A

Report on

SMART FARMING USING IOT

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

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COMPUTER SCIENCE ENGINEERING (DATA SCIENCE)

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ABSTRACT

Agriculture is the science and art of cultivating plants. Agriculture is done manually from ages. As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. IOT based Agriculture system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol. This smart agriculture using IOT system is powered by Arduino, it consists of Temperature sensor, Moisture sensor. When the IOT based agriculture starts, it checks any parameters like humidity and moisture level. This all can be seen through Blynk IOT platform where it shows information of Humidity, Moisture, based on per minute. Temperature can be set on a particular level, it is based on the type crops cultivated.

IOT based smart agriculture system can prove to be very helpful for farmers since over as well as less irrigation is not good for agriculture. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. This system also senses the invasion of animals which is a primary reason for reduction in crops and it also generates irrigation schedule based on the sensed real time data from field and data from the weather repository. This system contains Air quality flow sensor which measures the quality of air which is used for seeding purpose. The proposed project has developed as a prototype model.

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LIST OF ABBREVIATIONS

IOT	-	Internet of Things
GSM	-	Global System for Mobile Communication
WSN	-	Wireless Sensor Network
DHT11	-	DigitalTemperature and HumiditySensor
IR Sensor	-	Infrared Sensor
NODE MCU	-	NodeMicro Controller Unit

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CHAPTER 1
INTRODUCTION

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

The word 'Agriculture' springs from the Latin word 'Ager' means Land or field and 'Culture' means cultivation. It means the science and Art of manufacturing crops and livestock for economic purpose. Agriculture is an art of raising vegetarian from the soil for the use of mankind. Agriculture is that the mile stone within the history of human civilization, thanks to agriculture man settled at particular place. Agriculture is one amongst the oldest and prime activities of the human being. It's remained a vital source of land. In spite of growing industrialization and urbanization within the world, nearly one half working population still engaged in agriculture. In developing Countries agriculture sector has been a major source of employment and it's contributed to the economy. The fundamental aim of agriculture is to lift stronger and more fruitful crops and plants and to help them for their growth by improving the soil and supplying the water. Agriculture is a backbone of Indian economy. In India about sixty four percent of the totalpopulation is dependent onagriculture for their live food.

Indian agriculture is not an exception for this, today India is facing two main problem concerned with agriculture.The first is meeting the increasing demand of food and other is supplying agro products for ever increasing population and the second is uneven development of agriculture and changing pattern of agriculture land use. India tried to be self-sufficient in agriculture through the five year plans. After independence by taking systematic efforts due to the unique importance, agriculture gets more and more attention in every five year plans and top priority is given for the development of agriculture in our Country. The study of land and agriculture from the geographical point of view gained more importance after 1950. At the beginning of 1970 and later on the green Revolution brought of remarkable change in the field of agriculture, due to this India become not only self-sufficient in food grains but it could also expert a small quality of it. The process of agriculture development is not properly channelized because of uneven rainfall, unavailability of basic infrastructure facilities and unbalance allocation of resources. The green revolution is succeed only in the areas of irrigation. In spite of lot of efforts by Government, the small farmers could not get the benefit of it. This creates a large gap between small and big farmers and imbalanced is created.

To reduce this gap. Systematic planning is required for this purpose it is necessary to have the detailed information of the region. Many countries like India, majority of the population depends on farming, and its national income comes from farming. In spite of this and even the modern technology is found everywhere, the agriculture area is following the old conventional technology. Our farmers still resort to traditional methods like manual distribution of seeds, two crops per year pattern, unscientific systems of cultivation. The monsoons are irregular, and unevenness of availability of water throughout the year poses a major problem. All this leads to inadequate yield and low productivity. The implementation of scientific methods in the field of agriculture can bring about radical changes in the productivity of crops, due to improved efficiency in the farming techniques. Of the various advantages that IOT brings to the table, its ability to innovate the current scenario of farming methods is absolutely groundbreaking. Mostly, we come across ideas that suggest a wireless sensor network that collects data from the various sensors present in the field and sends the data to the main central server. This method focuses on studying the environmental factors to improve crop yield. But it turns out, monitoring environmental factors alone are never adequate to increase productivity of crops since a lot of other factors have a role to play.

1.2 OBJECTIVE

- The objective of this project is to offer assistance to farmers in getting live data for efficient environment monitoring which includes
- Temperature
- Humidity
- Soil Moisture
- Air Quality

1.3 PROBLEM STATEMENT

Description: Use data science and IoT to develop an innovative farming system that optimizes crop yield and reduces waste. The system should be able to collect data on soil moisture, temperature, and other factors to make real-time decisions on irrigation, fertilization, and other farming practices.

1.4 PROBLEM DEFINITION

It should utilize minimum resources in terms of hardware and value. This overcomes the manual operations required to observe and maintain the agricultural farms in automatic mode. It should be able to measure the rise or decrease in level of water yet as moisture within the soil.

CHAPTER 2
LITERATURE SURVEY

CHAPTER-2
LITERATURE SURVEY

Chetan Dwarkani M, R Ganesh Ram, S Jagannathan, R. Priyatharshini, "Smart agriculture system using sensors foragricultural task automation", 2015 IEEE.

Analysis of existing IoT techniques used for agriculture. There are various methodologies available in the field of agriculture but there is a need to deploy a model which is cost effective and easily understandable to all the common people providing all the farming necessities like irrigation, theft control, monitoring, security, etc. One way is “A Model for Smart Agriculture Using IoT”. This model implements areal-time soil monitoring system which monitors the soil moisture content, its ph level, and temperature and these values are used to deploy a decision-support system. This decision support system helps in pest and crop disease identification and sends SMS based alert to the owner. The proposed architecture consists of three modules: client side, server side, and farm side. A generic sensor board called Ubi-Sense Mote (M) is used to measure temperature, humidity, barometric pressure, and proximity sensing. The data collected by Ubi-Sense Mote is then sent to the server side. Server-side consists of a decision support system. Decision support system then sends the required information received from the sensors to the client side which consists of web application and mobile application for Android. The drawback within this system is that there is no technique proposed for improving the irrigation facilities and the mobile app isn't available for iOS-based phones Another system proposed is “ IoT based smart crop-field monitoring and automation irrigation system” . In the methodology, two sensors i.e. the soil moisture sensor and the temperature sensor is placed in the crop field. The data is collected from this sensor with the help of Raspberry Pi microcontroller. Data is then sent to the database i.e cloud with the help of wifi.

Sweksha Goyal ; Unnathi Mundra ; Prof. Sahana Shetty IJCSMC, Vol. 8, Issue. 5, May 2019, pg.143 – 148. SMART AGRICULTURE USING IOT.

IoT based smart agriculture system" . The aim for implementation of this system is to allow decisions to be taken for watering the plants according to the soil moisture content and continuous environmental conditions on the field. The system contains temperature, humidity sensor, motion sensor and soil moisture sensor which are deployed near the plant root area. The value of these sensors is sent to the Arduino board which is a microcontroller and acts as a gateway to transfer information. The data from the Arduino board is uploaded to the cloud which is further sent to the mobile application created. User can access to all this information using the same mobile app. The software is designed in such a way that whenever the values of sensors cross the threshold level notification is sent to the user of the app. The user has control over the water pump fromanyplace. When the user selects „TURN ON" the notification is sent to cloud and the same is received by Arduino board which in turn switches the motor ON.

Nageswara Rao and B. Sridhar " IoT based smart crop-field monitoring and automation irrigation system" in Institute of Electrical and Electronic Engineers, 2018.

The Internet of Things (IoT) is a technology where in a mobile device can be used to monitor the function of a device. The Internet of Things (IoT) is concerned with interconnecting communicating objects that are installed at different locations that are possibly distant from each other. Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information. Moisture sensor measures the moisture content of the soil and a threshold value will be set. Automatic irrigation control designed makes water pump to turn on when the threshold value crosses the set limit. Conventional irrigation agriculture uses 90% of the water in drought conditions. Accurate estimation f the utilization of water in farming measured in precision agriculture for effective water management. Describing irrigation strategies over an area is difficult because of the massive variety of crops planted and the diversity of farmers. Advanced agricultural system in IoT due to their efficient and easy maintenance of the farm. In addition, creating this type of automation system helps to water the plants without human assistance.

Riddhi Shindkar ,Gayatri Magdum ,Mansi Narkhede, Siddhi Shindkar,IJCSMC ,Vol 3, no 5, pp 3113-3117, May 2022. IoT Based Smart Agriculture System

The Internet of Things (IoT) is reworking the agriculture business and helping farmers to content with huge challenges they face during the plant & soil observation area unit the challenges wherever IoT is the solution. The innovative IoT applications address the problems in agriculture and increase the standard, quantity, property and price effectiveness of agricultural production. Today‟s massive and native farms will leverage IoT to remotely monitor sensors that may discover soil wetness, crop growth and discover blighter and management their good connected harvesters and irrigation equipment. This project aims at observation the soil parameters like soil wetness, temperature. User is acknowledged regarding the area once there's any deviation from the expected values via Thingspeak. Alongside soil parameters, temperature detection is additionally enclosed during this project. This ensures the entire system health.

In this paper, soil moisture sensor, temperature and humidity sensors placed in root zone of plant and transmit data to android application. Threshold value of soil moisture sensor was programmed into a microcontroller to control water quantity. Temperature, humidity and soil moisture values are displayed on the android application. So the new feature we are going to add is Air quality flow sensor, this sensor shows how much quality of air is present and pressure of air in the agricultural field through live data monitoring in android application

CHAPTER 3
PROPOSED SYSTEM

CHAPTER 3
PROPOSED METHOD

3.1 PROPOSED METHOD

This project presents proposed model for Smart Agriculture to develop real time monitoring system for soil properties like Temperature, Humidity and moisture, crop yield identification using SMS based Alerts. It will also be possible to control various operations of the field remotely from anywhere, anytime by mobile as well as web application. The IOT based agricultural monitoring system has been used to maximize the yield of crop by monitoring the environmental parameters and thus providing the required information to farmer remotely. This system can be implemented in any type of agricultural field with varying soils. The use of IOT over the other technology one aides for deploying it in any type of environment for monitoring, making it flexible and robust. The proposed system is developed for the goodwill of farmers. The system greatly reduces the human interaction, labour cost and wastageof water.

This proposed work is intended to offer ease of use, effective and reliable control system. It helps in reducing the amount of water and energy required. From an economical view, agriculture is the fount of living for over half of the world's population. Moreover, this system will increase yield for farmers at a moderate and accessible cost. This section initially explains about the functional and nonfunctional requirements and the next sections deal with system architecture, hardware and software design.

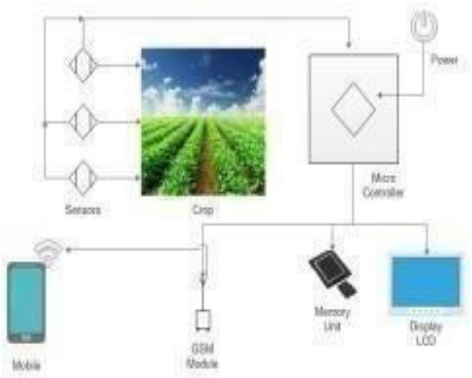

Fig 3.1 Model diagram for proposed work

The proposed system is modelled using Arduino mega development kit which connects to light sensor for measuring the light intensity, environment temperature/humidity sensor for getting the temperature and humidity in the surroundings, soil moisture sensor for volumetric water level, and air toxicity measuring carbon monoxide and oxygen levels.

Moreover, this smart agriculture using IoT system powered by NodeMCU consists of a DHT11 sensor, Moisture sensor, DS18B20 Sensor Probe, LDR, Water Pump, and 12V led strip. When the IoT-based agriculture monitoring system starts, it checks the Soil moisture, temperature, humidity, and soil temperature. It then sends this data to the IoT cloud for live monitoring. If the soil moisture goes below a certain level, it automatically starts the water pump. We previously build Autotmatic plant irrigation system which sends alerts on mobile but doesn't monitor other parameters. Apart from this Rain alarm and Soil moisture can also be helpful in building Smart Agriculture Monitoring System.

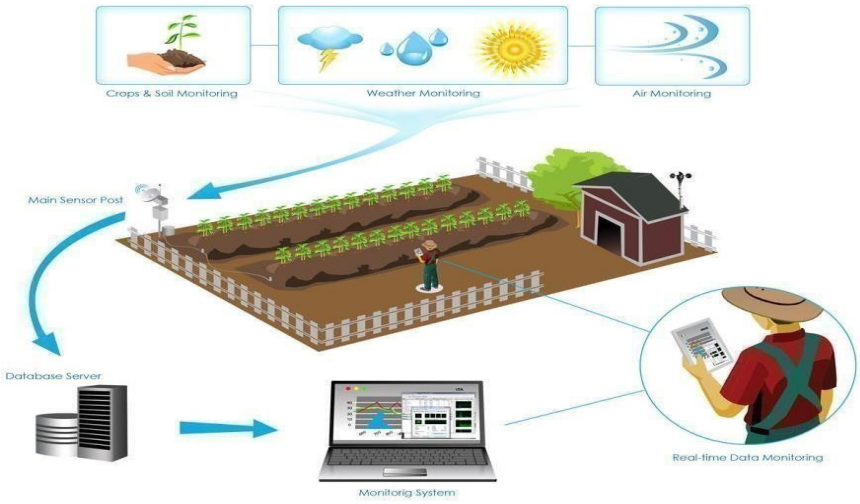

Fig 3.2 proposed system

3.2 BLOCK DIAGRAM

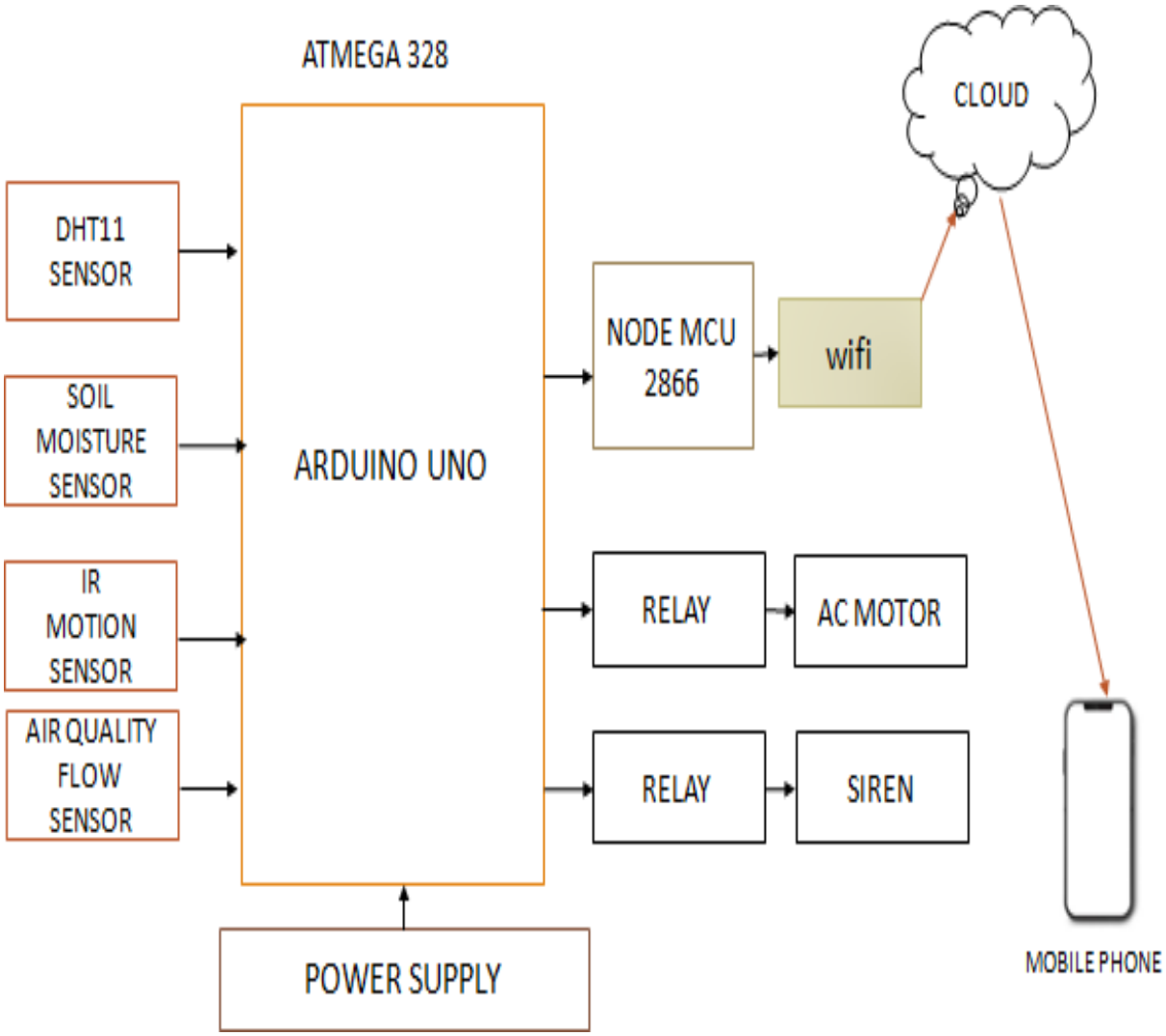

Fig 3.3 Block diagram

Arduino is a type of open-source hardware and software, which is used to design and manufacture single board microcontroller and micro controller kits which is used to build digital devices. Arduino is the main heart ofthe project which is used as an interface.

- In this project we are using three sensors they are soil moisture sensor, DHT11 sensor, Air quality sensor
- These sensors are connected to the Arduino which is taken as input
- Through this Arduino ESP8266 is taken as output, which mainly contain antenna and WIFI module in to it.
- Two relays are connected to the Arduino as output where one of the relay is for soil moisture detection. Another is for Motion detection
- The water pump is connected to the relay, when the moisture of the soil gets dry then automatically water pumps turn on
- The buzzer is connected to another relay, where any animals enter in to the field then buzzer is turned on.
- When the power supply is on, the sensors send the data to the cloud, so we can monitor all this information through mobile with the help of android application like Blynk IOT.
- LCD display is connected to display the values of the temperature, humidity, air quality, moisture ofthe soil.

CHAPTER 4
HARDWARE COMPONENTS

CHAPTER 4

HARDWARE COMPONENTS

4.1 COMPONENTS REQUIRED

Monitoring Agricultural Environment using IOT. This model is designed by using following components:

1. Arduino uno
2. Soil moisture sensor
3. DHT11 sensor
4. Air qualitysensor
5. IR sensor
6. ESP8266
7. Relay
8. Siren
9. Ac water pump
10. LCD Display
11. Regulated Power supply

4.2 SELECTIVITY OF EQUIPMENTS

- In our project we need Soil moisture sensor which is used for measuring and monitoring the moisture of the soil and we are using water pump to get the information of motor ON and OFF
- We use IR sensor which is used to detect the animals in the agriculture and weare using siren which that all the animals will move far away fromthe field
- We are using DHT11 sensor through which we can monitor the humidityand temperature in the agricultural field
- We are also using air quality sensor which gives the value of quality in the airinthe agricultural field
- We are using Arduino in which all the sensors are to be interfaced and it can beused for inserting the code to run the project
- We are using Relays through which water pump and buzzer are being connected.
- Regulated power supply is used to get the supply to the project.

4.3 COMPONETS

4.3.1 ARDUINO:

Fig 4.1 Arduino

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller as shown in fig 4.1. It is easy to use compared toother boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header as shown in fig 4.2. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms. The Arduino Uno is one kind of microcontroller board based on ATmega328, and Uno is an Italian term which means one. Arduino Uno is named for marking the upcoming release of microcontroller board namely Arduino Uno Board 1.0. This board includes digital I/Opins-14, a power jack, analog i/ps-6, ceramic resonator-A16 MHz, a USB connection, an RST button, and an ICSP header. All these can support the microcontroller for further operation by connecting this board to the computer. The power supply of this board can be done withthe help of an AC to DC adapter, a USB cable, otherwise a battery.

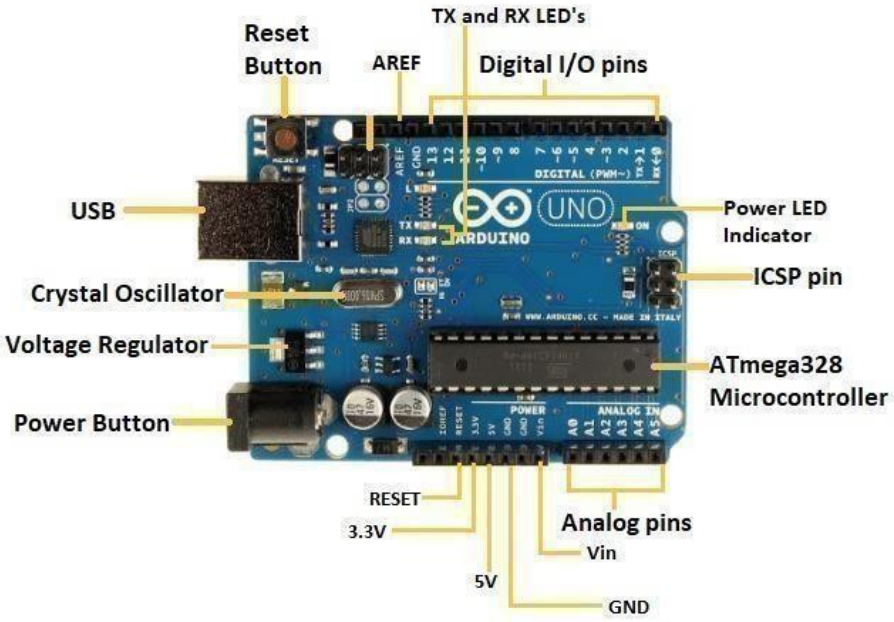

Fig 4.2 Arduino components

- ATmega328 Microcontroller- It is a single chip Microcontroller of the Atmel family. The processor code inside it is of 8-bit. It combines Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.
- ICSP pin - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- Power LED Indicator- The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.
- Digital I/O pins- The digital pins have the value HIGH or LOW. The pins numbered fromD0 to D13 are digital pins.
- TX and RX LED's- The successful flow of data is represented by the lighting of these LED's.
- AREF- The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board fromthe external power supply.
- Reset button- It is used to add a Reset button to the connection.
- USB- It allows the board to connect to the computer. It is essential for theprogramming ofthe Arduino UNO board.
- Crystal Oscillator- The Crystal oscillator has a frequency of16MHz, which makes the Arduino UNO a powerful board.

- Voltage Regulator- The voltage regulator converts the input voltage to 5V.
- GND- Ground pins. The ground pin acts as a pin withzero voltage.
- Vin- It isthe input voltage.
- Analog Pins- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to readthe analog sensor used in the connection. It can also act as GPIO (GeneralPurpose Input Output) pins.

ATmega328 is present in the Arduino. The high-performance Microchip 8-bit AVR® RISC-based microcontroller combines 32 KB ISP Flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte- oriented Two-Wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching one MIPS per MHz, balancing power consumption and processing speed.

ATmega328 is an 8-bit, 28-Pin AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash-type program memory of 32KB.Atmega328 is the microcontroller, used in basic Arduino boards. i.e Arduino UNO, Arduino Pro Mini and Arduino Nano.

4.3.2 DHT11:

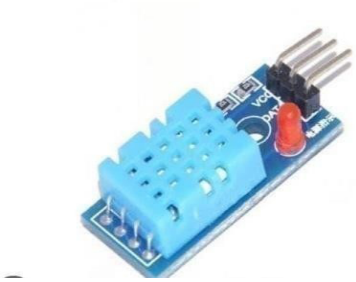

Fig 4.3 DHT11

DHT11 is a low-cost digital sensor for sensing temperature and humidity as shown in fig 4.3. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

Working Principle of DHT11 Sensor:

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers.

DHT22 and DHT11 are very basic temperature and humidity sensors. They both uses a thermistor and capacitive humidity sensor to measure the surrounding air. A capacitive humidity sensor is used to measure relative humidity with a range of 5 to 95 % RELHum. A thermistor is a resistance thermometer whose resistance is dependent on temperature. We can measure the resistance of a thermistor using an ohmmeter. Both sensors are pretty slow working, but they do have advantages like low power consumption and long term stability. DHT22 is much more accurate and better than DHT11. DHT11 has humidity range of 5 to 95% RH with a ±5% and also atemperature range of -20 to 60°C with a ±2%, while DHT22 has humidity sensor of 0 to 99.9 %RH with ±2% accuracy while the temperature sensor ranges from -40 to 80°C with ±0.5°C accuracy.

Pinout of DHT11 and DHT22 The both sensors have a very similar pinout. They has four pins namely Gnd, Vcc, Analog and Data. Gnd needs to be connected to the ground of Arduino or the circuit. Vcc can be either connected to 3.3V or 5.V of Arduino. Data pin outputs both temperature and humidity through serial data and needs to be connected to one of the digital pins of Arduino as per the code.

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.

4.3.3 SOIL MOISTURE SENSOR:

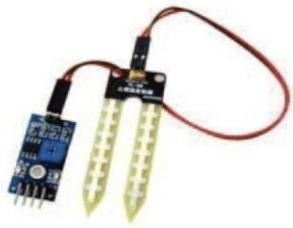

Fig 4.4 Soil moisture sensor

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil as shown in fig 4.4. As the straight gravimetric dimension of soil moisture needs eliminating,drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content.

The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity. The microwave emission which is reflected can be influenced by the moisture of soilas well as mainly used inagriculture and remote sensing within hydrology

These sensors normally used to check volumetric water content, and another group of sensors calculates a new property of moisture within soils named water potential. Generally, these sensors are named as soil water potential sensors which include gypsum blocks and tensiometer. Soil moisture sensors measure or estimate the amount of water in the soil. These sensors can be stationary or portables such as handheld probes. Stationary sensors are placed at the predetermined locations and depths in the field, whereas portable soil moisture probes can measure soil moisture at several locations.

Soil water tension indicates the energy required by plant roots to extract water from soil particles. As soil water is removed from soil, soil tension increases. Soil tension is expressed in centibars (cb) or bars of atmospheric pressure. When the soil is full of water, soil water tension is close to zero. For coarse textured soils, AWC is 50% depleted when soil tension is at 25-45 cb. Inthese soils, a crop should be irrigated before the sensor indicates 25-45 cb

However, soil tension measurements are soil specific and can be inaccurate. Depending on your crop and soil observations, soil tension limits should be refined. For example, note the soil tension at the earliest indication of water stress and always make sure that you irrigate before it reaches that point.

You can also track your water movement by taking measurement right after an irrigation event. If your bottom sensor after irrigation indicates zero reading that means you might have irrigated more than required, but if it shows less. Sensors should be placed at several different depths and locations in the field. Typically, sensors are placed in pairs at one-third and two-thirds the depth of the crop root zone and at two or more locations in the field, preferably in the representative soil type away from high points, depressions and slopes.

Some fields contain both heavy and light textured soils. In those fields, it is recommended that each soil type be monitored and managed separately for irrigation. Field mapping technologies can be used to identify different soil, such as electromagnetic conductivity (EM) mapping. By identifying different soils (different water holding capacities), management zones can be created that can be managed separately.

Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in thesoil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.

4.3.4 IR SENSOR:

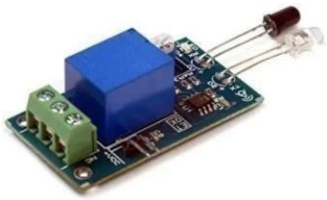

Fig 4.5 IR Sensor

A infrared sensor (IR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in IR-based motion detectors as shown in fig 4.5. PIR sensors are commonly used in security alarms and automatic lighting applications. IR sensors detect general movement, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm ,50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests. In a defined angle range, the sensor elements detect the heat radiation (infrared radiation) that changes over time and space due to the movement of people. Such infrared sensors only have to meet relatively low requirements and are low-cost mass-produced items. InfraTec does not supply such products, InfraTec develops, produces and sells pyroelectric detectors.

The pyroelectric IR sensor uses a wavelength range from2 to 14 µm. InfraTec uses special absorption layers so that the infrared sensors can even work as large-area, long-term stable receivers for UV radiation (e.g. 193 nm) but also for THz radiation in the range of 100 µm … 1 mm.

Further infrared sensors are Golay cells, bolometers and thermopiles, which also belongto the thermal IR sensors. The change in pressure of a gas volume is evaluated in a Golay cell and the change in temperature of a solid is evaluated in a bolometer. Thermopiles basically represent a series connection of thermocouples with an absorption layer and use the Seebeck effect. Photodiodes use the inner photo effect. At the same time, radiation quanta generate charge carrier pairs within a semiconductor. In the case of photoresistors, the radiation changesthe electrical resistance.

Applications of Infrared Detectors:

A pyroelectric detector with its high long-term stability can be used for accurate measurements of infrared radiation. As a thermal detector, it possesses (unlike semiconductor detectors) a very broad spectral sensitivity from 100 nm to about 1,000 μm and requires no cooling. Pyroelectric detectors are powerful thermal infrared detectors that can measure signals up to the kilohertz range. Short pulses can be detected up to a few microseconds.

Advantages:

The advantages of IR sensor include the following

- It uses less power
- The detection of motion is possible in the presence or absence of light approximately with equal reliability.
- They do not need contact with the object for detection
- There is no data leakage because of the ray direction
- These sensors are not affected by oxidation & corrosion
- Noise immunity is very strong

Disadvantages:

The disadvantages of IR sensor include the following

- Line of sight is required
- Range is limited
- These can be affected by fog, rain, dust, etc
- Less data transmission rate

4.3.5 SIREN:

Fig 4.6 Siren

A siren is a loud noise-making device as shown in fig 4.6. Civil defense sirens are mounted in fixed locations and used to warn of natural disasters. Sirens are used on emergency service vehicles such as ambulances, police cars, and fire engines. There are two general types: mechanical and electronic.

Siren is a kind of voice device that converts audio model into sound signal. It is mainly used to prompt or alarm. According to different design and application, it can produce music sound, flute sound, buzzer, alarm sound, electric bell and other different sounds.

Typical applications include siren, alarm device, fire alarm, air defense alarm, burglar alarm, timer, etc. It is widely used in household appliances, alarm system, automatic production line, low-voltage electrical equipment, electronic toys, game machines and other products and industries.

Many fire sirens (used for calling the volunteer fire fighters) serve double duty as tornado or civil defense sirens, alerting an entire community of impending danger. Most fire sirens are either mounted on the roof of a fire station or on a pole next to the fire station. Fire sirens can also be mounted on or near government buildings, on tall structures such as water towers, as well as in systems where several sirens are distributed around a town for better sound coverage. Most fire sirens are single tone and mechanically driven by electric motors with a rotor attached to the shaft. Some newer sirens are electronically driven speakers.

Electronic sirens incorporate circuits such as oscillators, modulators, and amplifiers to synthesize a selected siren tone (wail, yelp, pierce/priority/phaser, hi-lo, scan, airhorn, manual, and a few more) which is played through external speakers. siren that mimicked the sound of a mechanical siren was invented in 1965 by Motorola employees Ronald H. Chapman and Charles W. Stephens.

4.3.6 ESP8266:

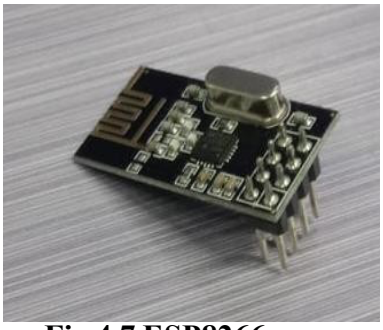

Fig 4.7 ESP8266

The ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor as shown in fig 4.7. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi/ Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

Once Arduino IDE is installed on the computer, connect the board with the computer using the USB cable. Now open the Arduino IDE and choose the correct board by selecting Tools>Boards>NodeMCU1.0 (ESP-12E Module), and choose the correct Port by selecting Tools>Port. To get it started with the NodeMCU board and blink the built-in LED, load the example code by selecting Files>Examples>Basics>Blink. Once the example code is loaded into your IDE, click on the 'upload' button given on the top bar. Once the upload is finished, you should see the built-in LED of the board blinking

4.3.7 AIR QUALITY SENSOR:

Fig 4.8 Air quality sensor

Air quality sensors are devices used to detect contaminants in the air as shown in fig 4.8. This includes particulates, pollutants and noxious gases that may be harmful to human health. They are used in applications like air quality monitoring, gas detection in industry, combustion controllers and oxygen generators in aircraft. Volatile organic compound (VOC) sensors are available that are capable of detecting volatile chemicals and odorous pollutants.

A common device for detecting particulate matter in the air is the household fire alarm. Smoke is detected using two types of sensor: ionization detectors and photoelectric detectors. Ionization sensors work by using a small radioactive source (Americium-241) produces alpha particles at a constant rate. Smoke particles enter the ionization chamber and interrupt the small leakage current between electrodes. This is detected, setting off the alarm. Dust sensors are available for air quality monitoring. These work by using an infrared diode and phototransistor pair to detect reflected light from dust particles. They are highly effective cigarette smoke detectors, and can use the patterns of reflected energy to distinguish between smoke and house dust. Theyare found in air purifiers, air conditioners and monitors.

The MQ-135 Gas sensor can detect gases like Ammonia (NH3), sulfur (S), Benzene (C6H6), CO2, and other harmful gases and smoke. Similar to other MQ series gas sensor, this sensor also has a digital and analog output pin. When the level of these gases go beyond a threshold limit in the air the digital pin goes high. This threshold value can be set by using the on-board potentiometer. The analog output pin, outputs an analog voltage which can be used to approximate the level of these gases in the atmosphere.The MQ135 air quality sensor module operates at 5V and consumes around 150mA. It requires some pre-heating before it could actually give accurate results

4.3.8 RELAY:

Fig 4.9 Relay

Protective Relay is an electrically operated device as shown in fig 4.9, designed to trip the circuit breaker if any fault in the flow of electricity is sensed. In case of underflow or overflow of current, the device automatically disconnects the current link and saves the appliance from any damage.

Nowadays, custom protection relays are designed per the equipment. Pump Protection Relays are designed to speed up the troubleshooting and reduce the downtime to a minimum among almost all kinds of motors. They protect pump motors, pumps, wiring, controls or power systems. These Protection Relays are well-equipped to not only prevent any damage to the equipment but also indicate the nature ofthe problem.

Gelco Electronics has pioneered the field of safety devices for various equipment. Whether it is at a domestic level or a commercial level, they have pioneered at each sphere. When it comes to Protection Relays, they offer a wide range. The Protection Relays manufactured by Gelco is made from high-quality components with precise engineering that ensures to provide are liable and smooth operation throughout. They provide relentless protection against over- current, over-voltage, phase failure, earth leakage and also ensure well-ordered interoperability and communication with the networks.

4.3.9 AC MOTOR WATER PUMP:

Fig 4.10 Ac motorwater pump

An AC motor or alternating current motor is an electric motor that consists of a stator with a coil that is supplied with alternating current to convert electric current into mechanical power as shown in fig 4.10.The stator is the stationary part of the motor while the rotor is the rotating part. AC motors can be single or three phase with three phase motors mainly used for bulk power conversion. Single phase AC motors are used for small power conversions.

There are two types of AC motors, which are synchronous and induction. Ina synchronous motor, the rotation of the shaft is at the same pace as the frequency of the applied current with multiphase AC electromagnets on the stator that produce a rotating magnetic field.An induction motor, or asynchronous motor, is a single excited motor where current is applied to one part of the motor, the stator. Flux from the stator cuts the short-circuited coil in the rotor,which feels torque that makes the rotor rotate.

4.3.10 LCD DISPLAY

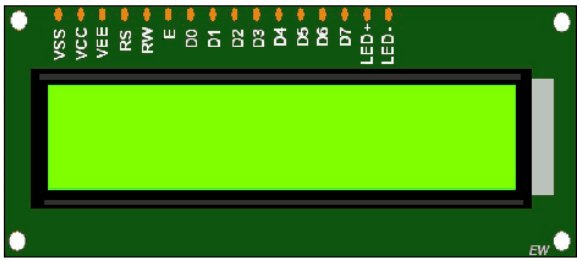

Fig 4.11 LCD display

Liquid Crystal Display (LCD) is widely used in various electronics applications. It is commonly used in various systems to show different status and parameters. LCD16x2 has 2 lines with 16 characters in each line as shown in fig 4.11. Each character is made up of a 5x8 (column x row) pixel matrix.

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. Inthis LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Command registers stores various commands given to the display. Data register stores data to be displayed. The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. In your Arduino project Liquid Crystal Library simplifies this for you so you don't need to know the low-level instructions. Contrast ofthe display can be adjusted by adjusting the potentiometer to be connected across VEE

4.3.11 POWER SUPPLY

Fig 4.12 Regulated Powersupply and Transformer

Universally, we cannot use the DC batteries due to expensive as well as require replacement when discharged. In this situation, we require a circuit which can change AC supply to DC supply. A rectifier filter circuit includes a normal DC power supply. The normal DC power supply o/p remains stable if the load is contrast. Although in several electronic circuits it is extremely significant to maintain the DC power supply constant irrespective of alternative AC supply. Otherwise, the circuit will get damage. To overcome this problem, voltage regulating devices can be used as shown in fig 4.12. So the blend of the voltage regulating devices by the normal dc power supply is named as DC regulated power supply.

This is an electrical device, used to generate the steady DC supply irrespective of alternative AC supply. We know that there are different types of electrical & electronic circuits which use a DC power supply

The IC Regulated power supply(RPS) is one kind ofelectronic circuit, designed to provide the stable DC voltage of fixed value across load terminals irrespective of load variations.The main function of the regulated power supply is to convert an unregulated alternating current(AC) to a steady direct current (DC). The RPS is used to confirm that if the input changes, then the output will be stable. This power supply is also called a linear power supply, and this will allow an AC input as wellas provides steady DC output.

CHAPTER 5

IMPLEMENTATION

CHAPTER 5

IMPLEMENTATION

5.1 HARDWARE IMPLEMENTATION

- INTERFACING ARDUINO & POWERSUPPLY WITH SOIL MOISTURE SENSOR
- INTERFACING ARDUINO & POWERSUPPLY WITH DHT11 SENSOR
- INTERFACING ARDUINO & POWERSUPPLY WITH IR SENSOR
- INTERFACING ARDUINO & POWERSUPPLY WITH AIR QUALITY SENSOR
- INTERFACING ARDUINO WITH LCD DISPLAY

5.1.1 INTERFACING ARDUINO&POWERSUPPLY WITH SOIL MOISTURE

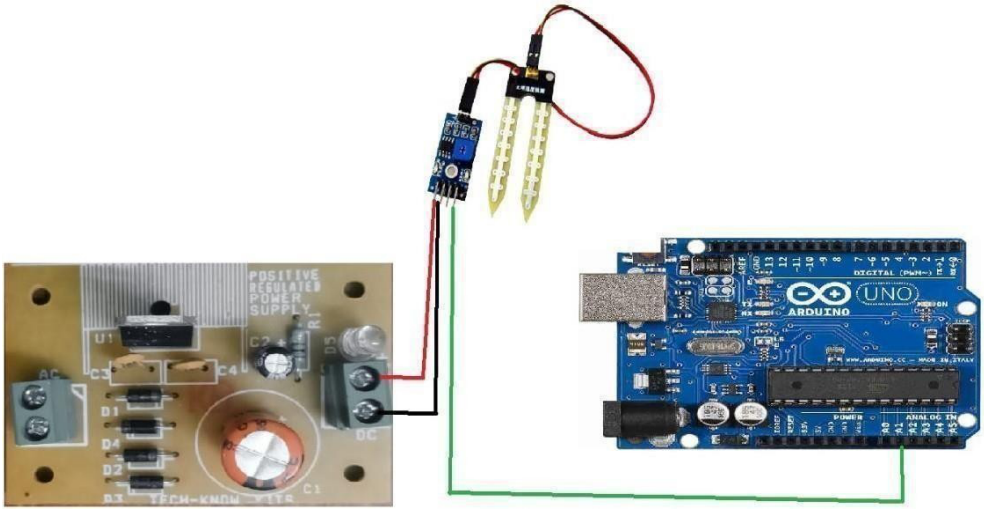

Fig 5.1 interfacing Arduino & power supply with soil moisture sensor

Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes that act as a probe. It can measure the moisture content in the soil based on the change in resistance between the two conducting plates.The resistance between the two conducting plates varies in an inverse manner with the amount of moisture present in the soil. Soil moisture sensor consist of two conducting plates which function as a probe and acting as a variable resistor together.

When the sensor is inserted into the water, the resistance will decrease and get better conductivity between plates.

Table 5.1 powersupply-soil moisture connections

POWER SUPPLY	SOIL MOISTURE SENSOR
POSITIVE TERMINAL	VCC
NEGATIVE TERMINAL	GND

Table 5.2 Arduino-soil moisture connections

ARDUINO	SOIL MOISTURE SENSOR
A1	ANALOG

Soil moisture sensor have four pins named GND (ground), VCC(positive supply) ,analog pin and the digital pin. The vcc pin is connected to one end of the positive supply and the ground pin is connected to another end of the negative supply. The analog pin in the soil moisture sensor is connected to the A1 terminal of the Arduino Uno as shown in fig 5.1. The digital pin is left over because we can use any pin based upon our choice either analog or digital. In our project we are using analog pin to connect to the Arduino.

5.1.2 INTERFACING ARDUINO&POWERSUPPLY WITH DHT11

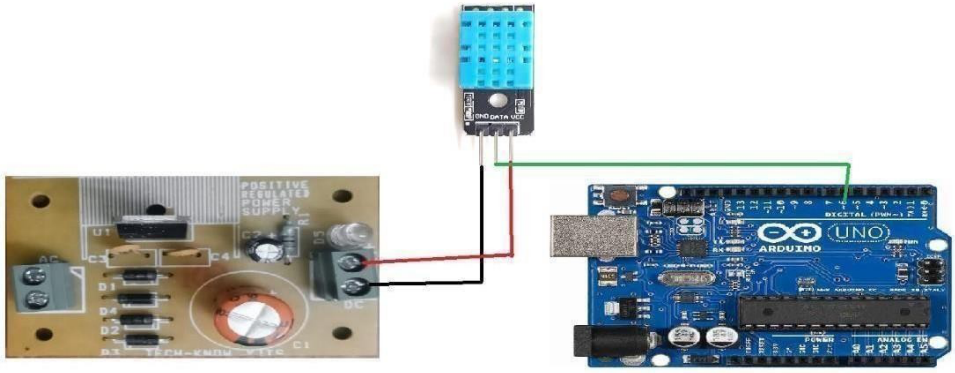

Fig 5.2 interfacing Arduino & powersupply with DHT11

DHT11 Module features a temperature & humidity sensor complex with a calibrated digital signal output. The exclusive digital-signal-acquisition technique and temperature & humidity sensing technology ensure high reliability and excellent long-term stability. This sensor includes an NTC for temperature measurement and a resistive-type humidity measurement component for humidity measurement. These are connected to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability, and cost-effectiveness

Table 5.3 powersupply-DHT11 connections

POWER SUPPLY	DHT11 SENSOR
POSITIVE TERMINAL	VCC
NEGATIVE TERMINAL	GND

Table 5.4 Arduino -DHT11 connections

ARDUINO	DHT11 SENSOR
6th DIGITAL PIN	DATA SIGNAL

DHT11 sensor have three pins named GND(ground),VCC(positive supply) and data signal.The vcc pin is connected to one end of the positive supply and the ground pin is connected to another end of the negative supply. The data signal pin in the DHT11 sensor is connected to the 6Th digital pin ofthe Arduino uno as shown in fig 5.2.

5.1.3 INTERFACING ARDUINO&POWERSUPPLY WITH IR SENSOR

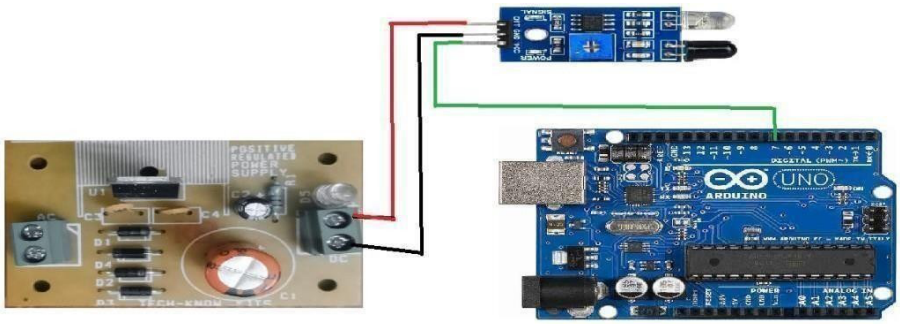

Fig 5.3 interfacing Arduino & powersupply with IR sensor

IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types ofradiations are invisible to our eyes, but infrared sensor can detect these radiations.

Table 5.5 powersupply- IR sensor connections

POWER SUPPLY	IR SENSOR
POSITIVE TERMINAL	VCC
NEGATIVE TERMINAL	GND

Table 5.6 Arduino- IR sensor connections

ARDUINO	IR SENSOR
7th DIGITAL PIN	OUT

IR sensor have three pins named GND (ground), VCC (positive supply) and OUT pin. The vcc pin is connected to one end of the positive supply (red wire) and the ground pin is connected to another end of the negative supply (black wire). The OUT pin in the IR sensor is connected to the 7Th digital pin ofthe Arduino uno (green wire) as shown in fig 5.3.

5.1.4 INTERFACING ARDUINO&POWERSUPPLY WITH AIR QUALITY SENSOR

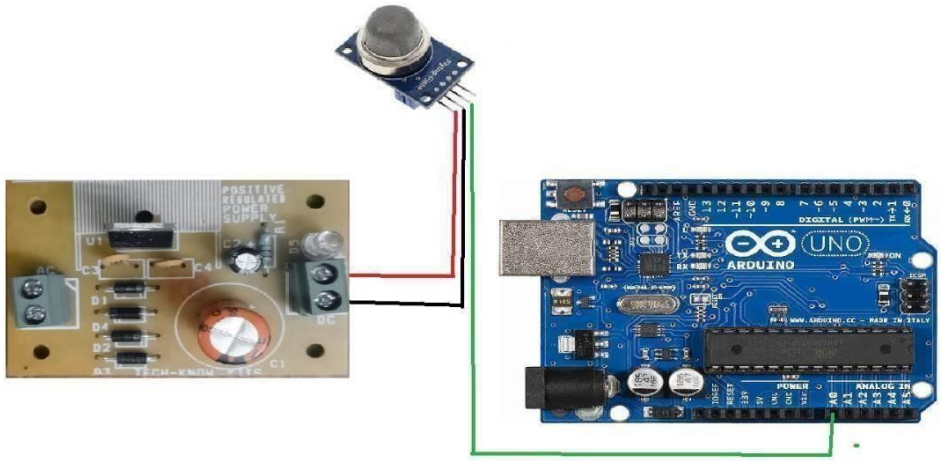

Fig 5.4 interfacing Arduino & powersupply with Airquality sensor

Air quality sensors are devices used to detect contaminants in the air. This includes particulates, pollutants and noxious gases that may be harmful to human health. They are used in applications like air quality monitoring, gas detection in industry, combustion controllers and oxygen generators in aircraft. Volatile organic compound (VOC) sensors are available that are capable ofdetecting volatile chemicals and odorous pollutants.

Table 5.7 powersupply- Airquality sensor connections

POWER SUPPLY	AIR QUALITY SENSOR
POSITIVE TERMINAL	VCC
NEGATIVE TERMINAL	GND

Table 5.8 Arduino- Airquality sensor connections

ARDUINO	AIR QUALITY SENSOR
A0	A0

Air quality sensor have four pins named GND(ground),VCC(positive supply),A0 pin and D0 pin.The vcc pin is connected to one end of the positive supply(red wire) and the ground pin is connected to another end of the negative supply(black wire). The A0 pin in the air quality sensor is connected to the A0 ofthe Arduino uno(green wire) as shown in fig 5.4.

5.1.5 INTERFACING ARDUINO WITH LCD DISPLAY

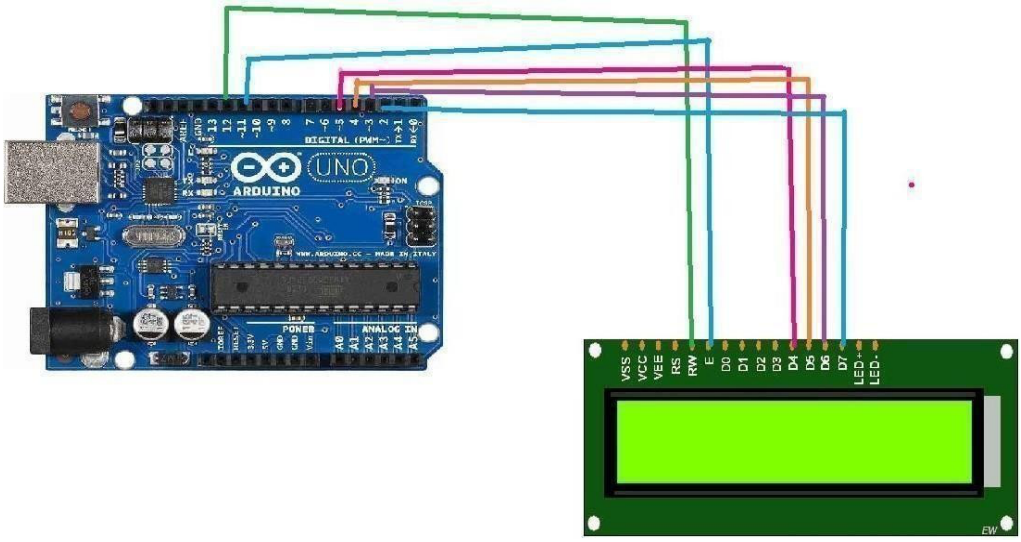

Fig 5.5 Interfacing Arduino with LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data..

Table 5.9 Arduino- LCD display connections

ARDUINO	LCD DISPLAY
12th DIGITAL PIN	RS
11th DIGITAL PIN	EN
5th DIGITAL PIN	D4
4th DIGITAL PIN	D5
3rd DIGITAL PIN	D6
2nd DIGITAL PIN	D7

LCD display has 16 pins named Vss(ground), Vcc(+5v), VEE(contrast control), RS(register select), RW(read/write), E(enable), D0, D1, D2, D3, D4, D5, D6, D7, LED+(led +5v), LED-(Led ground).In our project LCD of RS is connected to 12th pin of Arduino,EN is connected 11th pin of arduio,D4 is connected to 5th pin of Arduino,D5 is connected to 4Th pin of Arduino,D6 is connected to 3rd pin of Arduino and D7 is connected 2nd pin of Arduino as shown in fig 5.5.

5.2 COST ESTIMATION

Table 5.10 Statement of expenditure in executing the project

S.no	Components	Number	Cost
1	Cost of Arduino	1	Rs.944
2	Cost of Soil moisture	1	Rs.200
3	sensor Cost of DHT11	1	Rs.275
4	Cost of IR sensor	1	Rs.250
5	Cost of Air qualitysensor	1	Rs.460
6	Cost of Relay	2	Rs.500
7	Cost of Ac water pump	1	Rs.860
8	Cost of Buzzer	1	Rs.100
9	Cost of ESP8266	1	Rs.500
10	Cost of Regulated power supply	1	Rs.500
11	Cost of LCD display	1	Rs.500
12	Cost of Node MCU	1	Rs.350
13	Cost of Solenoid valves	3	Rs.570
14	Cost of Relays	2	Rs.400
15	PCB Board	1	Rs.100

Total cost: Rs 6,509

5.2 SOFTWARE IMPLEMENTATION

5.3.1 PROGRAMMING LANGUAGE:

To make a machine do something, the machine needs instructions on how to do it. A programming language is an artificial language that translates the code into machine instructions. Instructions are the lowest level of programming and are called assembler language. Programming languages can be divided into two subcategories: a low-level category and a high-level category. The low-level category includes languages that are close to machine code and thereby give the programmer more options to control the application since these types of languages talk directly to the hardware. High-level programming languages do not depend on the hardware in the same way as low-level languages do. It does not either require the programmer to handle memory operations or other low-level parameters. High-level programming languages are therefore a popular starting point for beginners in programming. Examples of high-level programming languages are Python and C/C++.Here we are using embedded C programming.

5.3.2 ARDUINO IDE:

The Arduino IDE contains a text editor for writing code, a message area, a text console and it connects to the Arduino hardware to upload programs and communicate with them. The new major release of the Arduino IDE is faster and even more powerful! In addition to a more modern editor and a more responsive interface it features autocompletion, code navigation, and even a live debugger. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board. A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).

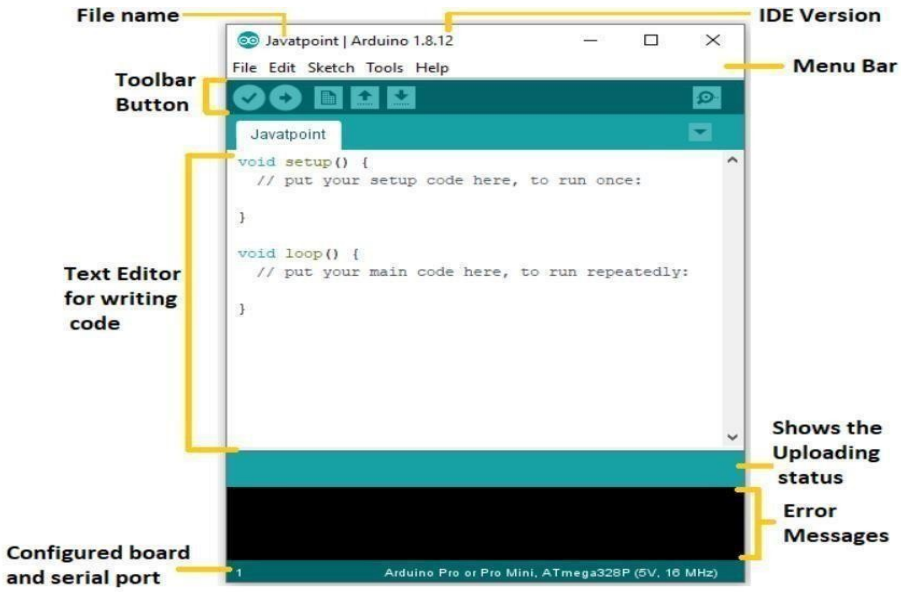

Fig .5.6 ARDUINO IDE

The Upload button compiles and runs our code written on the screen. It further uploads the code to the connected board. Before uploading the sketch, we need to make sure that the correct board and ports are selected. We also need a USB connection to connect the board and the computer. Once all the above measures are done, click on the Upload button present on the toolbar. The latest Arduino boards can be reset automatically before beginning with Upload. In the older boards, we need to press the Reset button present on it. As soon as the uploading is done successfully. Ifthe uploading is failed, it willdisplaythe message in the error window.

The Upload button The Open button is used to open the already created file. The selected file will be opened in the current window. The save button is used to save the current sketch or code. The Verify button is used to check the compilation error of the sketch or the written code. The serial monitor button is present on the right corner of the toolbar. It opens the serial monitor.

CHAPTER 6
WORKING MODEL AND RESULTS

CHAPTER 6

WORKING MODEL AND RESULTS

6.1 WORKING MODEL

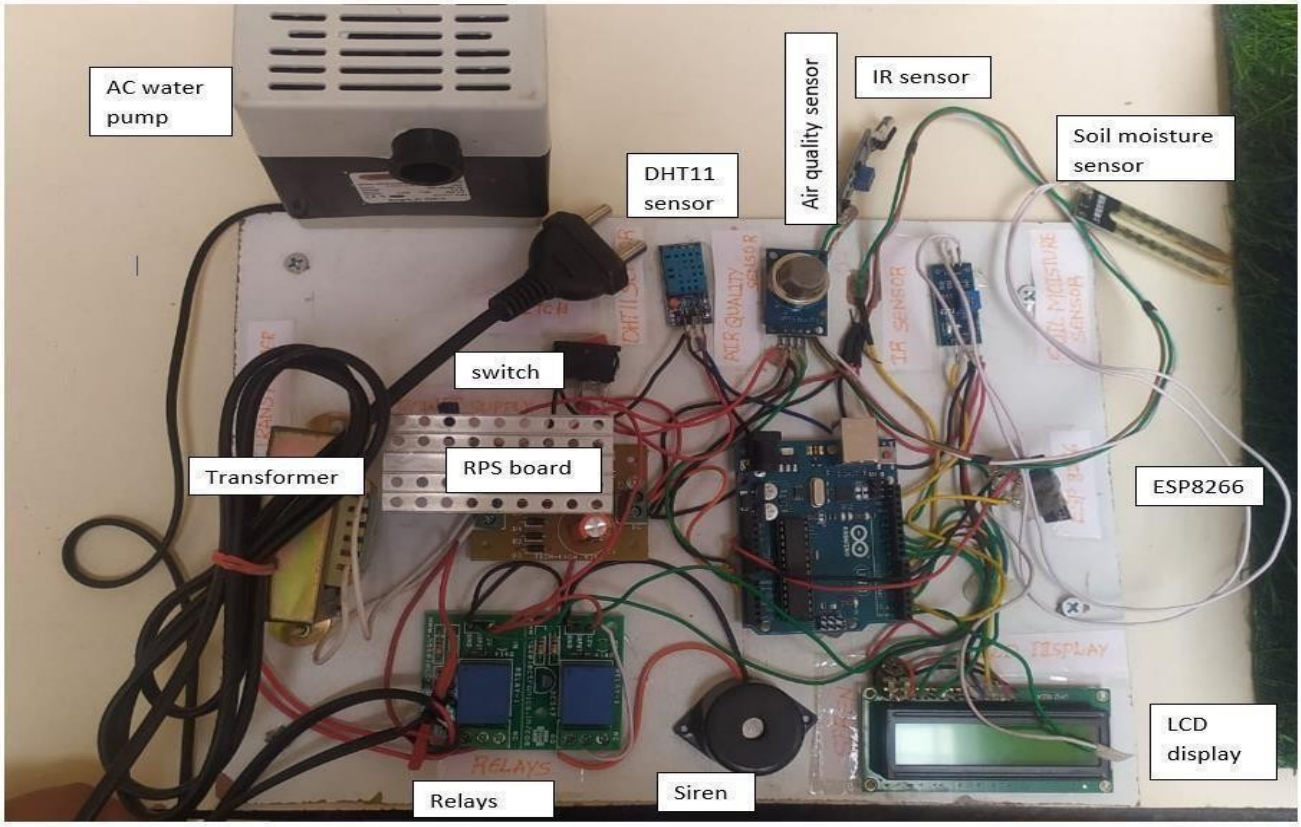

Fig 6.1 Working model

In the working prototype model, the IoT devices like sensors, Blynk IoT application, and cloud play a significant part in smart farming which acquires yield in the field of farming. All components are connected through Arduino pins and are used to control the target. Here all positive wires are connected to positive terminals and all black wires are connected to ground terminals. For working on each sensor, we required 5V and then relays required 12V and we have 12V power supply transformer. Here the power supply before the regulator is 12v and after the regulator is the voltage is 5v then this 5v output goes to sensors and microcontrollers. But the buzzer and relays operate on 12v.

We presented a 12v transformer, and in this 12v transformer, the supply is converted from ac to dc through a bridge rectifier. For smoothing and noise filtration we are using a condenser and capacitor. This is regulator input. By taking the regulator7805 it gives 5v output and this 5v output only we have to use a controller.

In our project the sensor first soil moisture sensor it senses the moisture content and when moisture content is decreased the microcontroller command is switch on the relay and through this relay the motor will be on and then content of moisture is increased the relay is switch of the motor through microcontroller command.IR motion sensor is used to detect animals and birds. Throughthis sensor we have to protect the trees when the animals are close to the trees the buzzer will give a siren sound and the animals went far away. DHT11 sensor reads the temperature and humidity readings and sends the microcontroller and then the microcontroller to the cloud through a small ESP01 WIFI module and then the data will be stored in the cloud. Air Quality MQ135 sensor will checks the quality of air like how much percentage of carbon dioxide and dusty air. We implemented an IoT platform that is Blynk IoT in this IoT platform we have to log in with our mail id they will give us one authentication code, this code we have to insert into the microcontroller through our program. Finally, we can monitor all the readings through the Blynk app. In blynk app will have virtual components like switches, lights, LEDs, indicators, levels, etc. The levels are moisture level, temperature level, etc. We can monitor the live data in the Blynk IOT application.

6.2 RESULTS

6.2.1 : Case-1 : Monitoring Temperature and Humidity

Fig 6.2(a) soil

Fig 6.2(b) Temperature values on LCD

Fig 6.2(c) Humidity values on LCD

- The values of Temperature and Humidity depends on agricultural field

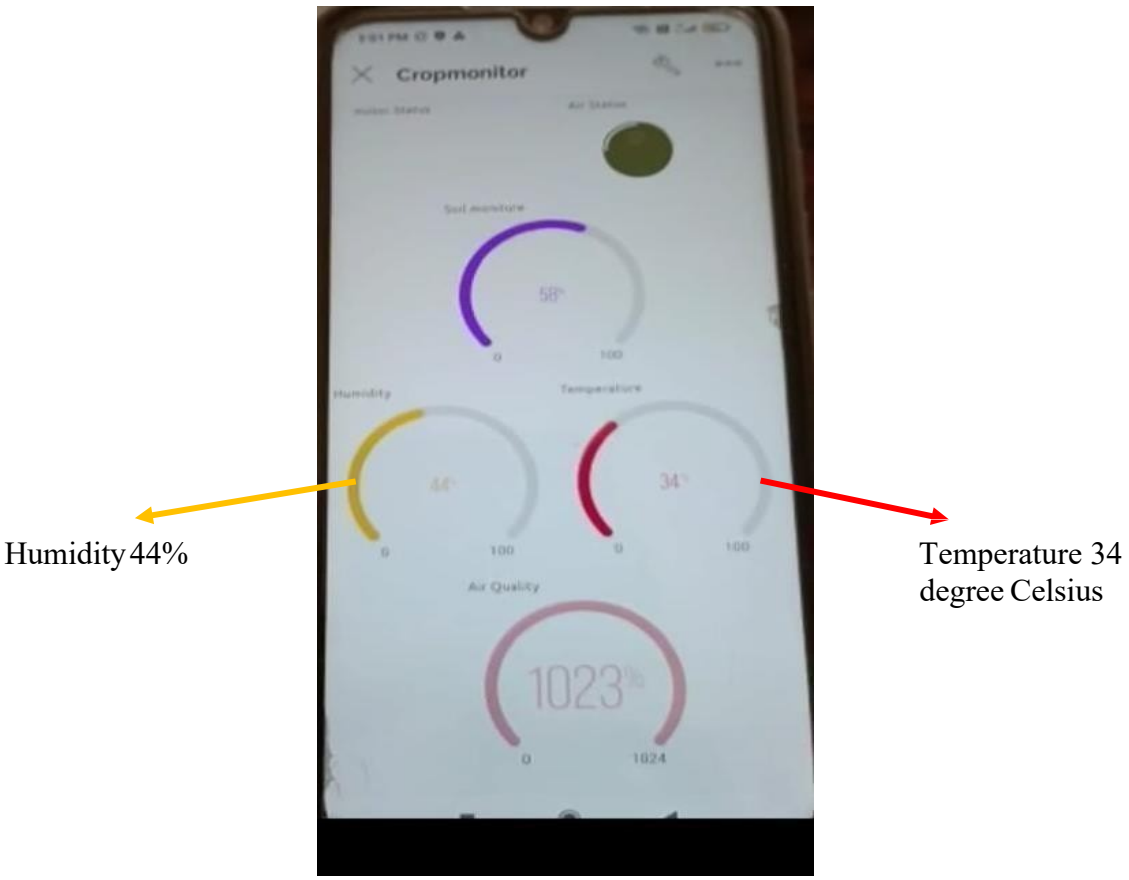

Fig 6.2(d) Temperature and Humidity values in Blynk IOT app

After inserting the soil moisture sensor into the soil as shown in fig 6.2(a) then it displays the temperature and humidity.The temperature and humidity depends on the agricultural field.The values of temperature and humidity can be seen through LCD display as shown in fig 6.2(b) and 6.2(c) and it also show in the blynk IOT application in the form of graph as shown in fig 6.2(d).

6.2.2 Case-2: When Soil is dry

Fig 6.3(a) Soil moisture sensor in dry soil

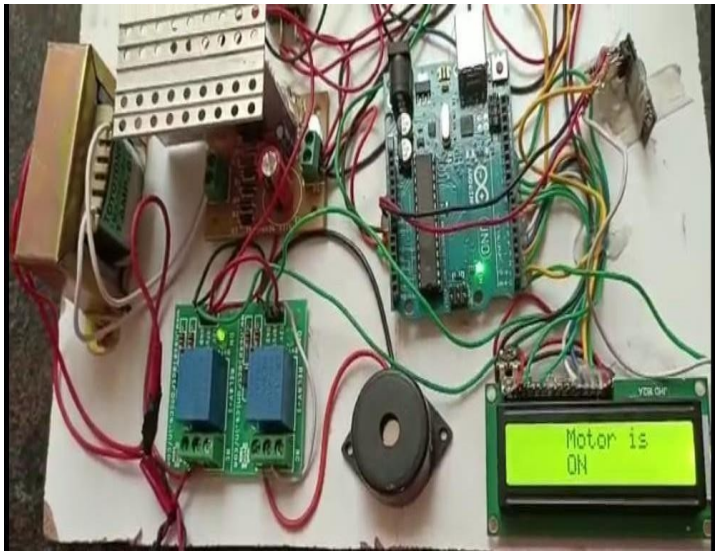

Fig 6.3(b) Displaying Motor ON in LCD

Fig 6.3(c) water flow through sprinklers

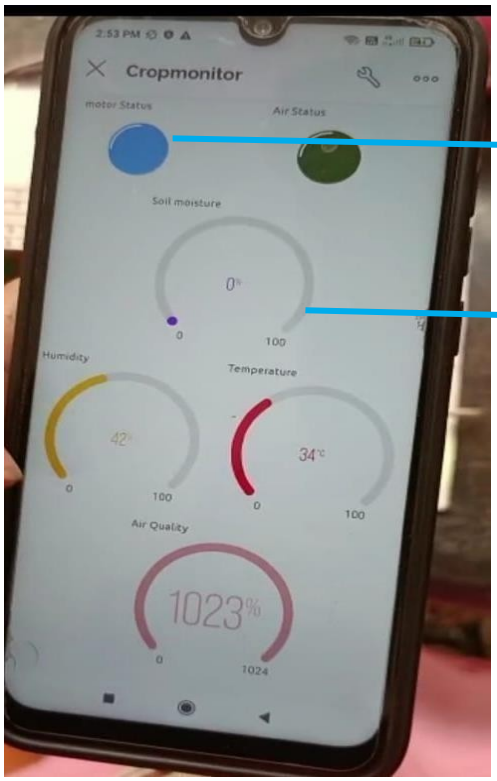

Fig 6.3(d) soil moisture level and motor status in Blynk IOT app

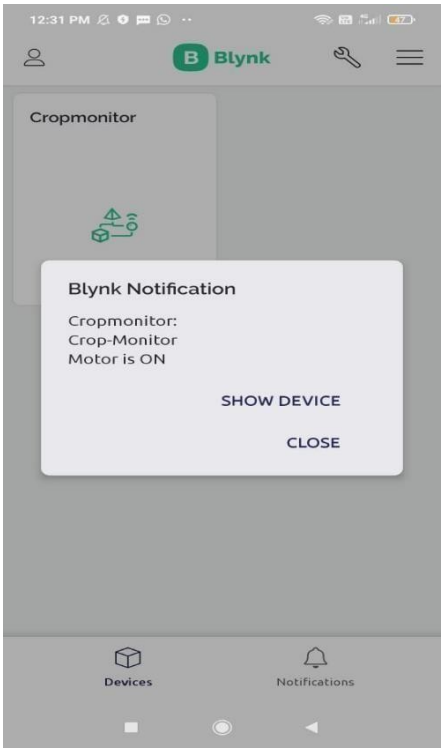

Fig 6.3(e) Blynk IOT app notification

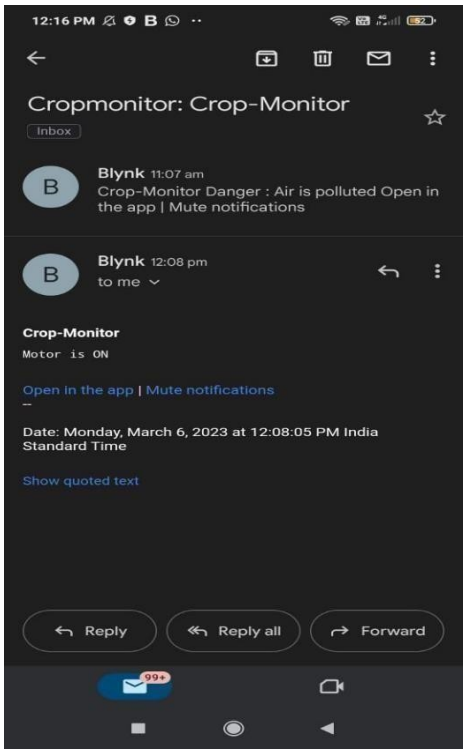

Fig 6.3(f) E-Mail notification

When the soil moisture sensor is inserted in to dry soil as shown in fig 6.3(a). Then moisture of the soil becomes very low then the motor is automatically turns ON and displayed onthe LCD as shown in the fig 6.3(b).The water flows through sprinklers as shown in fig 6.3(c). The percentage of moisture of soil and motor status an be visible in Blynk IOT app as shown in fig 6.3(d). Alert notifications is received to the authentication user ID through Blynk IOT app as shown in fig 6.3(e) and 6.3(f).

6.2.3 Case-3: When Soil is wet

Fig 6.4(a) Soil moisture in wet soil

Fig 6.4(b) Displaying Motor OFF in LCD

Fig 6.4(c) No water flow through sprinklers

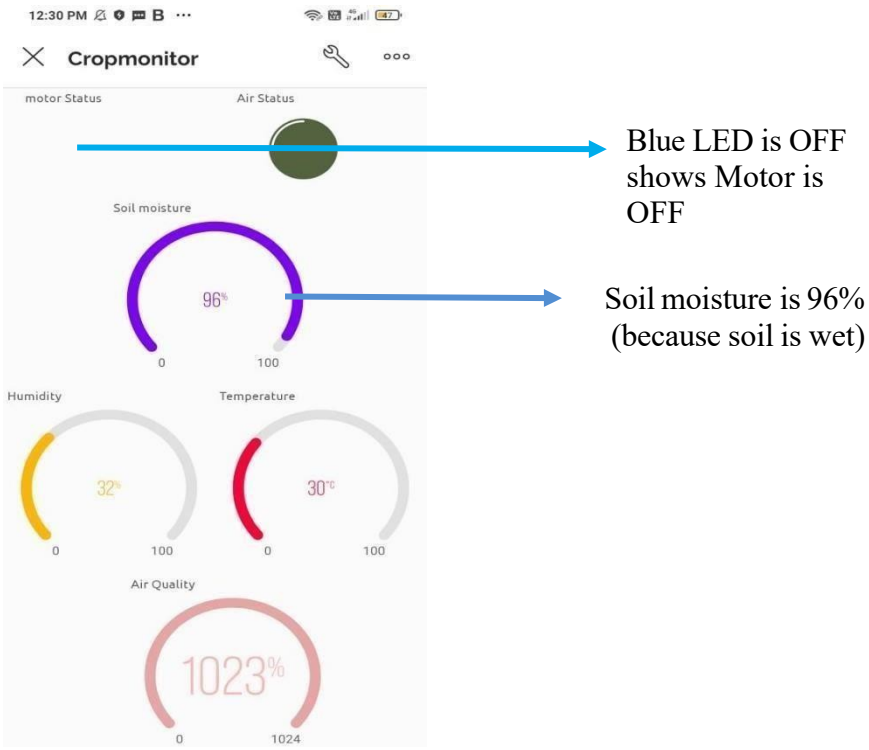

Fig 6.4(d) soil moisture level and motor status in Blynk IOT app

When the soil moisture sensor is inserted in to the wet soil as shown in fig 6.4(a). Then moisture of the soil becomes very high then the motor is automatically turns OFF and displayed on the LCD as shown in the fig 6.4(b).The water doesnot flow through sprinklers as shown in fig 6.4(c). The percentage of moisture of soil and motor status can be visible in Blynk IOT app as shown in fig 6.4(d).

6.2.4 Case-4: Monitoring Air Quality

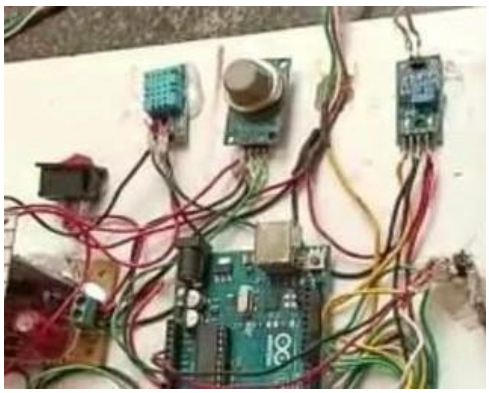

Fig 6.5(a) monitoring air quality

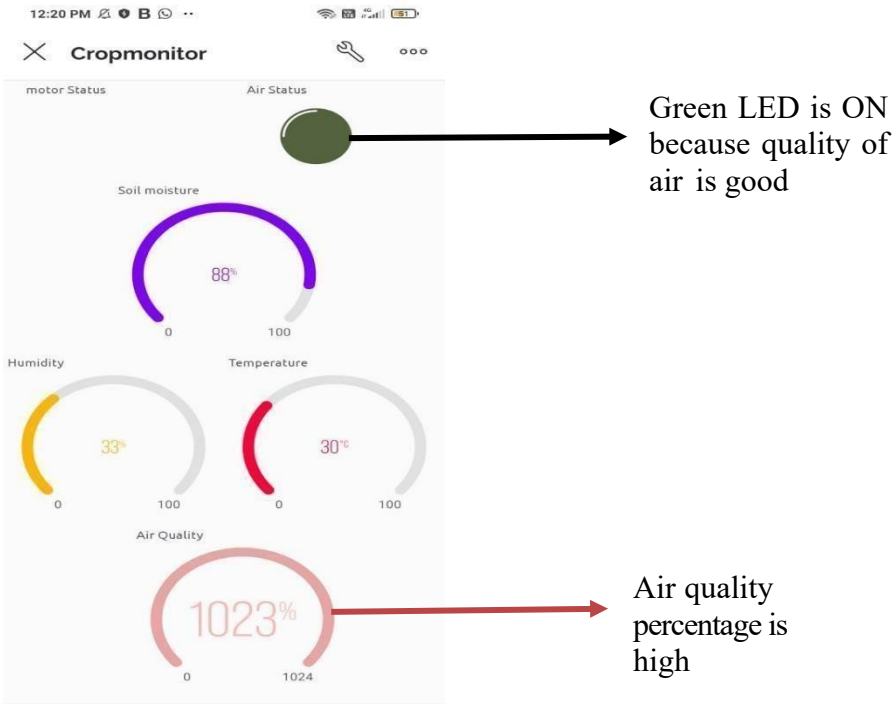

Fig 6.5(b) Air quality level and air status in Blynk IOT app

Byusing air quality sensor as shown in fig 6.5(a),we can able to get how much quality of air is present in the agricultural field. If the quality of air is good then it represents green LED status and the air quality level in the blynk Iot app as shown in fig 6.5(b).

6.2.5 Case-5: When air is polluted

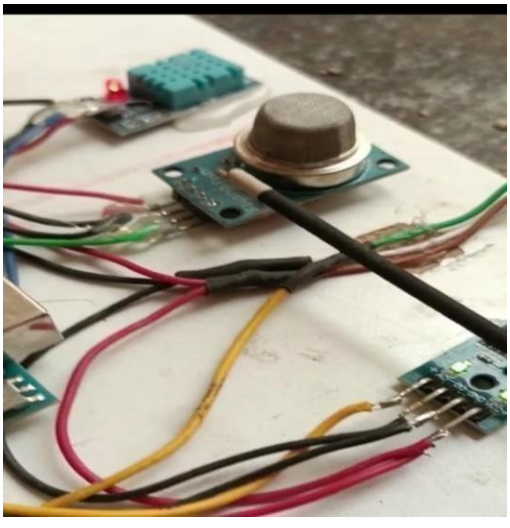

Fig 6.6(a) when air is polluted

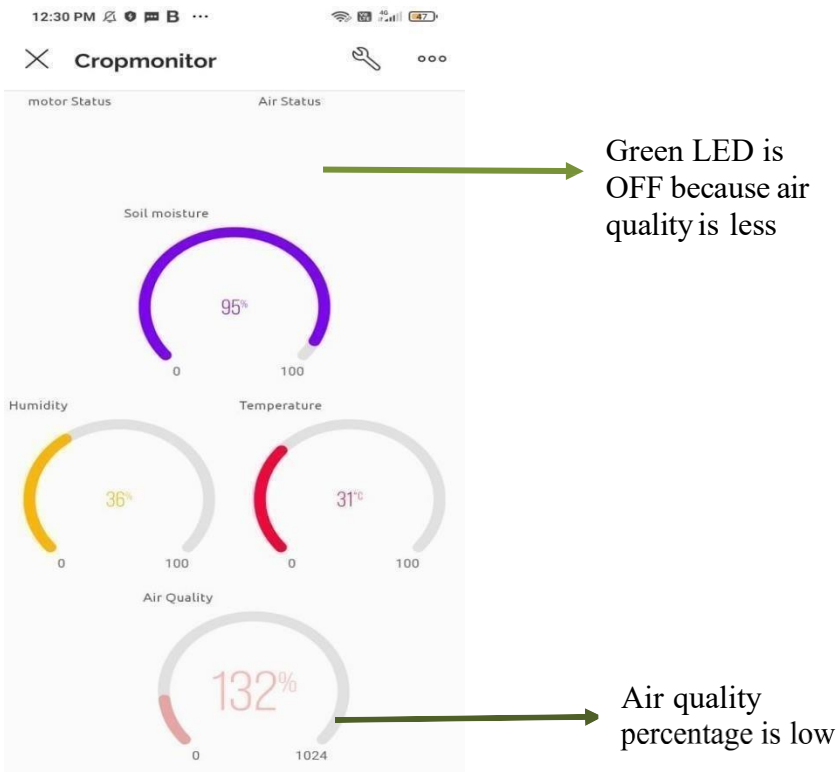

Fig 6.6(b) Air quality level and air status in Blynk IOT app

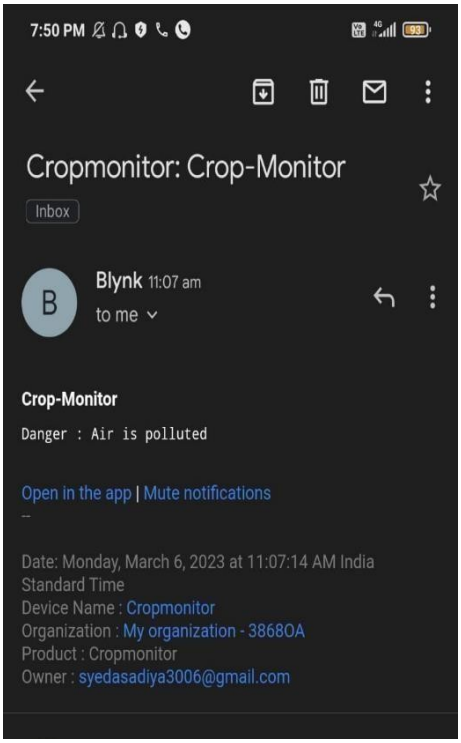

Fig 6.6(c) Notification in E-mail

Ifthe air is polluted as shown in fig 6.6(a), then LED air status willdisappear and air qualitylevel is visible in the blynk iot app. as shown in fig 6.6(b). This system also sends alert notifications to the authentication user ID through Blynk app as shown in fig 6.6(c).

6.2.6 Case-6: Detecting motion through IR sensor

Fig 6.7 Detecting motion through IR sensor

If any animal or any moving body comes to contact with IR sensor, then sensor detects the motion and blinks in green colour as shown in fig 6.7 then siren sound is heard, through thatany animals that enters the field will move far away fromthe agricultural field.

FERTIGATION

Fertigation is a method of fertilizer application in which fertilizer is incorporated within the irrigation water by the drip system. In this system fertilizer solution is distributed evenly in irrigation. The availability of nutrients is very high therefore the efficiency is more. In this method liquid fertilizer as well as water soluble fertilizers are used. By this method, fertilizer use efficiency is increased from 80 to 90 per cent.Fertigation is defined as the injection of fertilizers, soil amendments and other products typically needed by farmers into soil.

COMPONENTS

NODE MCU

The NodeMCU is an open-source development board that uses the ESP8266 WiFi module. It's popular for IoT projects and is compatible with the Arduino IDE, making it easy to program and connect to the internet. If you have completed various Arduino projects and are familiar with Arduino, using NodeMCU instead of Arduino Uno is the logical next step if you're looking for a more compact module that encompasses Wi-Fi. NodeMCU is predicated on the Esperessif ESP8266-12E Wi-Fi System-On-Chip. It is based on Lua-based firmware and is open-source.

SOLONOID VALVES

- Solenoid valves are used wherever fluid flow has to be controlled automatically. They are being used to an increasing degree in the most varied types of plants and equipment. The variety of different designs which are available enables a valve to be selected to specifically suit the application in question.

CONSTRUCTION

- Solenoid valves are control units which, when electrically energized or de-energized, either shut off or allow fluid flow. The actuator takes the form of an electromagnet. When energized, a magnetic field builds up which pulls a plunger or pivoted armature against the action of a spring. When de-energized, the plunger or pivoted armature is returned to its original position by the spring action.

RELAYS

- Relays are electrically operated switches that open and close the circuits by receiving electrical signals from outside sources. Some people may associate “relay” with a racing competition where members of the team take turns passing batons to complete the race.
- The “relays” embedded in electrical products work in a similar way; they receive an electrical signal and send the signal to other equipment by turning the switch on and off.

Fig 6.8 Fertigation Connections.

CHAPTER 7
CONCLUSION

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CONCLUSION

IoT had helped to enhance smart farming. Using IoTthe system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled. IoT works in different domains of farming to improve time efficiency, water management, crop monitoring, soil management and control of insecticides and pesticides. This system also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming. IOT based smart agriculture system can prove to be very helpful for farmers since over as well as less irrigation is not good for agriculture. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. The system also senses the invasion of animals which is a primary reason for reduction in crops. This system generates irrigation schedule based on the sensed real time data from field and data from the weather repository. Continuous internet connectivity is required. The humidity, temperature, soil moisture data can be visible in the Blynk IOT app where we can monitor real time data based on per minute.

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