers which provides the systems that use technologies helpful for increasing the agricultural yield[5,6].

In the studies related to sensor networks, researchers measured soil related parameters such as water level and humidity. Sensors were placed below the soil which communicates with relay nodes by use of effective communication protocol providing very low duty cycle and hence increasing the life time soil monitoring system ESP8266 module is works as IOT device that allows communicating with Blynk (third party server) wherever user can be[7,8].

Where necessary action was taken for controlling irrigation according to the database available system provides a promising low cost wireless solution as well as remote controlling for precision irrigation An Arduino module is programmed sensors to control relay in the automation mode and necessary to control the field with different condition and also monitoring field all the time[9]-[11].

Different kind of irrigation can be performed; according to that devices can be programmed especially various kind of farming lands needs different kind of treatments This survey shows that implementing technology in the field will reduce the human effort, increase the yield that controls all the action in the field by the remote control device though internet [12]-[19].

II. IOT based smart farming

By implementing the latest sensing and IoT technologies in agriculture practices, every aspect of traditional farming method can be fundamentally changed. Currently, seamless integration of wireless sensors and the IoT in smart agriculture can raise agriculture to levels which were previously unimaginable. By following the practices of smart agriculture, IoT can help to enhance the solutions of the many traditional farming issues, like drought response, yield optimization, land suitability, irrigation, and pest control. Figure 1 depicts the block diagram of proposed method.

(a)Solar Technology on the farm: Solar energy can be the key to lowering production costs of any agricultural. Dozens of high-tech options are available today for using photovoltaic systems in agriculture and horticulture. Passive solar techniques, such as staging the crop rows and designing or updating buildings to take advantage of the sunlight, often come at little cost but offer the capacity to boost a farm's productivity. PV panel systems can harness the sun's energy to pump water for irrigating crops and powering farm machinery and equipment. Solar technologies can also be effectively used to provide light, heat and ventilation to the farmhouse and livestock buildings.

(b)Humidity and temperature sensor: For measuring humidity they use the humidity sensing component which has two electrodes with moisture holding substrate between them. So as the humidity changes, the conductivity of the substrate changes or the resistance between these electrodes changes. This change in resistance is measured and processed by the IC which makes it ready to be read by a microcontroller. The DHT11 sensor is used to measure temperature and humidity.

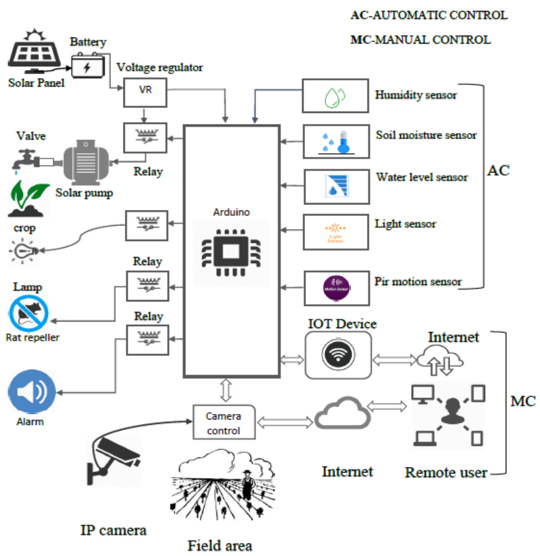


Fig 1 shows the block diagram of IOT based Smart farming

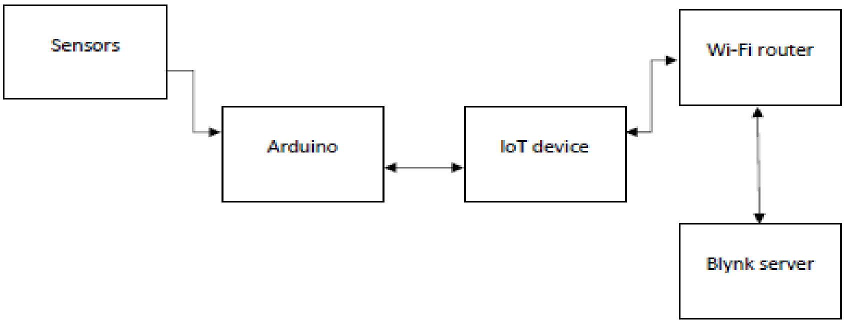


Fig 2 shows the Flow Diagram

(c)Soil Moisture Sensor: Soil moisture sensor is used to control the moisture level in the soil by supplying sufficient amount of water to the land. moisture sensor is interfaced with arduino for improving performance of the operation. The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, and environmental science.

Use the Soil Moisture Sensor to:

• Measure the loss of moisture over time due to evaporation and plant uptake.

• Evaluate optimum soil moisture contents for various species of plants.

• Monitor soil moisture content to control irrigation in greenhouses.

(d)PIR Motion Sensor:

The PIR (Passive Infrared) Sensor is a pyroelectric device that detects motion by sensing variations in infrared levels generated by nearby objects. By looking for a high, this motion can be noticed. PIR sensors detect movement and are virtually always used to determine whether a human or animal has entered or exited the sensor's range.

(e)LIGHT SENSOR (LDR)

The resistance of the LDR increases as the light level lowers. The voltage dropped across the LDR grows as this resistance increases in comparison to the other Resistor, which has a fixed resistance. When this voltage reaches a certain level (0.7V for a typical NPN Transistor).The fixed resistor's value is determined by the LDR, transistor, and supply voltage utilised.

(f)Water Level Sensor

It detects the quantity of water on the ground and, in an emergency or during the rainy season, automatically controls the motor's outlet valve to limit the amount of water on the region and reduce crop damage.

(g)Rat Repeller

We have designed a circuit using 555 timer IC in Astable mode to produce 40 kHz frequency sound. We have connected Buzzer at the output (PIN 3) of the 555 timer IC so that a sound of desired frequency can be generated. We should note here that we need a HIGH frequency Piezo buzzer, so that a high frequency sound can be generated. Also note that we might not be able to hear the sound, generated by the circuit as it is beyond our audible range. We can calculate the value of resistors and capacitor to produce oscillation of 40KHz frequency by given formulae:

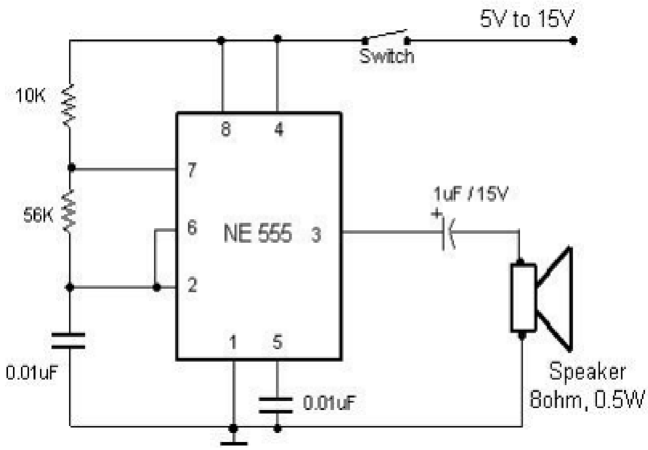
F = 1.44 / ((R1+R2*2)*C)

In our case we have used:

R1= 1K R2 (RV1) = 1.3 K (variable resistor of 10k, set at 1.3K with the help of multimeter)

C = 0.01uF

F = 1.44 / {(1 + 2*1.3)*1000} * 0.01uF = 40KHz



Fig(3) Shows the Rat repellent Circuit

(h)**BLYNK SERVER for IOT**

Blynk is an Arduino control platform with iOS and Android apps. It's a digital dashboard where you may drag and drop widgets to create a graphic interface for your project. Everything is really simple to set up, and you'll be tinkering in less than 5 minutes. Blynk isn't bound to any particular board or shield. Instead, it's about allowing you to use whatever gear you want. Blynk will get you online and ready for the Internet of Things, whether your Arduino or Raspberry Pi is connected to the Internet by Wi-Fi, Ethernet, or this new ESP8266 chip. Blynk was created with the Internet of Things in mind. It can control hardware remotely, show sensor data, and save, visualise, and perform a variety of tasks.

III. Results and Discussion

Various sensors will detect current field updates and communicate them to Arduino, which will analyse the data and make a decision. The actuators can be turned on or off depending on the sensor data. For example, if the temperature in the soil exceeds the threshold values, the sprinkler motor will start, supplying water to the field. The Arduino's values will then be communicated to the IoT device, where the user can access it and obtain information on changes in the field.

The circuit diagram for monitoring and control system model based on IoT is presented as a system in Figure 4. The router connects IoT devices to the network, allowing them to transfer data to a remote server on the Internet or to Cloud services. Sensor data collected from IoT devices is saved in a cloud database and made available to users. Users can access this information from anywhere using their desktop PCs, tablets, or smart phones.Users can operate actuators via IoT devices via the Internet, in addition to the system's monitoring role. Figure 5 depicts implementation of the IoT concept utilising Arduino platforms and suitable sensors. The IoT node's computational foundation is an Arduino Uno Board, on which numerous extra shields are pinned and sensors are mounted.

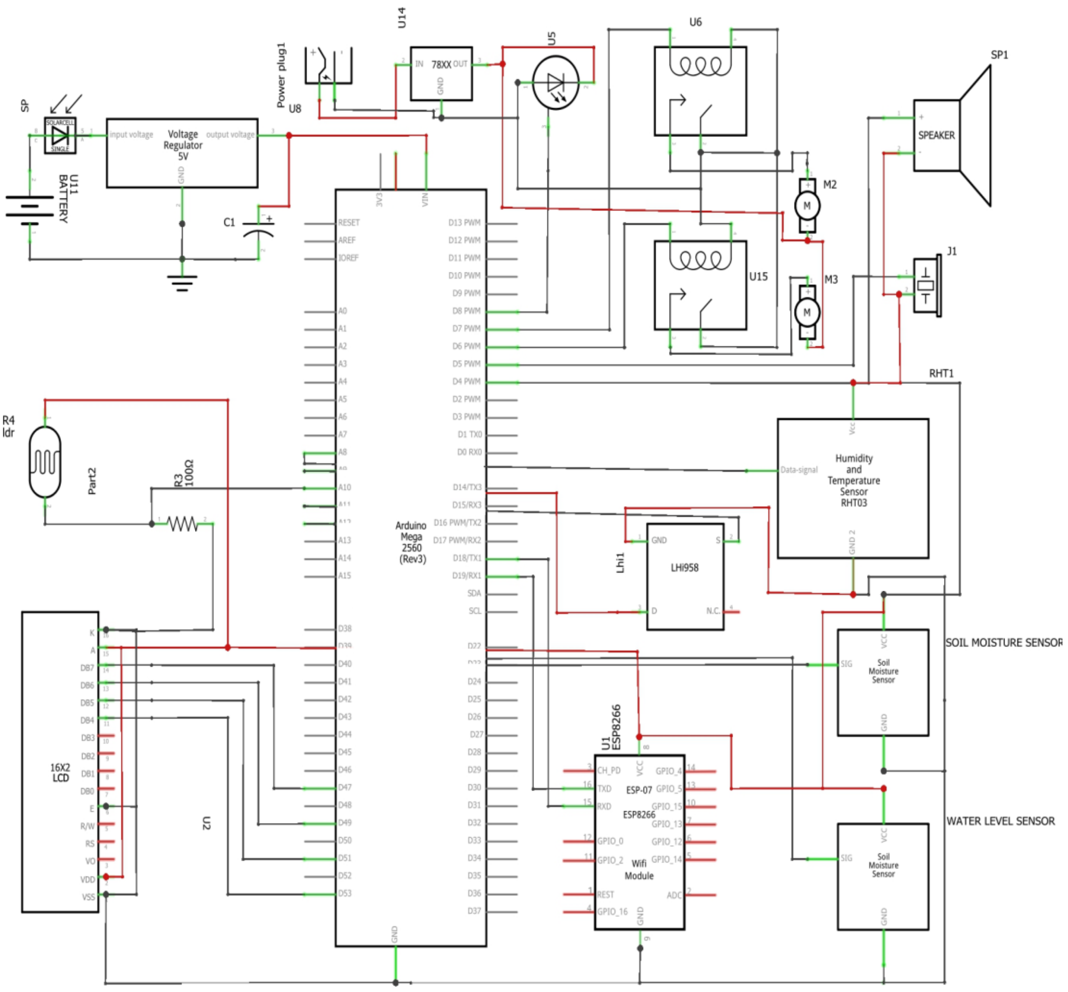


Fig 4 Circuit diagram of IOT based Smart farming

Temperature and relative humidity sensors, such as the DHT11, are employed, as well as gas emission, PIR motion detection, water flow, and light intensity. The information collected by these sensors, which are connected to analogue and digital Arduino pins, can be saved locally or transferred to a remote server. The main board communicates with the Ethernet module through SPI and may deliver data using the HTTP protocol. In this situation, the IOT device serves as a web client, and when data from sensors is collected, it can send an HTTP request to a web server on the Internet.

Another function of IoT devices is to act as a recipient, accepting requests from other devices. This indicates that the Web server is running on the device and serving network requests. Users can gain access to the device and manipulate the attached actuators, such as a solar-powered DC motor or the intensity of the light. The components are configured in such a way that these devices can be used in agricultural production.

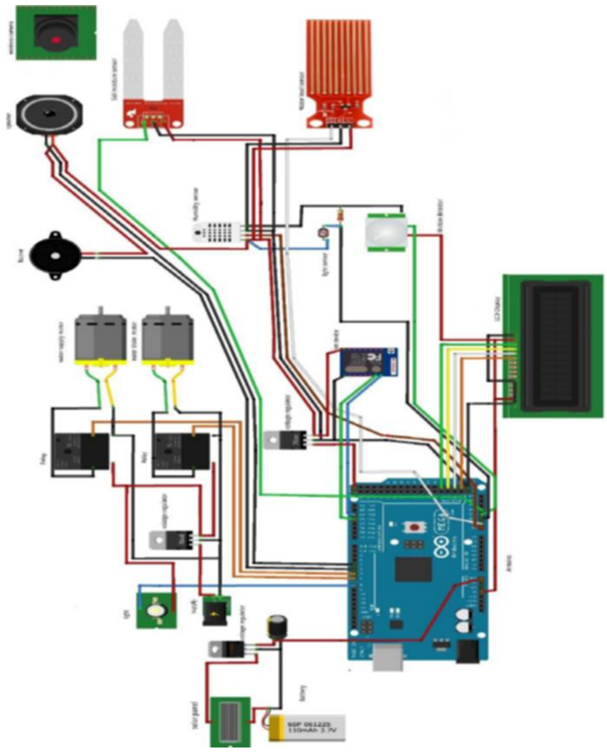


Fig 5 simulation of IOT based Smart farming

Fig 6 Hardware Module of IOT based smart farming

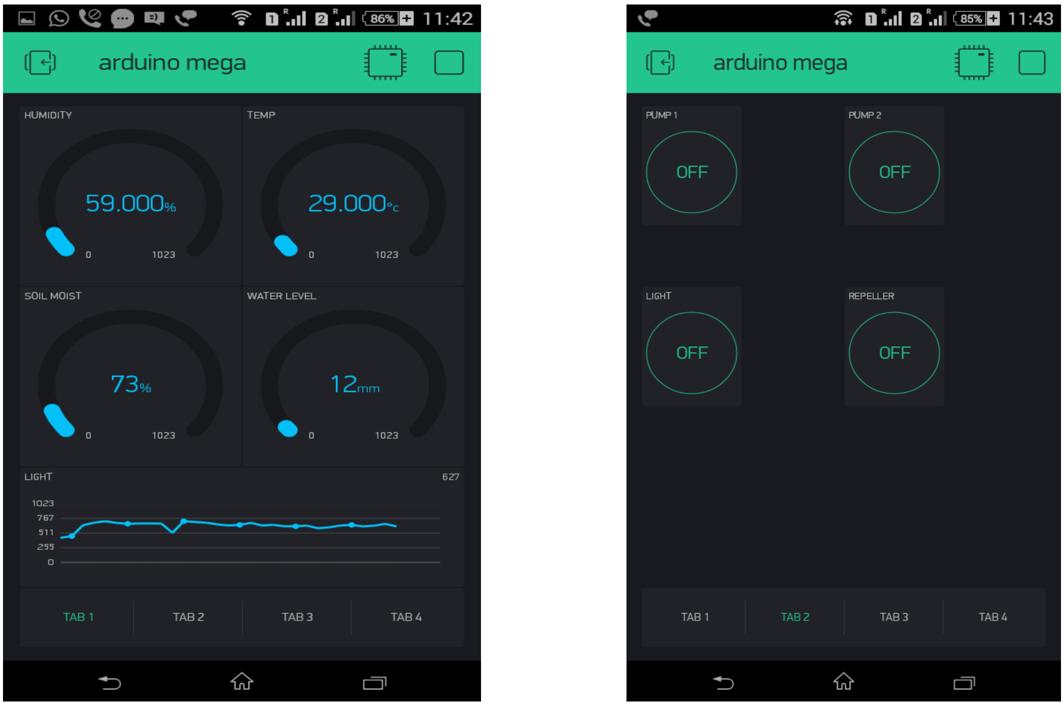


Figure 7 shows the output of IOT based smart farming

The greenhouse's temperature and relative humidity sensor is utilised to collect data. This sensor, along with the light sensors, provides information about the stable's conditions. The water flow sensor is used to keep track of how much water is consumed. The device's output can also be used to start the motor or change the light remotely when used in conjunction with the relay module. Figure 6 depicts the proposed work's hardware model. Figure 7 depicts the Android application's home page.

When you launch the app, it will show you the humidity, temperature, soil moisture, water level, pump status, and rat repellent status, among other things. The farmer can monitor and control all of the settings from a remote location based on the status. Node MCU used inbuilt Wi-Fi and an external LTE modem to transport all data to IOT. The Android application will receive data from the IoT and present it to the user. All of the parameters in the field can be tracked using the Android application. Develop a system that meets the needs of customers while remaining cost-effective.

When the humidity and temperature sensor values are less than the predetermined value, For example by using humidity and temperature sensor value is less than the set value. Then solar based DC motor pump automatically actuated. By using the above application farmers can increase productivity which leads to increase in come. This reduces labour income and increases the productivity.

IV **CONCLUSION**

The proposed project will develop an embedded-based irrigation system that will decrease manual field monitoring and deliver information in the form of digital data; the system will include a distributed wireless network of soil moisture and temperature sensors positioned in the root zone of the plants. A gateway unit also manages sensor data, triggers actuators, and sends data to a web application created specifically for IoT-based applications. The data is inspected in real time on a website, where the soil-moisture and humidity levels are visually shown through an application interface and stored in a database server, thanks to the Internet connection. Direct programming of scheduled irrigation schemes and trigger settings in the receiver according to crop growth and season management is also possible with this access. The proposed method can be utilised to properly irrigate a public garden space. Automated irrigation systems are in high demand and have a bright future. It saves time by eliminating human mistake in adjusting available soil moisture levels and maximising net profits through aspects such as sales, quality, and product growth.

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