SMART AGRICULTURE SYSTEM USING IOT

Project Exhibition –2

Submitted in partial fulfillment for the award of the degree of

Bachelor of Technology

In

Electronics And Communication Engineering

(Specialization in Ai and Cybernetics)

Submitted to

VIT BHOPAL UNIVERSITY (M.P.)

Submitted by

Rani Kushwaha, Sachin, Manish Meena, Kajal

Registration No:-

21BAC10035, 21BAC10036, 21BAC10038, 21BAC10039

Under the Supervision of

Dr. Amit Kumar Singh

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

VIT BHOPAL UNIVERSITY

BHOPAL (M.P.)-466114

October - 2022

VIT BHOPAL UNIVERSITY BHOPAL (M.P.) 466114

SCHOOL OF ELECTRICAL & ELECTRONICS ENGG.

CANDIDATE'S DECLARATION

I hereby declare that the Dissertation entitled "**SMART AGRICULTURE SYSTEM USING IOT**" is my own work conducted under the supervision of **Dr. Amit Kumar Singh**, assistant professor, SEEE at VIT University, Bhopal.

I further declare that to the best of my knowledge, this report does not contain any part of work that has been submitted for the award of any degree either in this university or in other university / Deemed University without proper citation.

Rani Kushwaha(21BAC10035)

Sachin (21BAC10036)

Kajal (21BAC10039)

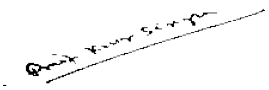
Manish Meena (21BAC10038)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Date: 17/02/2023

Dr. Amit Kumar Singh

Assistant professor (SEEE)



Digital Signature of Guide

VIT UNIVERSITY BHOPAL (M.P.) – 466114

SCHOOL OF ELECTRICAL & ELECTRONICS ENGG.

CERTIFICATE

This is to certify that the work embodied in this Project Exhibition -2 report entitled **"SMART AGRICULTURE SYSTEM USING IOT"** has been satisfactorily completed by **Ms./Mr. Rani Kushwaha, Sachin, Manish Meena, and Kajal**. Registration No. **21BAC10035, 21BAC10036,21BAC10038, and 21BAC10039** respectively in the School of Electrical & Electronics Engineering at VIT University, Bhopal. This work is a bonafide piece of work, carried out under my/our guidance in the School of Electrical & Electronics Engineering for the partial fulfillment of the degree of Bachelor of Technology.

Dr. Amit Kumar Singh

Assistant Professor SEEE

Forwarded by

DR SOUMITRA KESARI NAYAK

Program Chair

Approved by

DR DEBASHIS ADHIKARI

Professor & Dean

Acknowledgement

In the first place, we would like to thank **Dr. Amit Kumar Singh** (assistant professor SEEE), for their cooperation and guidance in completing our project SMART AGRICULTURE SYSTEM USING IOT. Above all and the most needed, he provided us with unflinching encouragement and support in various ways. His words have always inspired us to work in an efficient and comprehensive way. We would like to thank him for his constant encouragement that enabled us to grow as a person. His presence has definitely improved us as a human being.

We express our gratitude towards "**Dr. Debashis Adhikari ",** Professor and Dean of SEEE, VIT Bhopal University, for providing us all the help and permitted us to work in the laboratory with no time limits.

We would also like to thank **Dr. Soumitra Kesari Nayak ,** Programme chair of **BAC** , VIT Bhopal University, for giving us his valuable time and guidance.

Executive Summary

Smart Agriculture system using IOT is a project that helps farmers to increase the productivity of their crops and by saving time for the farmers. Life by making everything smart and intelligent. IoT refers to a network of things that make a self-configuring network. The development of Intelligent Smart Farming IoT-based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim of this report is to propose IoT based Smart Agriculture System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT-based Smart Farming System being proposed via this report is integrated with different Sensors and a Node MCU ESP8266 WIFI module producing live data feed that can be obtained online from Blynk Andriod App.

List of Figures

Table of contents

INTRODUCTION

India is an agricultural country. Nowadays, at regular intervals, the lands are manually irrigated by the farmers. There is a chance that the water consumption will be higher or that the time it takes for the water to reach the destination will be longer, resulting in crop dryness. Real-time temperature and humidity monitoring is crucial in many agricultural disciplines. However, the old method of wired detection control is inflexible, resulting in several application limitations. This project achieves irrigation automation as a crucial answer to this problem. This is accomplished with ESP8266, which controls the moisture and temperature sensors based on the input provided. Moisture sensors are used in the construction of an automated plant watering system for this purpose. The main aim of our project is to reduce the complexity of supervision and to avoid continuous monitoring. We can accomplish smart agriculture using our system. This system includes IoT-based agricultural monitoring. The Internet of Things (IOT) is transforming the agriculture business and addressing the enormous difficulties and huge obstacles that farmers confront today in the field. The soil moisture sensor is put into the soil to determine whether the soil is wet or dry, and If the moisture level in the soil is low, the relay unit attached to the motor switch must be monitored on a regular basis. When the soil is dry, it will turn on the motor, and when the soil is moist, it will turn off the engine.

LITERATURE RIVIEW

1. Title – IoT based Smart Agriculture

Published in - 6, June 2016 International Journal of Advanced Research in Computer and Communication Engineering.

Authors - Nikesh Gondchawar, Prof. Dr. R. S. Kawitkar

Agriculture plays vital role in the development of agricultural country. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Hence the project aims at making agriculture smart using automation and IoT technologies. The highlighting features of this project includes smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, etc. Secondly it includes smart irrigation with smart control and intelligent decision making based on accurate real time field data. Thirdly, smart warehouse management which includes temperature maintenance, humidity maintenance. Controlling of all these operations will be through any remote smart device or computer connected to Internet and the operations will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with micro-controller and raspberry pi.

2. Title – Smart Agriculture System using IoT Technology

Published in - 5, January 2019 International Journal of Recent Technology and Engineering (IJRTE).

Authors - Muthunoori Naresh, P Munaswamy .

In the olden days Farmers used to figure out the ripeness of soil and influenced suspicions to develop which to kind of yield. They didn't think about the humidity, level of water and especially climate condition which terrible a farmer increasingly. IOT modernization helps in assembly information on circumstances like climate, dampness, temperature and fruitfulness of soil, Crop web based examination empowers discovery of wild plant, level of water, bug location, creature interruption in to the field, trim development, horticulture. IOT utilize farmers to get related with his residence from wherever and at whatever point. Remote sensor structures are utilized for watching the homestead conditions and tinier scale controllers are

utilized to control and mechanize the home shapes. To see remotely the conditions as picture and video, remote cameras have been used. IOT development can diminish the cost and update the productivity of standard developing.

3.Title- Solar Based Smart Irrigation System using Internet of Things

Published in - Issue 7, July 2020 International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE).

Authors- Pratik D. Solanki , Ram H. Mistry , Dhaval M. Sakhiya , Sandip J. Ranpariya , Maulik J. Ramani , Mitesh J. Paghdal

Agriculture is the backbone of every country and it has been the most important from the human life. Appropriate atmospheric conditions are necessary for expected plant growth, better crop fields, and proper use of water and other resources. Traditional methods for irrigation such as overhead sprinkler type is not that much efficient. They result in a lot of wastage of water. Automated irrigation system is for conservation of the water and indirectly of the farm. About 85% of total available water resources across the world are used for the irrigation purpose. In upcoming years this demand is likely to increase because of increasing population. In automation system water availability to crop is monitored through sensors and watering is done through the controlled irrigation. The idea is to focus on temperature and soil moisture. This is a Mobile Integrated and smart irrigation system using Internet of things (IoT) based on controlled monitoring system. The main objective of this project is to control the water supply and monitor the plants through a Smartphone. Solar powered smart irrigation systems used to the Indian farmer.

PROBLEM FORMULATION AND PROPOSED METHODOLOGY

PROBLEM FORMULATION

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials.It plays vital role in the growth of country's economy. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. This project therefore proposes a system which is useful in monitoring the field data as well as controlling the field operations which provides the flexibility.

PROPOSED METHODLOGY

When the power is turned on, the NodeMCU and all of the components turn on as well. We are using a renewable source of energy (solar energy), first solar energy is converted into a dc source of light by solar panels and we have connected a chargeable battery so it is charged by the charge controller.The soil moisture sensor measures the moisture content of the soil and turns on the motor automatically if the moisture content is low. At the same time, information about the motor is presented on the LCD, as well as the moisture content value. Similarly, when the soil moisture sensor detects a high moisture content, the engine turns off automatically and information is shown on the LCD. Simultaneously, through the Blynk IoT application, we'd get all the information of what's going on in our mobile, such as whether the engine is on or off and how much soil moisture content there is. All of this is accomplished with the help of an ESP8266 wi-fi module that is connected to the internet and sends data to our phones. Because everything is done automatically over the internet, we can conclude that our project is built on IoT.

BLOCK DIAGRAM

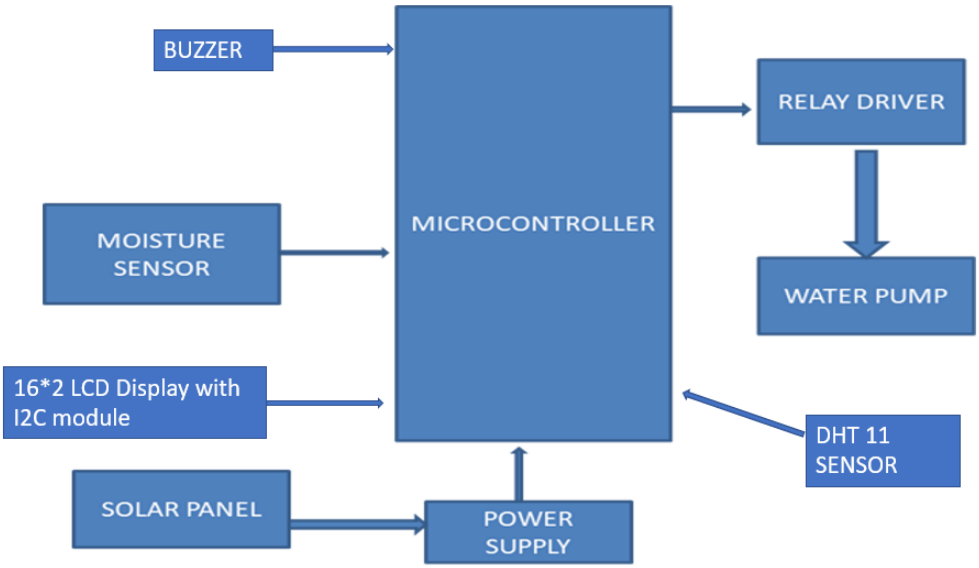


Fig2.1.1 Block Diagram

CIRCUIT DIAGRAM

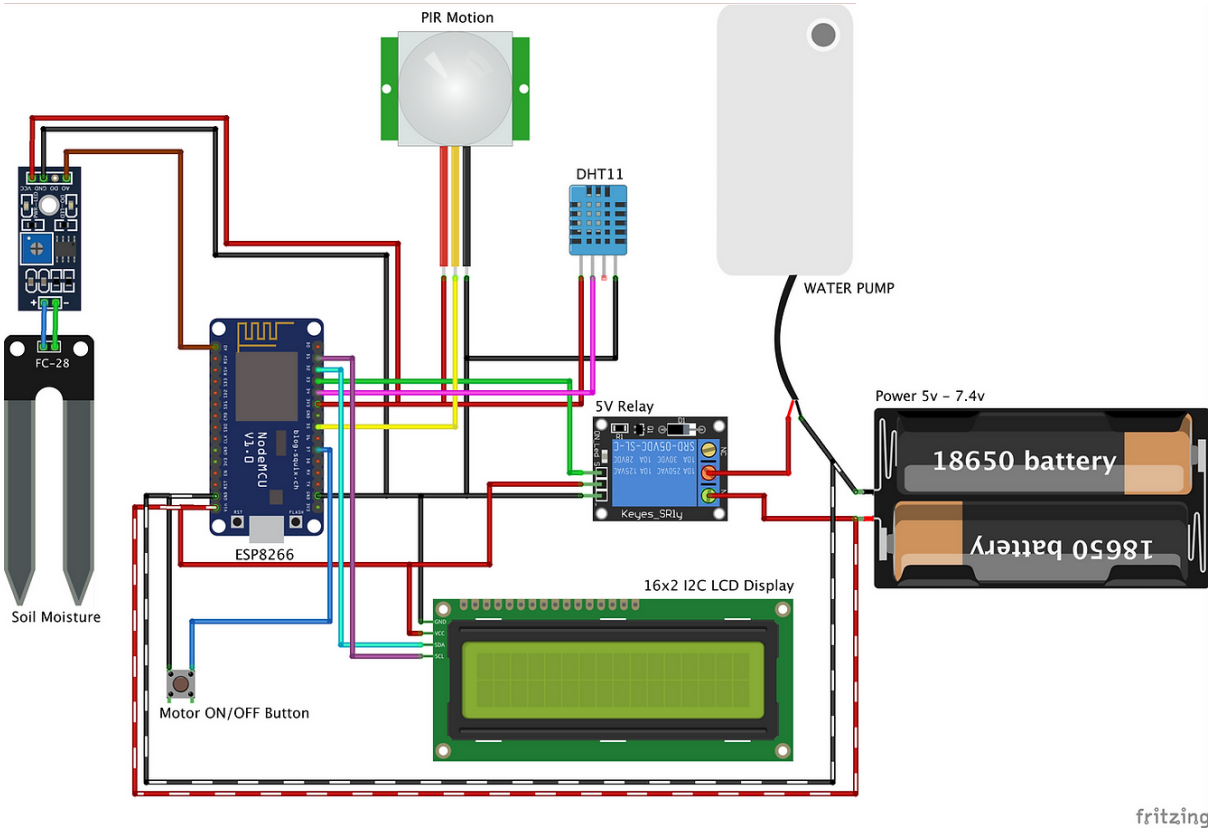


Fig.2.1.2 Circuit Diagram

COMPONENTS DESCRIPTION

ESP8266 -

The **ESP8266** is a very user-friendly and low-cost device to provide internet connectivity to your projects. The module can work both as an Access point (can create a hotspot) and as a station (can connect to Wi-Fi), hence it can easily fetch data and upload it to the internet making the **Internet of Things** as easy as possible. It can also fetch data from the internet using API's hence your project could access any information that is available in the internet, thus making it smarter. Another exciting feature of this module is that it can be programmed using the Arduino IDE which makes it a lot more user-friendly. It is a powerful Wi-Fi module available in a compact size at a very low price. It is based on the L106 RISC 32-bit microprocessor core and runs at 80 MHz. It requires only 3.3 Volts power supply.The current consumption is 100 m Amps.The maximum Input/Output (I/O) voltage is 3.6 Volts It consumes 100 mA current.

Fig.3.2.1.1 ESP8266

USB-

The USB connection with the PC is necessary to program the board and not just to power it up. The ESP8266 automatically draw power from either the USB or an external power supply. Connect the board to your computer using the USB cable.

Temperature and humidity sensor (DHT11):-

Product Description:

DHT11 digital temperature and humidity sensor is a composite Sensor that contains a calibrated digital signal output of the temperature and humidity. Application of dedicated digital modules collection technology and temperature and humidity sensing technology, to ensure that the product has high reliability and excellent long-term stability. The sensor includes a resistive sense of wet components and an NTC temperature measurement devices and is connected to a high-performance 8-bit microcontroller.

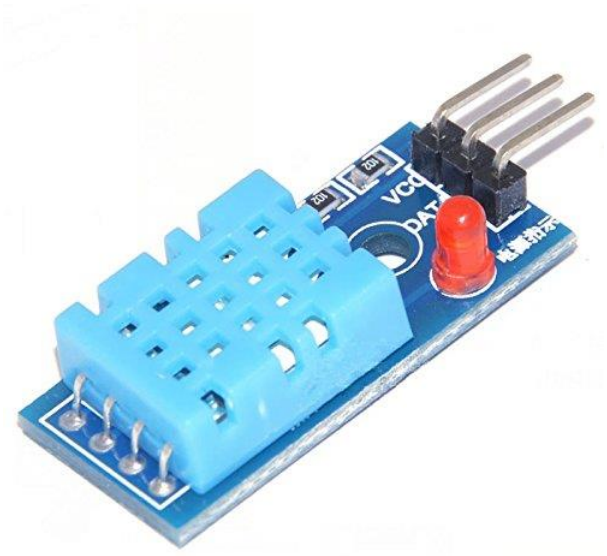


Fig. 3.2.1.2 DHT11 Sensor

Pin Description:

- 1, the VCC power supply 3.5～5.5V DC
- 2 DATA serial data, a single bus
- 3, NC, empty pin
- 4, GND, used to connect the module to system ground

Soil moisture sensor -

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. 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. This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent.

Fig. 3.2.1.3 Soil moisture sensor

SPECIFICATIONS

- VCC pin is used for power.
- A0 pin is an analog output.
- D0 pin is a digital output.
- GND pin is a Ground.
- The required voltage for working is 5V.
- The required current for working is <20mA.
- Type of interface is analog.
- The required working temperature of this sensor is 10°C~30°C.

Water pump:-

The water pump works using water suction method which drain the water through its inlet and released it through the outlet. You can use the water pump as exhaust system for your aqurium and controlled water flow fountain. How to Use: Firstly, simply connect the red wire (+) and black wire (-) to a 3V or 5V DC supply.

Fig3.2.1.4 5v dc water pump

5V Relay module

The 5V relay module can be used to control a load such as a lighting system, motor, or solenoid. It can also be used to switch AC or DC voltages. The maximum voltage and current that the 5V relay module can control is dependent on the specifications of the relay.

Fig3.2.1.5 5v relay module

5V Solar Panel-

This is a high-performance, lightweight, portable monocrystalline silicon solar panel in a PET package, with an integrated voltage regulator output of 5V, with working indicators, USB type-A mother-port output, plug-and-play. It can supply plenty of power in various environments to prevent the system from shutting down, even in rainy days.

Fig3.2.1.6 Solar panel

TP4056 Charge controller:

TP4056 module is a linear charger for lithium-ion and LIPO batteries. This module can charge batteries consists of single cells. Due to its capability of supplying 4.2V, it is highly suitable for charging 18650 cells and other 3.7V batteries.

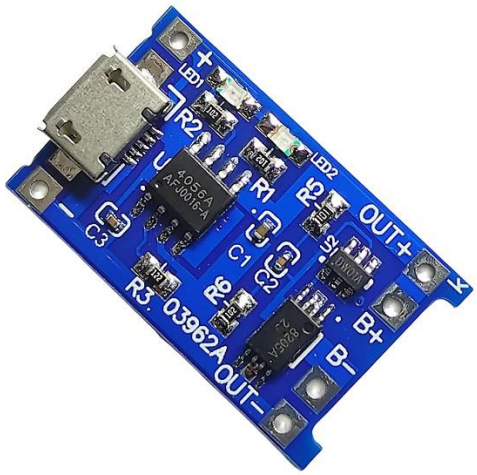


Fig3.2.1.7 TP4056 Charge controller

5V Lithium-ion Battery

A 5V lithium-ion battery is a rechargeable battery that uses lithium-ion technology to store and provide electrical power at a voltage of 5 volts. Lithium-ion batteries are a type of rechargeable battery that has become increasingly popular due to their high energy density, low self-discharge rate, and long cycle life.

Fig3.2.1.8 5v Lithium-ion Battery

16X2 LCD Panel:-

Product Description:

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. [1] LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays.

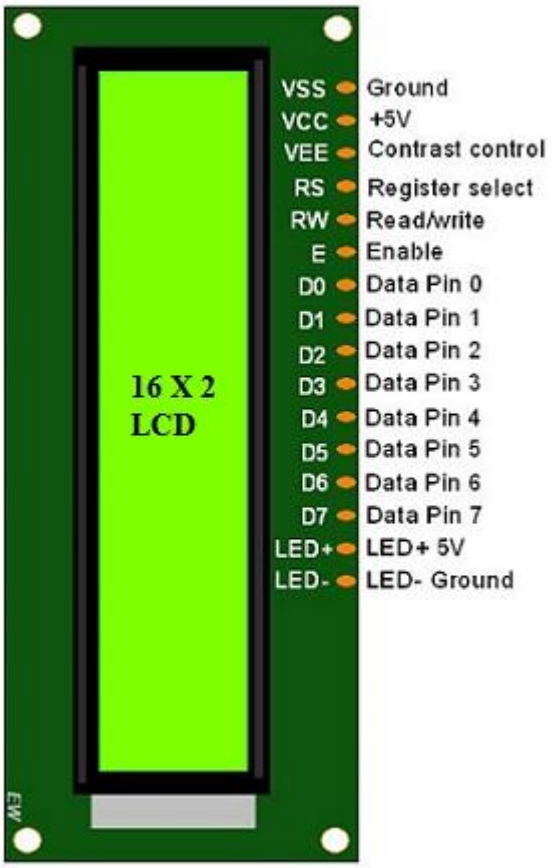


Fig. 3.2.1.9 LCD

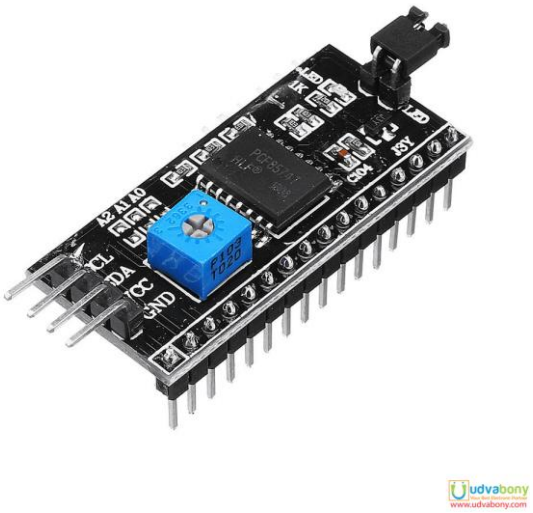
Features of LCD16x2

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

I2C module for lcd

This is a RoHS compliant I2C Serial LCD Daughter board that can be connected to a standard 16×2 or 20×4 Character Display Module that supports 4-bit mode. All Character Modules sold on our site support 4-bit mode, and nearly all commercially available 16×2 and 20×4 line character modules support it too.

This board has a PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display. There are many examples on the internet for using this board with Arduino. Do a search for "Arduino LCD PCF8574". The I2C address is 0x3F by default, but this can be changed via 3 solder jumpers provided on the board. This allows up to 3 LCD displays to be controlled via a single I2C bus (giving each one it's own address)



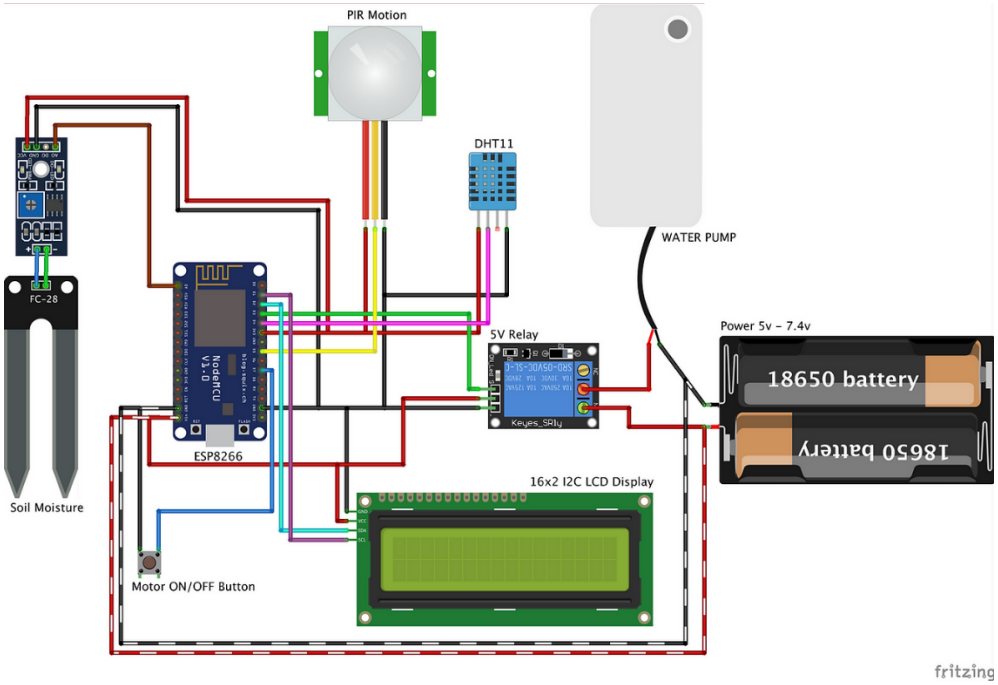
Fig,3.2.1.10 I2c module

This section mentions some of the features and specifications of the I2C Serial Interface Adapter Module.

1. Operating Voltage: 5V DC
2. I2C control using PCF8574
3. Can have 8 modules on a single I2C bus
4. I2C Address: 0X20~0X27 (the original address is 0X20, you can change it yourself via the onboard jumper pins)

SIMULATION

(a)



(b)

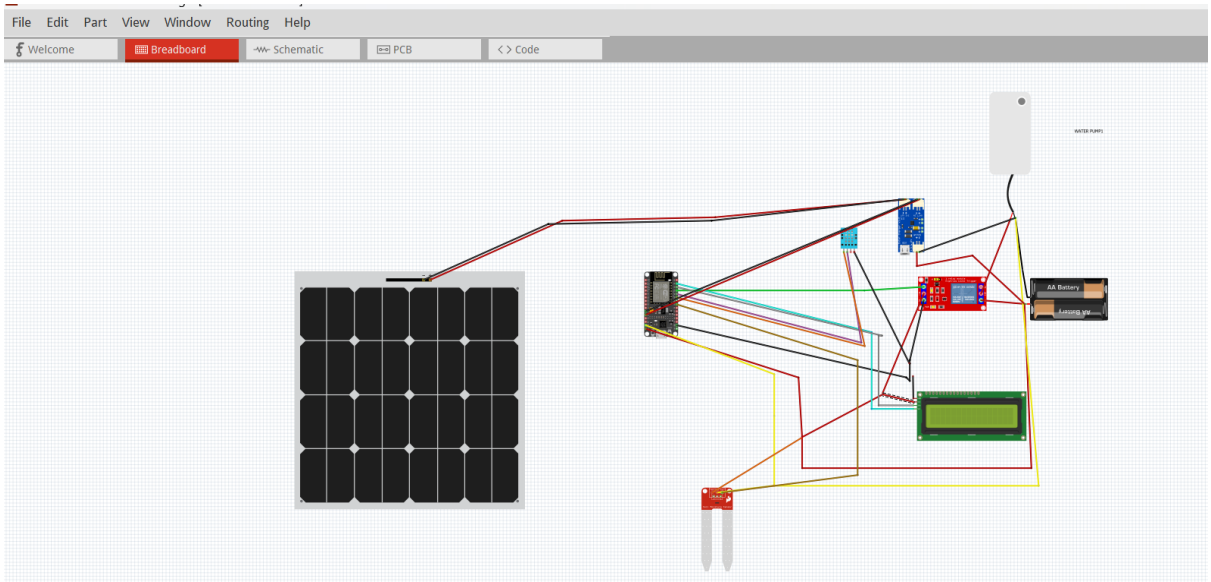


Fig.2.1.3 Simulation

RESULTS AND DISCUSSION

RESULTS

Reading

The calculation formula is soil moisture content=W/M*100%, M is the weight of soil before drying, and W is the weight of soil moisture, that is, the difference between M and the weight of soil after drying M.

The output of the soil moisture sensor changes in the range of ADC value from 0 to 1023. This can be represented as moisture value in terms of percentage using formula given below.

Analog Output=ADC Value/1023

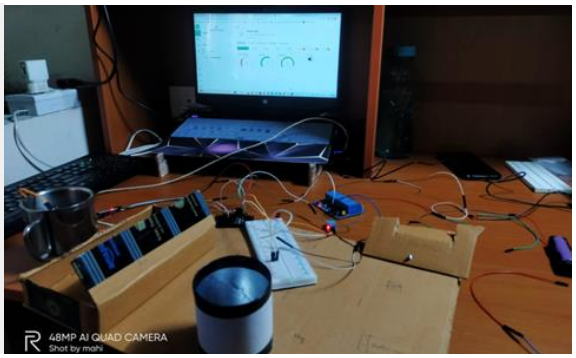
Moisture in percentage = 100-(Analog output*100)

For zero moisture, we get a maximum value of 10-bit ADC, i.e. 1023. This, in turn, gives 0% moisture.

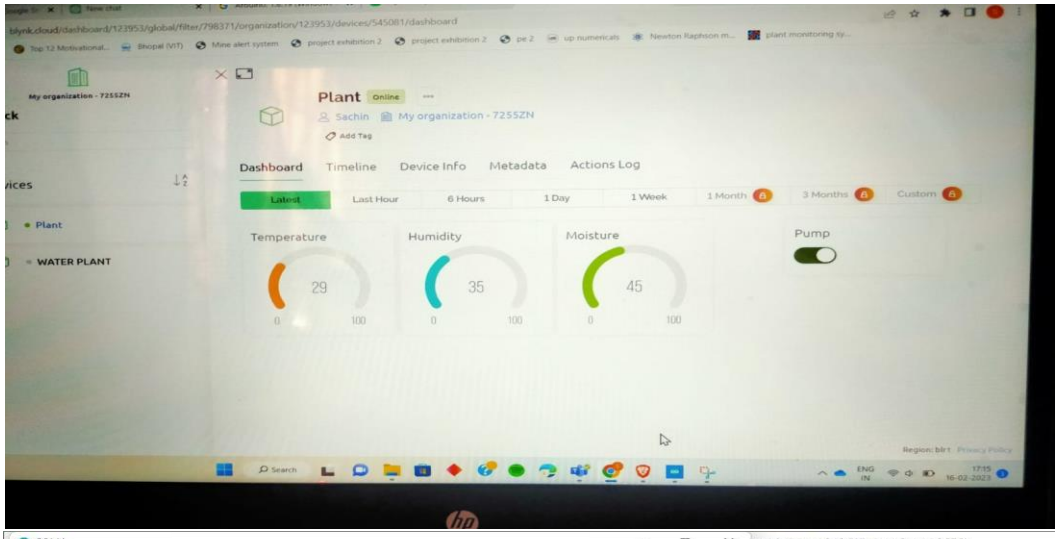
Item	Condition	Min	Typical	Max	Unit
Voltage	-	3.3	/	5	V
Current	-	0	/	35	mA
Output Voltage	Supply Voltage 5 V	0	-	4.2	V
Output Value	Supply in dry soil	0	-	300	/
	Sensor in humid soil	300	-	700	/
	Sensor in water	700	-	950	/

Conversion of Sensor Value into Moisture Percentage

```
float moisture_percentage;
int sensor_analog;
sensor_analog = analogRead(sensor_pin);
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
Serial.print("Moisture Percentage = ");
Serial.print(moisture_percentage);
Serial.print("%\n\n");
delay(1000);
```



IMPLEMENTATION



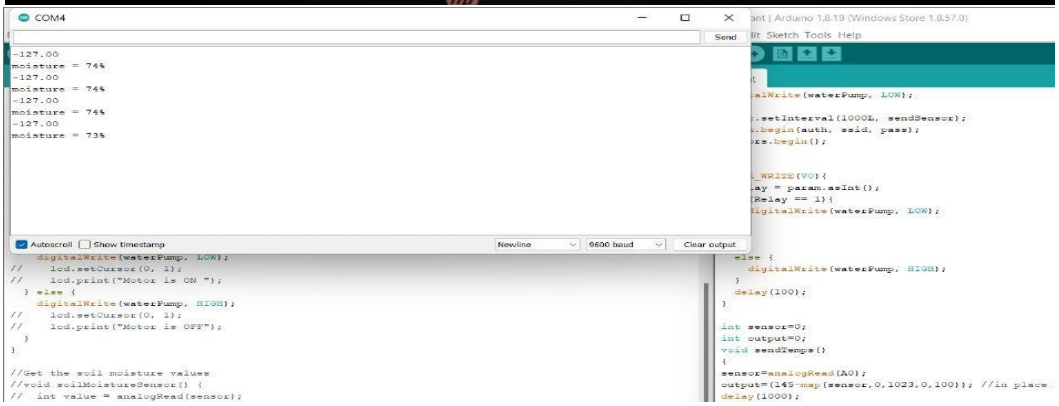


Fig.2.1.4 Result figures

CONCLUSION & FUTURE SCOPE

CONCLUSION

The smart agriculture using IoT will revolutionize the world of farming, and it will increase productivity. It will improve the quality and can save the lives of the farmer. There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology, it has become necessary to increase the annual crop production output of our country India, an entirely agro-centric economy. Save farmers' effort, water and time have been the most important consideration. Farmers can relate to his residence from wherever and at whatever point. It will save the time of farmers.

FUTURE SCOPE

In the near future, this system can be modified to add a lot more features by increasing highly sensitive, selective sensors. Also, measured sensor data can be stored in a database, and cloud server.

REFERENCE

- Mahendra Swain, Rajesh Singh, Anita Gehlot, Md Farukh Hashmi, Shiv Kumar, Manish Parmar, "A reliable approach to customizing linux kernelusing custom build tool-chain for ARM architectureand application to agriculture," International Journal of Electrical and Computer Engineering (IJECE), vol. 9, no. 6, pp. 4920~4928, December 2019.
- Paparao Nalajala, P Sambasiva Rao, Y Sangeetha, Ootla Balaji, K Navya," Design of a Smart Mobile Case Framework Based on the Internet of Things", Advances in Intelligent Systems and Computing,Volume 815, Pp. 657-666, 2019.
- https://circuitdigest.com/microcontroller-projects/iot-based-smart-irrigation-system-using-esp8266-and-soil-moisture-sensor
- https://www.elprocus.com/smart-irrigation-system-using-iot/
-
- **DHT11 is a Humidity and Temperature Sensor-** https://www.electronicscomp.com/dht11-temprature-humidity-sensor-module-india
- Paparao Nalajala, D. Hemanth Kumar, P. Ramesh and Bhavana Godavarthi, 2017. Design and Implementation of Modern Automated Real Time Monitoring System for Agriculture using Internet of Things (IoT). Journal of Engineering and Applied Sciences, 12: 9389- 9393 2017.
- N. I. Tchernyshev, O. E. Sysoev, D. B. Solovev, E. P. Kiselyov, "Basic Robotecnical Platform for Implementation of Accurate Farming Technologies," Bulletin of Electrical Engineering and Informatics, vol. 7, no. 4, pp. 522-528, December 2018.
- https://www.xenonstack.com/use-cases/iot-smart-farming
- Davide adami, Fabio Vigoli, and Stefano Giordano, "IoT solution from crop protection against wild animals attack", 2018.
- G. Sushanth and S. Sujatha, IOT Based Smart Agriculture System, IEEE, 2018.