Smart Farming Using IOT

CH Nishanthi[1], Dekonda Naveen[2], Chiramdasu Sai Ram[3], Kommineni Divya[4], Rachuri Ajay Kumar[5]
[1] *Associate Professor, ECE Dept., Teegala Krishna Reddy Engineering College, Hyderabad, India*
[2,3,4,5]*student, ECE Dept., Teegala Krishna Reddy Engineering College, Hyderabad, India*

***Abstract* - The agriculture industry is developed a lot with the help of technology; it became data-centered and smarter. The rapid growth of the Internet of Things based technologies reshaped many industries, including agriculture. Such a radical change dismantles existing farming practices and creates new opportunities along with some challenges. The IoT systems contributed in many fields and proven. It is time for farmers need to introduce the Smart Agricultural systems for higher crop yield. With a compilation of data from sensors and modern electronic gadgets, the farmer can monitor agricultural fields. Smart Agriculture can forecast weather data, switching ON the pump motor and switch ON the bulb for artificial light due to less light intensity, for farms acknowledging the dampness of soil of moisture levels. The IR sensor detects the pest and humans by their temperature; the sensors are interfaced to process module Arduino-UNO. The Smart agriculture system can be operated from anywhere with the help of networking technology.**

***Index Terms* - Internet of Things (IoT), Agriculture, Soil moisture sensor, Arduino-UNO ATmega328p, IR sensor, Smart farming.**

I.INTRODUCTION

Despite a growing population, the agriculture industry must rise to meet demand, regardless of environmental challenges like unfavorable weather conditions and climate change. In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, IR sensor.) and automating the irrigation system. The farmers can know the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach. The benefits which farmers are obtaining by adapting the IoT program are innumerable. It has helped farmers to reduce costs and increase crop yields. The primary purpose of the system is to maintain the ideal environment for the growth of crops. With the usage of smartphones and computers, users can access the data through the mobile site. Users can keep track of the crops and control the water pumps, lights, and fans in the control panel of the user interface. The primary aim of an intelligent irrigation system is to provide and maintain the optimum conditions for the crops. Through cultivating in an environment with sufficient water supply and ideal temperature, the growth of plants can be improved. Thus, the productivity of the agriculture field will increase as well. Using an IR sensor, we can detect the pest, birds, and humans through their temperature sensing and informs them to the user. By using this technology, we can increase productivity and can feed more people in the future. IoT transforms the agriculture industry with advancements and helps farmers to contend with their challenges. The applications can notify the IoT issues; it is cost-effective, and production of the crop will be increased [1]

II.LITERATURE SURVEY

A brief overview of existing work in various papers, which have been referred for implementation.

In [1] K. Lakshmi Sudha et. al, “Smart Precision Based Agriculture Using Sensors”; It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system.

In [2] Sushanth & G. Sujatha, “IoT Based Smart Agriculture”; The paper aims at making use of evolving technology i.e., IOT and smart agriculture using automation. Monitoring environmental conditions is the major factor to improve yield of efficient crops. The feature of this paper includes development of a system which can monitor temperature, humidity, moisture and even the movement of animals which may destroy the crops in agricultural fields through sensors using an Arduino board.

In [3] M.K.Gayatri & J.Jayasakthi, "Providing Smart Agriculture Solutions to Farmers for Better Yielding Using IoT"; The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.

In [4] Chetan Dwarkani Met. al, "Design and Development of Precision Agriculture System Using Wireless Sensor Network"; This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology.

In [5] Dr. V.Vidya Devi & G. Meena Kumari, "RealTime Automation and Monitoring System for Modernized Agriculture"; It proposes an idea about how an automated irrigation system was developed to optimize water use for agricultural crops. In addition, a gateway unit handles sensor information.

In [6] S. R. Nandurkar et. al, "Agricultural Protection System Based on IoT"; It is designed for an IoT based monitoring system to analyze crop environments and the method to improve the efficiency of decision making by analyzing harvest statistics.

In [7] Monika Jhuria et. al, "Image Processing for Smart Farming: Detection of Disease and Fruit Grading"; In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. The variations are seen in colour, texture and morphology.

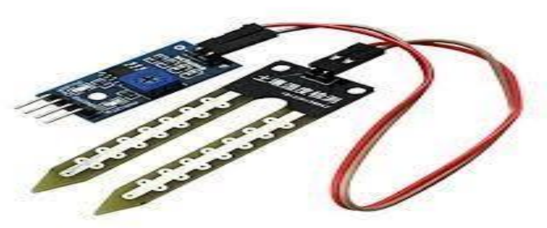
III EXISTING AGRICULTURAL PRACTICES

Agricultural activities continue to be one of the prominent livelihood strategies. Production of food crops is not dependent on any formally acquired knowledge of farming. Especially in rural areas, farmers following the traditional methods to produce their food crops with the help of the environment. Using the conventional techniques for agriculture, the labour work required for the farm is more to build a good crop yield. For an excellent crop yield, we need to protect the crop against pests. This pest control is done through traditional methods where farmers used to spray pesticides to kill the problems from the field by using sprays. There is a loss in the crop yield. As we don't know about the weather reports daily, we need to depend on rains and water flow upstream to downstream and canal watering system. A proposed innovative agriculture system is brought out to convert loss-making traditional farming into high crop yielding and profit-making.

IV PROPOSED SYSTEM

Our proposed system concentrates on monitoring the farming conditions through sensors like Humidity, Temperature, and soil moisture; LDR is used to sense the light intensity for the farm, and also IR sensor is used to detect the pest, birds, and humans by their body temperature and alerts the user through the message format to their mobile These sensors are the interface to process module Arduino-UNO. The LCD is used to display the status of different sensors. When there is a change in temperature condition, the sensor detects and turns ON the DC and cools down the condition. After the temperature comes to a normal state, the DC fan will turn OFF [2]. LDR (Light Dependent Resistor) is used to detect the light intensity in the farm. When the light intensity is less on the farm, the LDR senses the condition and turns ON the bulb. When the required light intensity is back, the bulb will turn OFF [2]. The soil moisture sensor is used to sense the moisture level in soil (water level) when the water levels are reached low in the ground. The ground gets dry, and the sensor detects it, then turn ON the DC water pump. When floor gets moisturized, the DC water pump will turn OFF.[3] The user can monitor these conditions in mobile phone with the help of Wi-Fi module through IOT mobile site [4].

4.1 SOIL MOISTURE SENSOR



The soil sensor, which stipulates the wetness of the soil, measures the volumetric contents of water inside the earth and gives us the moisture level as output. The sensor averages the water content over the entire length of the soil environment, wet or dry and the propelled yield. The sensors can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1.[2][3]

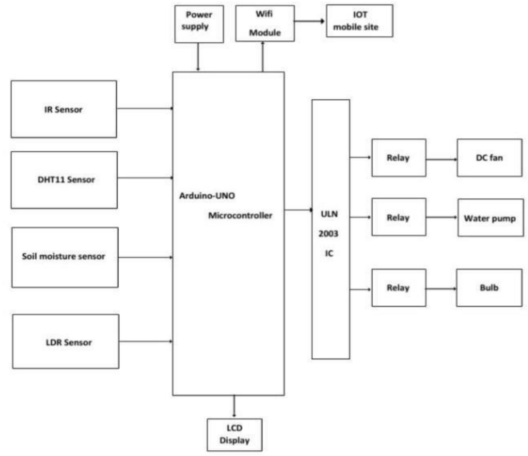
4.2 TEMPERATURE & HUMIDITY SENSOR

The humidity sensing device DHT11 is a moisture holding substrate with the electrodes applied to the surface. The change in resistance between the two electrodes is proportional to the relative humidity. Humidity sensors work by detecting changes that alter electrical currents or temperature in the air.[2]

4.3 LIGHT SENSOR

A light-dependent resistor, also known as a photoresistor or photoconductor, or photocell, is a resistor whose resistance depends on light intensity. LDR's are lightweight, sensitive devices. The light sensor is a passive device that converts this "light energy," whether visible or in the infra-red parts of the spectrum, into an electrical signal output. Light sensors are more commonly known as "Photoelectric Devices" or "Photo Sensors" because they convert light energy (photons) into electricity (electrons). Photoelectric devices can be grouped into two main categories: those that generate electricity when illuminated, such as Photo-voltaic or Photoemissions, etc., and those that change their electrical properties in some way, such as photoresist or Photo-conductors. This leads to the following classification of device [2]

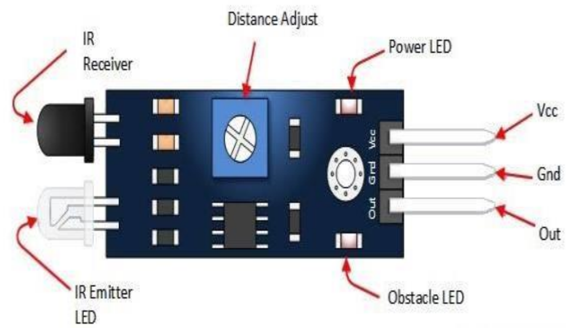
V BLOCK DIAGRAM



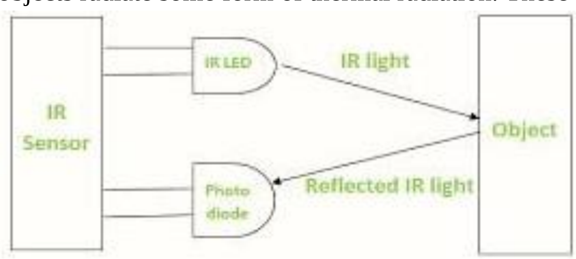
5.1 ARDUINO-UNO MICROCONTROLLER BOARD

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. Cc it is easy-to-use hardware and Software. Arduino can input various sensors as input and reproduce the given output required for actuators, motors, etc. It's user friendly to those who have an awareness of basic electronics and C programming language. Arduino platform mainly contains a Hardware Board called Arduino Board & Software Arduino IDE to program it. Other external hardware as Sensor Modules, Motors, Arduino UNO, and Arduino Software (IDE)-1.0. The Uno is a microcontroller board based on the ATmega328P. The Arduino consists of 14 digital input/output pins in which 6 are PWM outputs, and 6 are analog inputs, a USB connection, a power jack, and a 16MHz quartz crystal, an ICSP header, and a reset button. The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, Mac, OS, Linux) written in the Java programming language. It is used to write and load programs on the Arduino board to rise from room temperature. The sensors can convert the result, which involves the change of output voltage, which triggers the detection.[10]

5.2 IR SENSOR



The infrared sensor is used to emits light to sense the object in the surroundings. It can measure the temperature of an object and detects the movement of things. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These

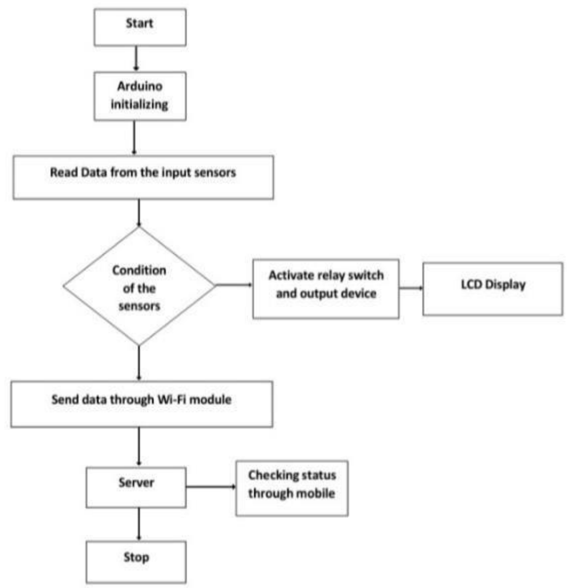


types of radiations are invisible to our eyes, but the infrared sensor can detect these radiations. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received [5][6].
An IR sensor consists of an IR LED and an IR Photodiode; together, they are called Photocoupler, or Optocoupler the IR Transmitter is a LED that emits infrared radiations are called IR LED. The IR LED looks like a regular LED, the radiations emitted by IR LED are invisible to the human eye [5][7]

5.3 WI-FI MODULE

ESP8266 Wi-Fi Module is an independent system on chip with built-in TCP/IP protocol stack which allows the microcontroller to access the Wi-Fi network. The ESP8266 has the potential of either hosting an application or discharging the Wi-Fi networking functions entirely from an additional application processor. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime.[8][9]

5.4 FLOW CHART

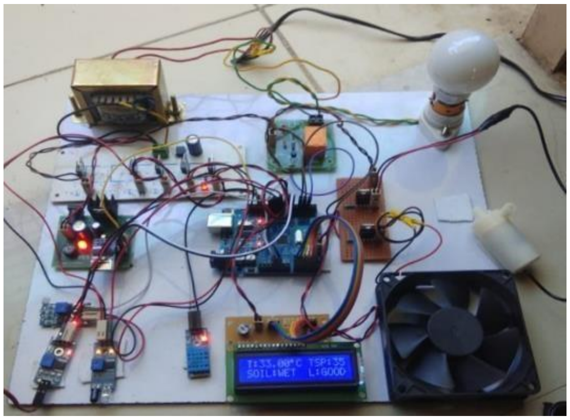


VI IMPLEMENTATION

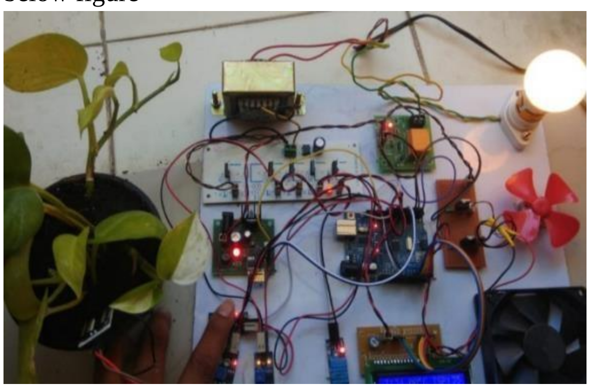
First, we write the code in Arduino IDE then upload the code to the Arduino board. Arduino starts initializing. First, we write the code in Arduino IDE then upload the code to the Arduino board. Arduino starts initializing. Then, we connect all the sensors, wife module, relay switch, bulb, water pump, and Dc fan with Arduino board. At the same time, we are joining the Arduino board and IDE with the help of a data cable. This cable helps provide the received voltage to run the hardware Arduino board and see the serial output. Then once the data is uploaded to Arduino hardware and connected to an Arduino IDE, The project starts to work. Then based on the behaviour of the sensor, the Arduino board starts the operational status of the sensors displayed on LCD. It also sends the data through the Wi-Fi module to a server and monitors its position through a mobile phone.

VII.RESULT

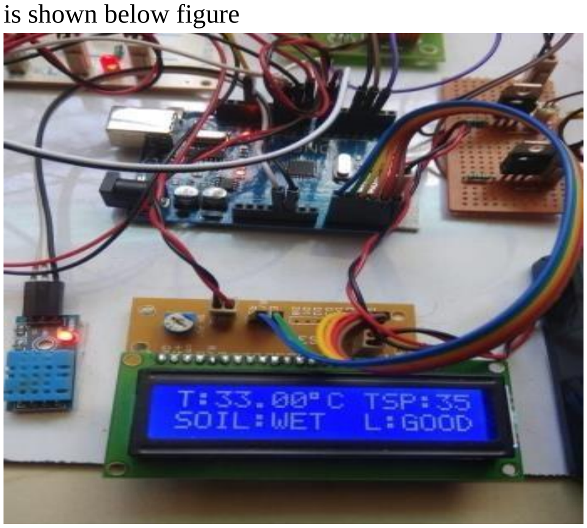
Connections of Smart Farming using IOT is shown in below figure



The output of Smart Farming using IOT is shown below figure



The status of various sensors displayed on LCD screen is shown below figure



The status of sensors monitor through mobile site isshown in below

VIII CONCLUSION

By using IoT, we can increase the crop yield in agriculture farms. With this IoT platform, we can monitor the weather conditions like Humidity and Temperature. We can also change the essentials required to the farm; the dampness and dryness of the soil can be observed through this. Using an IR sensor, we can detect the pest and humans by their movement in the field. The availability of sensors and microcontrollers interfaced with each other with the help of IoT and wireless communication between the sensors. This can reduce the challenges of the farmer which are faced by the weather. So, farmers can monitor the conditions of the farm through mobile or computers. These systems offer excellent crop yielding and produce better output results. Use these systems to increase the excellent crop yield in agricultural production in India. IOT capable of controlling the condition of the yield and growth. It can also reduce the labour work on the farm.

REFERENCES

[1] Nikesh Gondchawar and R. S. Kawitkar, "IoT based Smart Agriculture", International Journal of Advanced Research in Computer and Communication Engineering, vol. 5, no. 6, pp. 2278-1021, June 2016.

[2] P. Rajalakshmi and S. Devi Mahalakshmi, "IOT Based Crop-Field Monitoring and Irrigation

Automation" in 10th International conference on Intelligent systems and control (ISCO) 7–8 Jan 2016, published in IEEE Xplore, Nov 2016.

[3] R.V. Krishnaiah Sanjukumar, "Advance Technique for Soil Moisture Content Based Automatic Motor Pumping for Agriculture Land Purpose", International Journal of VLSI and Embedded Systems-IJVES, vol. 04, September 2013.

[4] Fan TongKe, "Smart Agriculture Based on Cloud Computing and IOT", Journal of Convergence Information Technology (JCIT), vol. 8, no. 2, Jan 2013.

[5] Davide adami, Fabio Vigoli, and Stefano Giordano, "IoT solution from crop protection against wild animals attack", 2018.

[6] Meonghun Lee et. al, "Agricultural Protection System Based on IoT", IEEE 16th International Conference on Computational Science and Engineering, 2013.

[7] Monika Jhuria, "Image Processing for Smart Farming: Detection of Disease and Fruit Grading", IEEE Second International Conference on Image Information Processing (ICIIP), 2013.

[8] S. R. Nandurkar et. al, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014.

[9] Joaquín Gutiérrez et. al, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE Transactions on Instrumentation and Measurements, 0018-9456,2013.

[10] Chetan Dwarkani et. al, "Smart Farming System Using Sensors for Agricultural Task Automation", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).

[11] Lakshmisudha et. al, "Smart Precision Based Agriculture Using Sensors", International Journal of Computer Applications (0975-8887), Volume 146No.11, July 2011.

[12] M.K.Gayatri et. al, "Providing Smart Agriculture Solutions to Farmers for Better Yielding Using IoT", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).

[13] Chetan Dwarkani et. al, "Smart Farming System Using Sensors for Agricultural Task Automation", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).

[14] Dr. V.Vidya Devi & G. M Kumari, "Real- Time Automation and Monitoring System for Modernized Agriculture" ,International Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 No.1. PP 7-12, 2013.

[15] S. R. Nandurkar et. al, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014.

[16] Monika Jhuria, "Image Processing for Smart Farming: Detection of Disease and Fruit Grading", IEEE Second International Conference on Image Information Processing (ICIIP), 2013.

[17] G. Sushanth and S. Sujatha, IOT Based Smart Agriculture System, IEEE, 2018.