A
Project Report
On

"Implementation of Cost Effective Smart Hydroponics System Monitoring & Controlling Using IOT "

Submitted to

Sant Gadge Baba Amravati University, Amravati

Submitted in partial fulfilment of
the requirements for the Degree of
Bachelor of Engineering in
Electronics and Telecommunication Engineering

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Certificate

This is to certify that the project report entitled

"Implementation of Cost Effective Smart Hydroponics System Monitoring & Controlling Using IOT" is hereby approved as a creditable study carried out and presented by

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in a manner satisfactory to warrant of its acceptance as a pre-requisite in a partial fulfillment of the requirements for the degree of Bachelor of Engineering in Electronics & Telecommunication Engineering of Sant Gadge Baba Amravati University, Amravati during the Session 2020-2021.

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Abstract

Hydroponic System is a system in which farmers cultivate different plants without utilizing the soil. We are proposing IoT system that monitors and controls all parameters of hydroponic system like water level, pH, light intensity, humidity and temperature through web server/mobile application. We will use an ESP32 micro-controller that is controlled pump.

The pump will draw water from a reservoir which is connected to a regular water line. If the water level of the reservoir falls down to a certain level, the system will send an notification to the Farmer. The farmer can control the water line and make the reservoir full by our designed mobile application. An LDR and DHT11 humidity sensor is used to. control the light and temperature of the farm. In system, we also used pH sensor where pH sensor is a scientific instrument that measures the hydrogen-ion activity in water-based solutions and indicating its acidity or alkalinity expressed as pH.

Acknowledgement

We would like to take this opportunity to express our heartfelt thanks to our guide **Prof.V.S.ingole** for his esteemed guidance and encouragement, especially through difficult times. His suggestions broaden our vision and guided us to succeed in this work. We are also very grateful for his guidance and comments while designing part of our project and learnt many things under his leadership. Also we would like to thank to Dr. G. S. Gawande, Head of Electronics and Telecommunication Department, all teaching and non-teaching staff of EXTC Department for their encouragement and suggestions for our project.

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Abbreviations

Wi-Fi - Wireless Fidelity

LED - Light Emitting Diode

IC - Integrated Circuit

RC - Remote Control

RPM - Rotation Per Minute

mAh - milli Amperes hour

USB -Universal Serial Bus

GPS - Global Positioning System

RPM - Rotation Per Minute

EEPROM - Electrically Erasable Programmable Random Access Memory

Ph -Potential of Hydrogen

LDR -Light Dependence Resistor

NFT -Nutrition Firm Technique

HW -Horse Power

C -Celsius

Ml -Milimeter

List Of Figure:-

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Chapter 1

Introduction

1.Research Background:- Nowadays agriculture is largely dependent on soil and its nutrition contents. But due to global warming and globalization, the availability of soil for agricultural purpose is decreasing and this hampers the production of different plants. Also, fertilizers and pesticides are needed to use to get a better crop which is also da- maging the environment. To solve these problems, hydroponics can be used in agriculture. Hydroponics is a method of growing plants without soil and instead.

using mineral nutrient solutions in a water solvent. The word "Hydroponics" it- self is an amalgamation of two Greek words: "Hydro" meaning water and "Pon- ics" meaning to work. Using hydroponics, terrestrial plants can be grown with only their roots exposed to the nutritious liquid, or the roots may be physically supported by an inert medium such as perlite or gravel [1]. The nutrients used in hydroponic systems can come from an array of different sources, including (but not limited to) byproduct from fish excrement, duck manure, or purchased chemical fertilizers. Through careful manipulation and management of the plant growing environment which includes the amount of water, the pH levels and the combination of specific nutrients, plants can be encouraged to grow faster. Hydroponics is a less wasteful approach including reduced waste, preservation of water stocks and a diminished reliance on pesticides, fertilizers and other poten- tially harmful materials. The net impact is an expanded surrender and pro- gressed utilize of assets. Plants commonly developed hydroponically incorporate tomatoes, peppers, cucumbers, lettuces, and cannabis. The web of things,or IOT, could be a framework of interrelated computing gadgets, mechanical and advanced machines,objects, creatures or individuals that are given with inter- esting identifiers and the capacity to exchange information over an organization without requiring human-to-human or human-to- computer interaction. Implanted with gadgets, web network, and other shapes of equipment such assen- sors, these gadgets can communicate and connecte with others over the web, and they can be

remotely checked and controlled. These advantages of IOT have in- spired scientists to use the technology in different aspects of our day to day life.

Due to limited resources, farmers need to produce more with less resource and without hampering environment. So, more people are trying to set up hydroponics farm, since it does not require a large area and there is a very mi- nimal need of water in the cultivation process. Using hydroponics with IOT can be an efficient way to produce maximum crops with reduced environmental impact and resources. Horticulture IOT arrangements permit agriculturists to use sensors, shrewd doors, and observing frameworks to gather and analyze data and make more educated choices. The rise of IOT has permitted ranchers to computerize the hydroponic horticulture handle to a certain degree. From keeping up the water temperature to a certain level to robotizing the supplement blending, each single handle can be done by means of this imaginative innova- tion.

1.2 motivation:-

Nowadays agriculture is largely dependent on soil and its nutrition contents. But due to global warming and globalization, the availability of soil for agricultural purpose is decreasing and this hampers the production of different plants. Also, fertilizers and pesticides are needed to use to get a better crop which is also damaging the environment. Due to climate change, the availability of cultivable land is decreasing day by day.

So, an alternative way of cultivation is needed to overcome the situation. Hydroponics gives people that opportunity to cope with the environmental change.

In the flood affected areas, farmers cannot grow any crops and wait for the government help to feed themselves. Instead they can grow crops on water using the knowledge of hydroponics and support themselves during the disastrous times.

There are also some lands which cannot be cultivated i.e., hilly areas. By creating small swampy area, people can grow different kinds of crops using the knowledge of hydroponics.

1.1 Literature review:-

Vertical Cultivating into urban communities has extended. Vertical developing could be a creating vegetable vertically by unused green procedures, which joins the structure of structure and farms all together in a lifted structure interior the urban areas. This development ought to be appearing both within the rustic framework and auxiliary advancement together, in any case, small has been dis- persed on the advancement of Vertical Cultivating. In this examination, devel- opment as one of the critical figure of vertical developing is talked approximately and reviewed by subjective strategy. Within the to begin with, recognizing exist- ing and future VF amplifies in Europe, Asia, and America from 2009 to 2016. At that point a total composing looked into on developments and methods that are

utilized in VF The headways advertised can be a direct for utilization advance ment and foreseeing creative and developing wanders of Vertical Cultivating in urban ranges. Truth be told, it can go almost as a reason for evaluating prospec- tive cultivating and plan together. The blend of food creation into the urban dis- tricts has been seen as an affiliation with the city and its inhabitants. It whereas reduces destitution, includes sanitation, and increases coherent viability and human prosperity. The examination resources were formed from 62 interesting sources from 2007 to 2016 .

Hardeep Singh made and built a vertical Hydroponic apex. An apex plant, also called a window farm is a course of action of vertical hydroponics, which conso- lidates an A-Frame hydroponic system, hydroponic divider and falls of contain- ers. It tends to be utilized for creating distinctive harvests like strawberry, let- tuce, Swiss chard, herbs, spinach, kale, broccoli and flowering petunia. There are distinctive online sources to urge these systems, which can taken a toll around

$500 or more, however you'll be able manufacture your claim apex plant for considerably less. It can moreover be utilized for creating plants interior in the event that lights are given over the apex, whichis celebrated in urban domains

with fair a small space for developing. The apex nursery structure portrayed here can hold 28 plants for each apex and two towers can be set in a 5-foot × 5-foot space, conveying 56 plants at one time. The arrange can be modified as shown by slant. For occasion, towers can be dangled from the top and can deplete to a solitary tank to gather the supplement arrangement. Materials recorded under- neath can be found at a tool shop, with the exception of the net pots which can be acquired from hydroponic sellers or on the web. On the off chance that tower material is modified, make a point to utilize sustenance grade material [5].

The unremitting designs of growing people, urbanization, diminishing water supply, and continuing with natural alter have included to declining loads of ar- able arrive per person. As arrive resources for cultivation decay, procedure mak- ers are looked with the test of viability and feeding the rapidly creating add up to people which is expected to attain around 9.7 billion out of 2050.Answers for progressing future food era are exemplified by urban vertical developing which incorporatesa parcel more unmistakable utilization of advancement and roboti- zation for land-use streamlining.

The vertical property framework anticipates to basically extend benefit and reduce the biological impression interior a structure of urban, indoor, climate controlled tall structures. It is ensured that such workplaces offer various potential focuses of intrigued as a idealize and green wellspring of food, nearby biosecurity, opportunity from vermin, dry spells, and reduced utilization of transportation and petroleum subsidiaries. In this article, the issues included are evaluated beside potential focuses of intrigued and ob- stacles. Potential consequences are recognized for thought by approach makers and to energize assist budgetary examination .

1.2 Objective:-

- The main objective of this project is to design and construct a hydroponic system which is fully automatic that can be integrated into the agricultural curriculum while introducing business skills.
- Several benefits of this technique is ,it takes very less time in growing crops,which help to get more yield when compared with natural process of cultivation
- Commercially hydroponic technique has been used in entire world which has got very successful in agriculture field with less water usage and pesticides
- For successful implementation of this technique, it is important to develop a cost effective and user friendly so that the user with less technical skill also can be able to operate.

1.3 System Overview:-

Hydroponics is a method of cultivation without soil. Its lexical meaning of hydro is water. However, this method requires other planting media such as gravel, sand, coconut fiber, a substance silicate, broken rock or reef, pieces of wood, and foam. In the growth and development process of watercress is influenced by independent variables, namely levels of nutrients, acidity, and temperature. Those independent variables can be used as input variable system to predict the watercress growth and growth.

Variables used in this study were the variables of input system:

a. Variable of water level

b. Variable of water temperature

c. Variable of pH

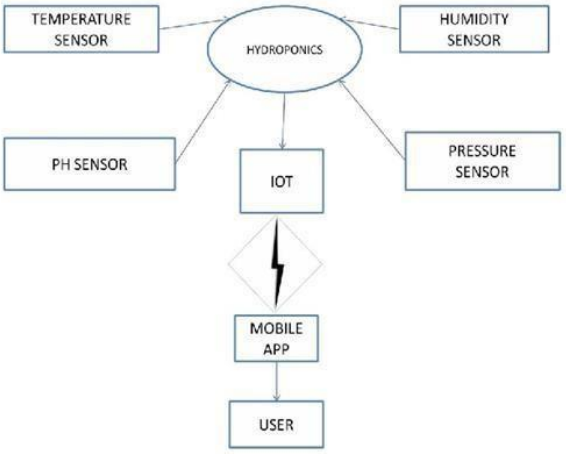

Fig 1.1 system overview

The water temperature should be in the range 18-26 C. It should in that limit only otherwise the plant may die. if more or less temperature the water has. The purpose of this sensor is to detect whether the water or nutrient solution level is upto a sufficient height for plant growth or not . That is to detect if water or nutrient solution is present in the pipes or not. The pH of the nutrient solution for most nutrient film technique is 6.0-7.0.

1.4 Outline of Project: Chapter 1 defines basic definition of hydroponic system and its day to day use in daily life in agriculture field. The problem associated in farming of on plant recognition is addressed and how a hydroponic can be solution to this problem is discussed. A brief overview of the system designed is explained in detail. Chapter 1 defines basic definition of hydroponic and its day to day use in daily life in agriculture field. The problem associated in farming of on plant is addressed and how a hydroponic can be solution to this problem is discussed. A brief overview of the system designed is explained in detail.

The component description and their importance in building hydropinic system are mentioned in chapter 2and also it includes all actual hardware and software used in this project.The circuit diagram of hydroponic system is explained in this section.Aloso it gives the result associated with the hydroponic system.Finally conclusion and future scope are discussed.

Chapter 2

Methodology

This project is about hardware and software application based. It has followed some features and presented its own methodology with its own strategy. Following **Figure 2.1** shows a diagrammatic representation of different phases of this project methodology.

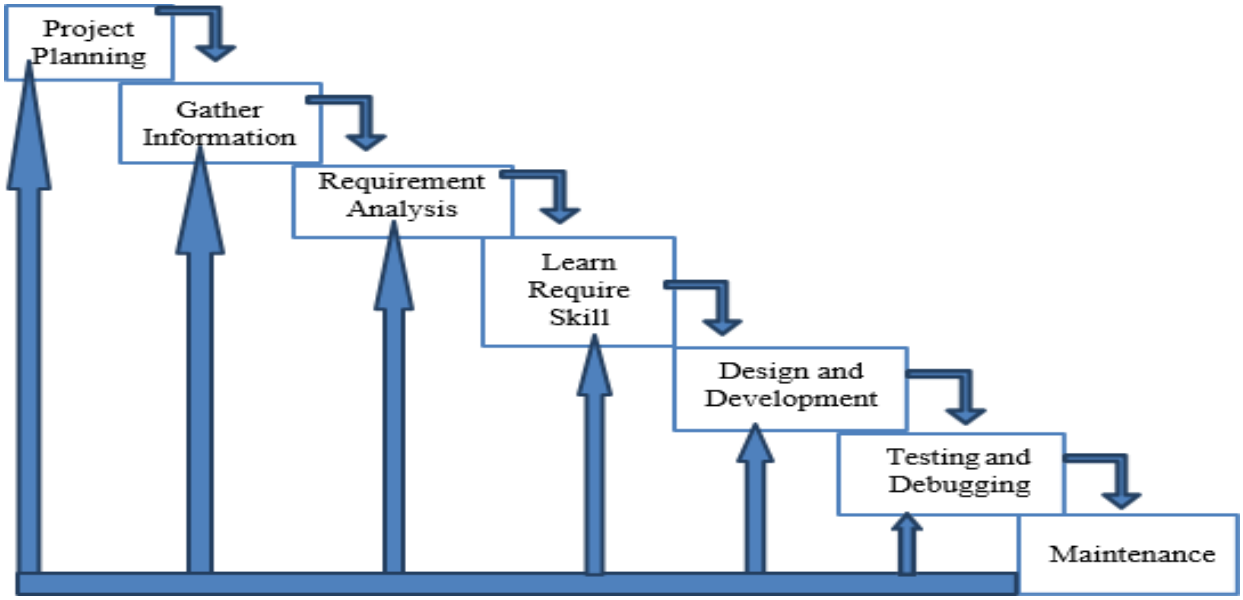

Fig 2.1 diagram of proposed methodology

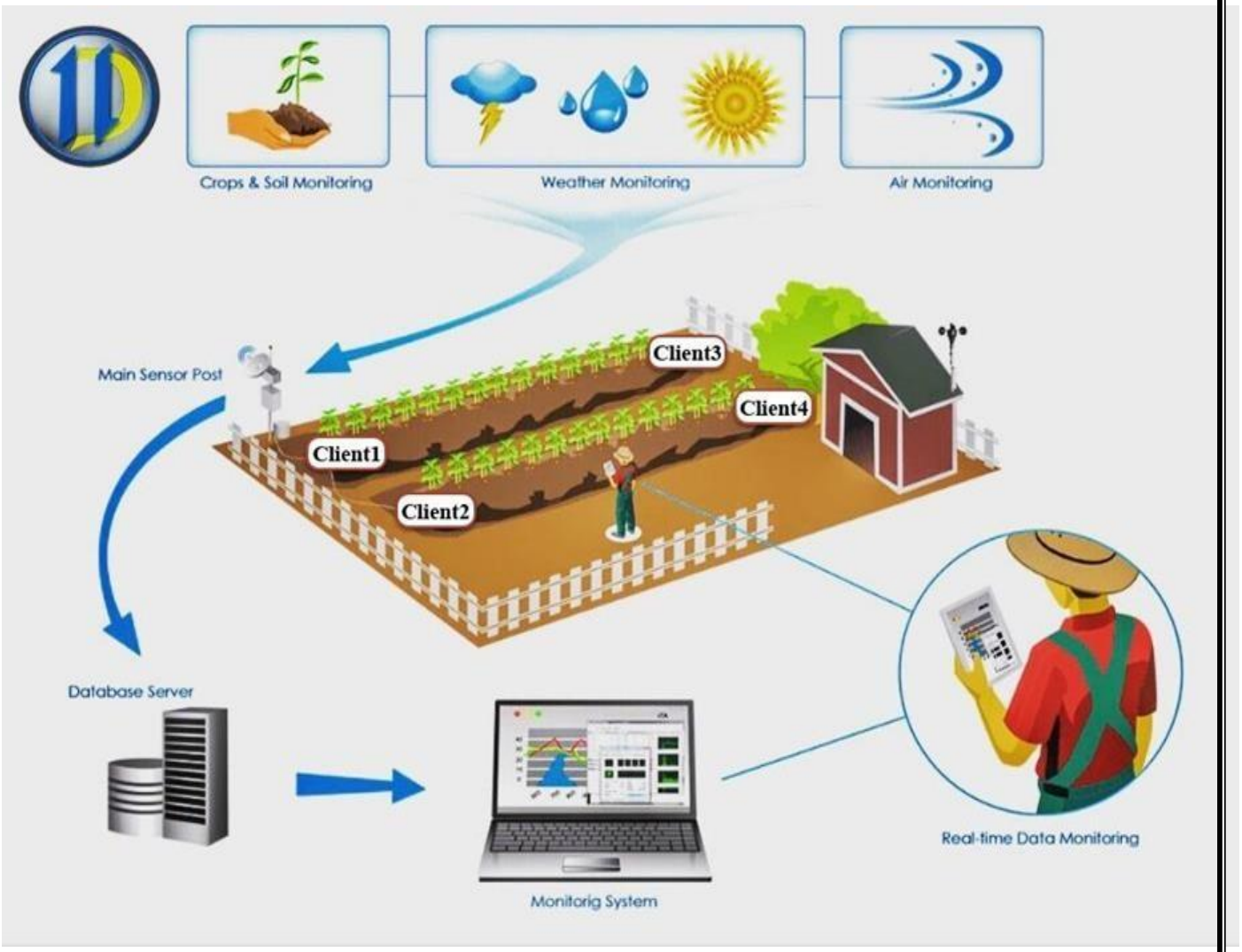

Fig2.2 diagram of proposed system

2.1 Hardware:-

2.1.1 input Devices:-

- **Temperature & Humidity Sensor (DHT11) :-** The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA. It has Temperature and humidity resolution of 16 bit.

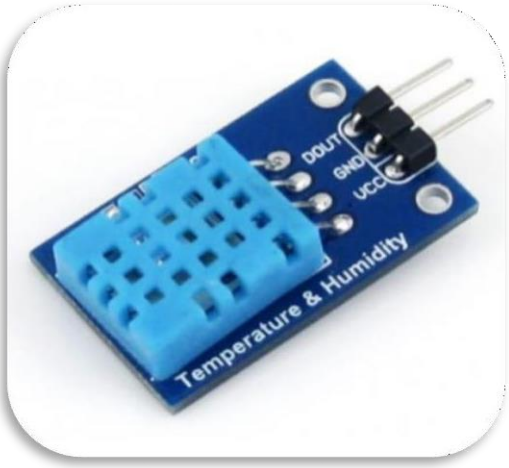

Fig 2.3DHT 11 sensor

- **PH Sensor**:- pH sensor is a rugged reliable water pH measuring device. It has operating range between 0-14.It has accuracy of <=(0.01 ph).Response time is less than equal to 1 min .It has mV Reading upto -1250mV to 1250mV . May consume more than 5mA during start up, less than 2 seconds.Ph probe is connected with Ph sensor through BNC connector.It has mV Reading: 1mV.

Fig 2.4 Ph sensor

- **LDR (Light Dependence Resistor):-** LDR (Light Dependent Resistor) is a resistor whose resistance varies inversely with the amount of light falling on it. It is also known as photo resistor, photocell, photo conductive cell etc. LDR are available in 5mm, 8mm, 12mm and 25mm dimensions. LDR is made of high resistance semiconductor material. Semiconductor material used for the photo resistors is cadmium sulphide, CdS. When it's dark, LDR has high resistance known as dark resistance. Usually dark resistance will be in the range of mega ohms. When light falls on LDR, resistance reduce to kilo ohms range. Working principle: when light falls on LDR i.e. when photons fall on LDR, valence band electrons get sufficient energy to get excited to the conduction band. Incident photons must have energy greater than the forbidden energy gap of the semiconductor. When light having enough energy falls on the device, more electrons will get excited to conduction band. As the number of free electrons increases, more current flows through the circuit. Hence it is said that, as light falls on LDR, resistance decreases.It has peak wavelength of 600nm.It has dark resistance after 1 sec is 0.03M ohm.

Fig 2.5 LDR Sensor

- **Ultrasonic sensor** :- This sensor can be used as distance sensor. The ultrasonic sensor is a transducer which converts electrical energy into sound waves and viceversa. These sound waves fall above the normal range of human hearing and hence it is known as ultrasonic waves. These type of waves are above the frequency of about 18000 Hz.

- It has nominal frequency output of 40 khz.it has coverare range of 0.2 to 6 meter. it has minimum range of 3 cm.It require 10 μs. Global Current Consumption 15 mA.

Fig 2.6 Ultrasonic sensor

2.1.2 Output Device:-

- **Water Pump:-:-**

  - Because of their limited power, submersible pumps are really only suitable for hydroponic systems with a total GPH (Gallons Per Hour) requirement of 1200 or less.

  - This should be more than adequate for most home growers. Inline pumps are so powerful that they are not measured in GPH, but rather in HP (horsepower)

Fig 2.7 Water pump

- **Air Cooler:-**

  - Air temperature is important aspect in the area of plant growth.

  - Due to this when there is rise in temperature then we can control it by the fan system.

  - Remote operation via PLCs to monitor and regulate process temperature**.**

Fig 2.8 Water Cooler

- **LED:-**

  - Light level can be major problem with the plant growth.
  - Led can be controlled and customized to any desired color temperature for
  - nurturing the hydroponic system.

Fig 2.8 Led

2.1.3 controller used:- ESP32 is a series of low-cost, low-power system on a chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The integration of Wi-Fi, Bluetooth and Bluetooth LE ensures that a wide range of applications can be targeted, and that modules are truly versatile. Using Wi-Fi ensures connectivity within a large radius, while using Bluetooth allows the user to easily detect (with low-energy beacons) a module and connect it to a smartphone. With in-built antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules, our chips add priceless functionality and versatility to your applications with minimal PCB requirements. ESP32 modules can be ordered with different antenna configurations (e.g. PCB antenna, antenna connector) and flash sizes, so thatthey correspond to the needs of different applications. ESP32 modules also offer manufacturing customizations with the pre-programming of application firmware, custom data and pre- provisioning with cloud certificates. All ESP32 Series of modules have a wide operating temperature range of -40°C to 105°C, and are suitable for commercial application development witha robust 4-layer design.

Fig 2.9 Esp 32 controller

2.2 Interfacing of DHT11 Sensor With Arduino with Tinkercad:-

Tinkercad is a free, easy-to-use app for 3D design, electronics, and coding. Tinkercad could be used in numerous ways, from creating designs based on a scientific concept to being featured in a unit or class on 3D design and printing. For example, in a challenge -based lesson, st udents could design a solution to an authentic problem from their community. Students could be asked to think of some problem that a physical object could solve and then be given a couple of weeks to design and test their solutions. Alternatively, students who are engaged with Minecraft in schools can extend their play -create experience by importing Tinkercad objects.

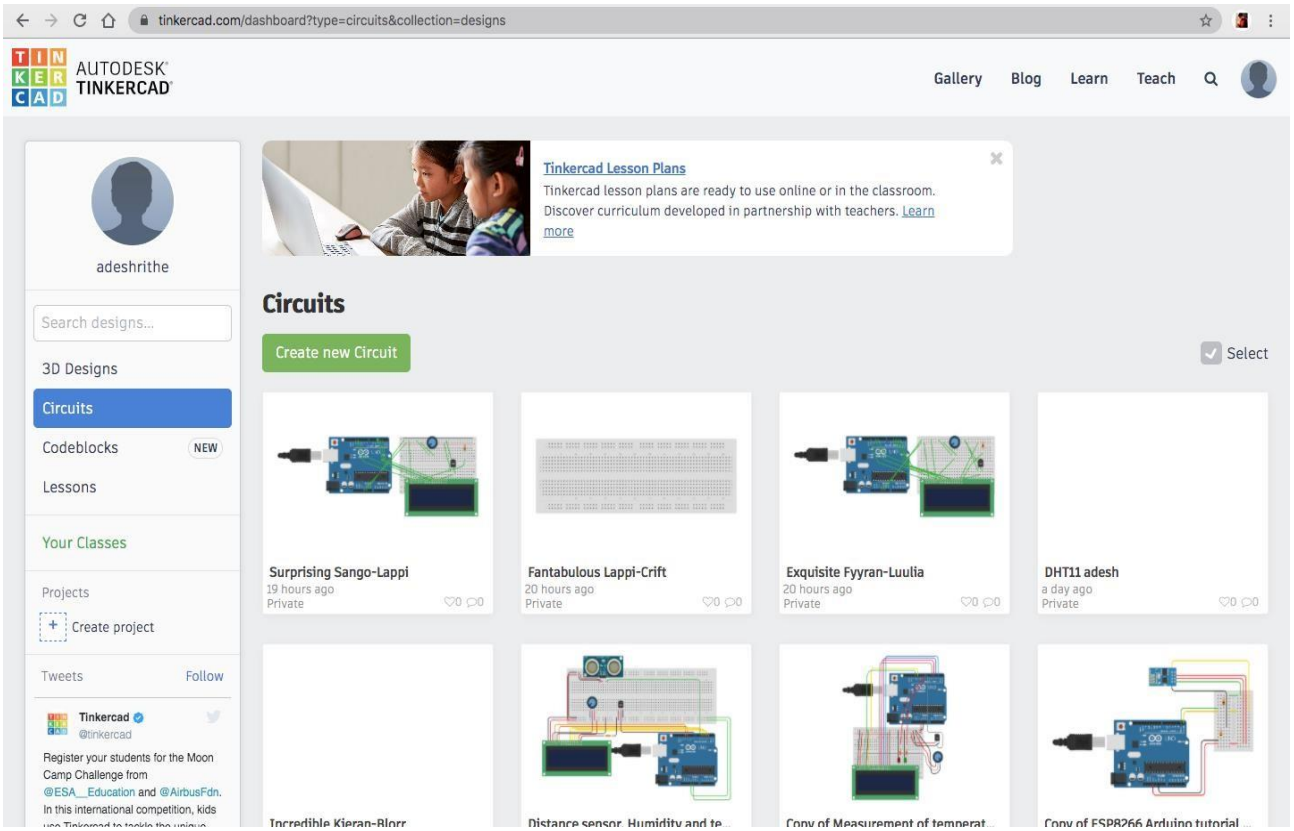

Fig 3.0 Tinkercad creating a circuit

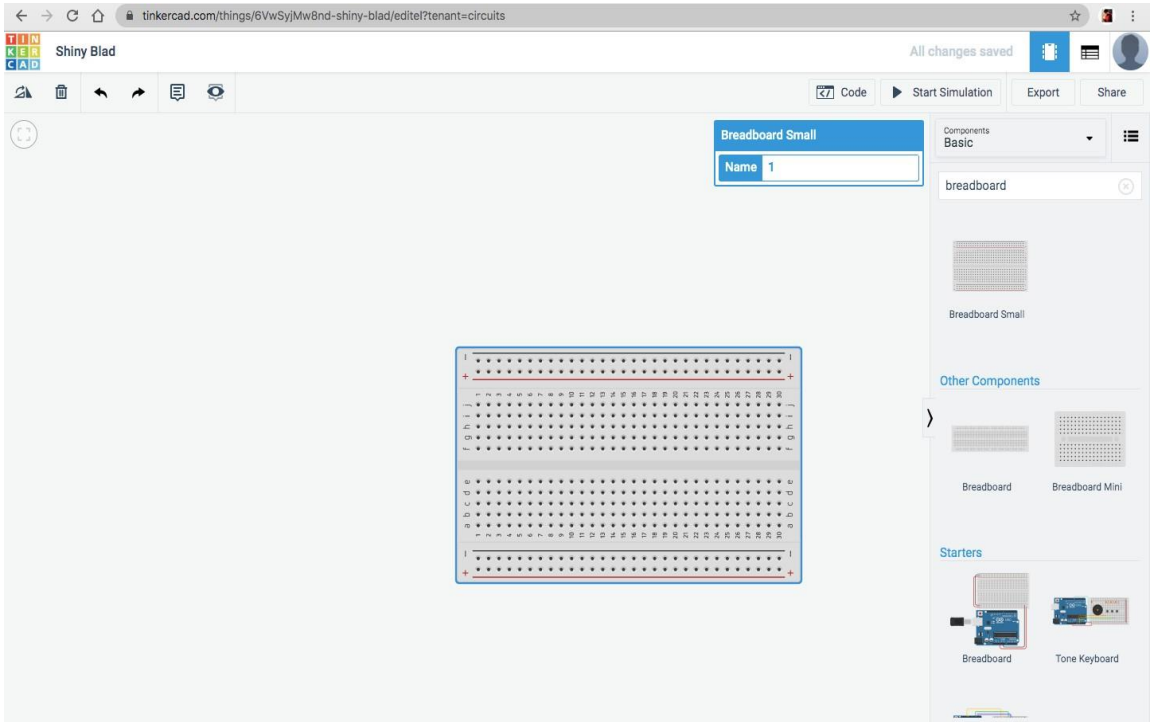

Fig 3.1

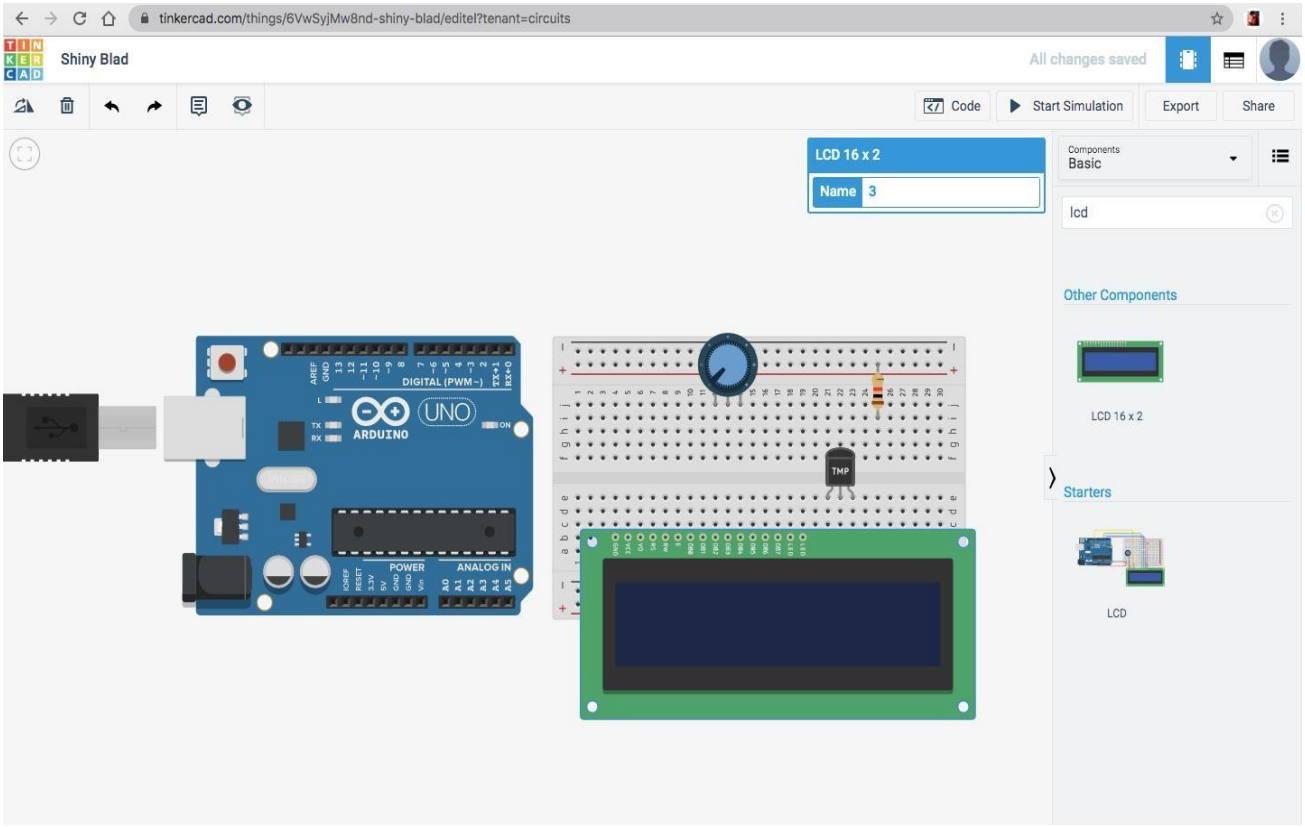

Fig 3.1 and fig 3.2:- Adding required components

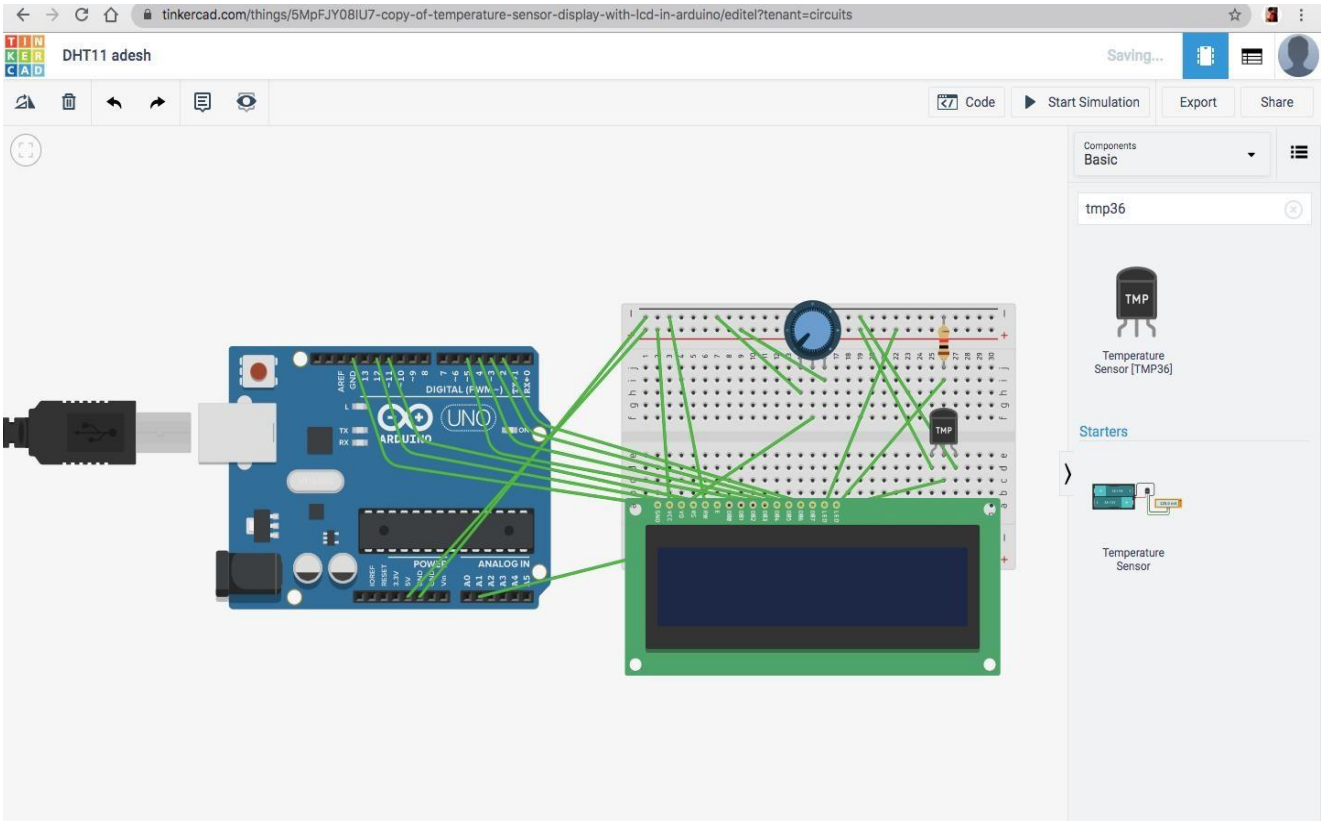

Fig 3.3 required connection

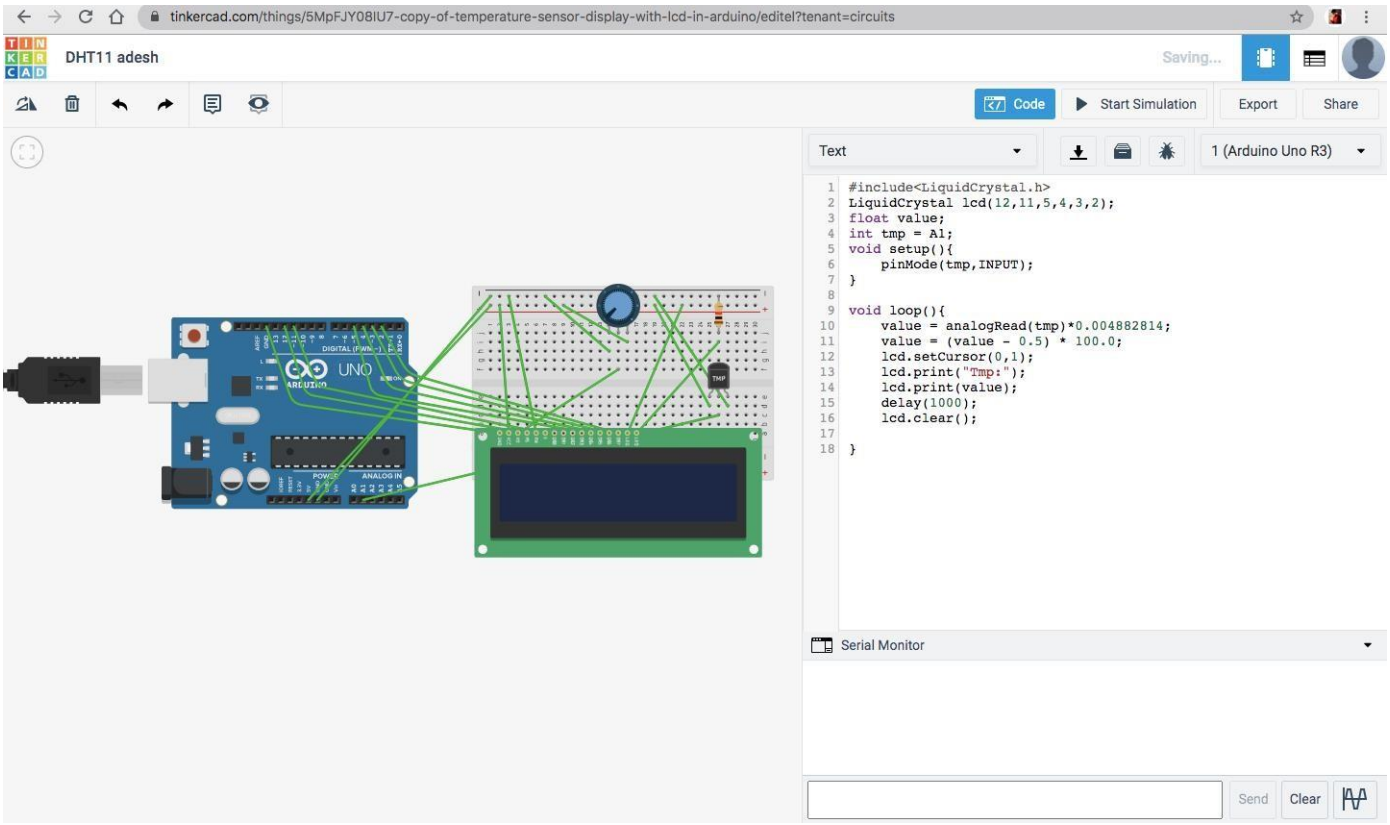

Fig 3.4 required code

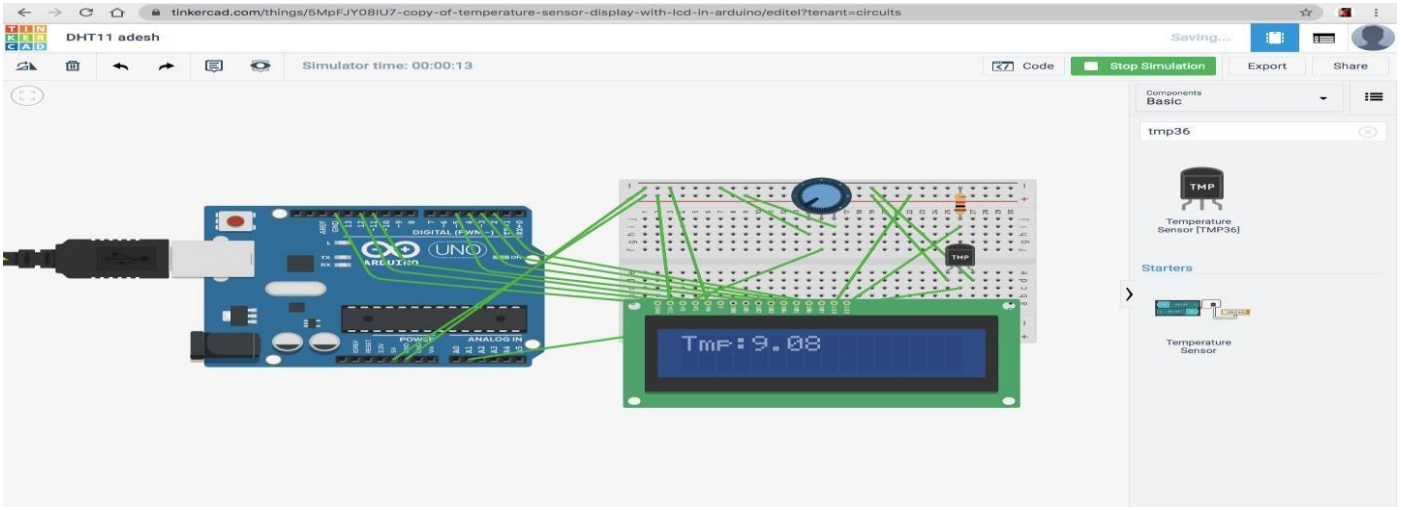

Fig 3.5 Output

2.3Interfacing Of DHT11 Sensor:-Interfacing of DHT 11 sensor with ESP32 is very simple as it has only three pins.Connect the vcc and GND pin of the sensor to the 3.3v and GND pin of ESP32 .Then connect the data pin of the sensor to the D2 pin of ESP32.After making the connection my hardware looks like this.

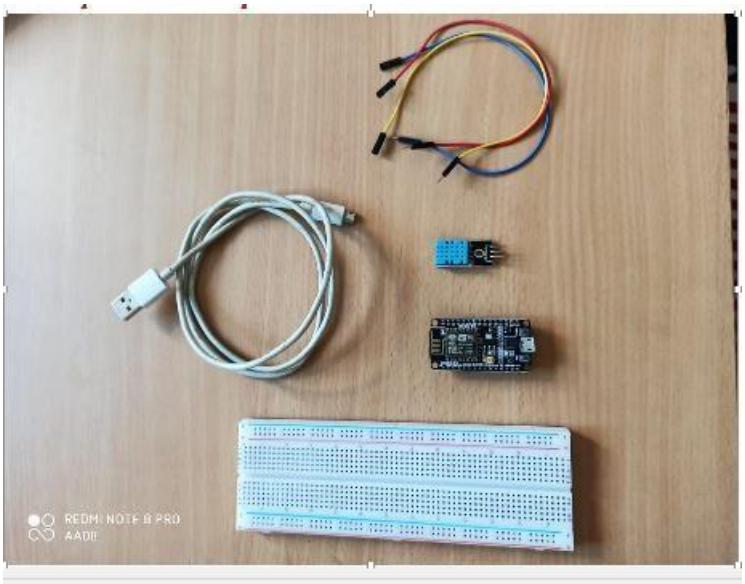

Fig 3.6 component required

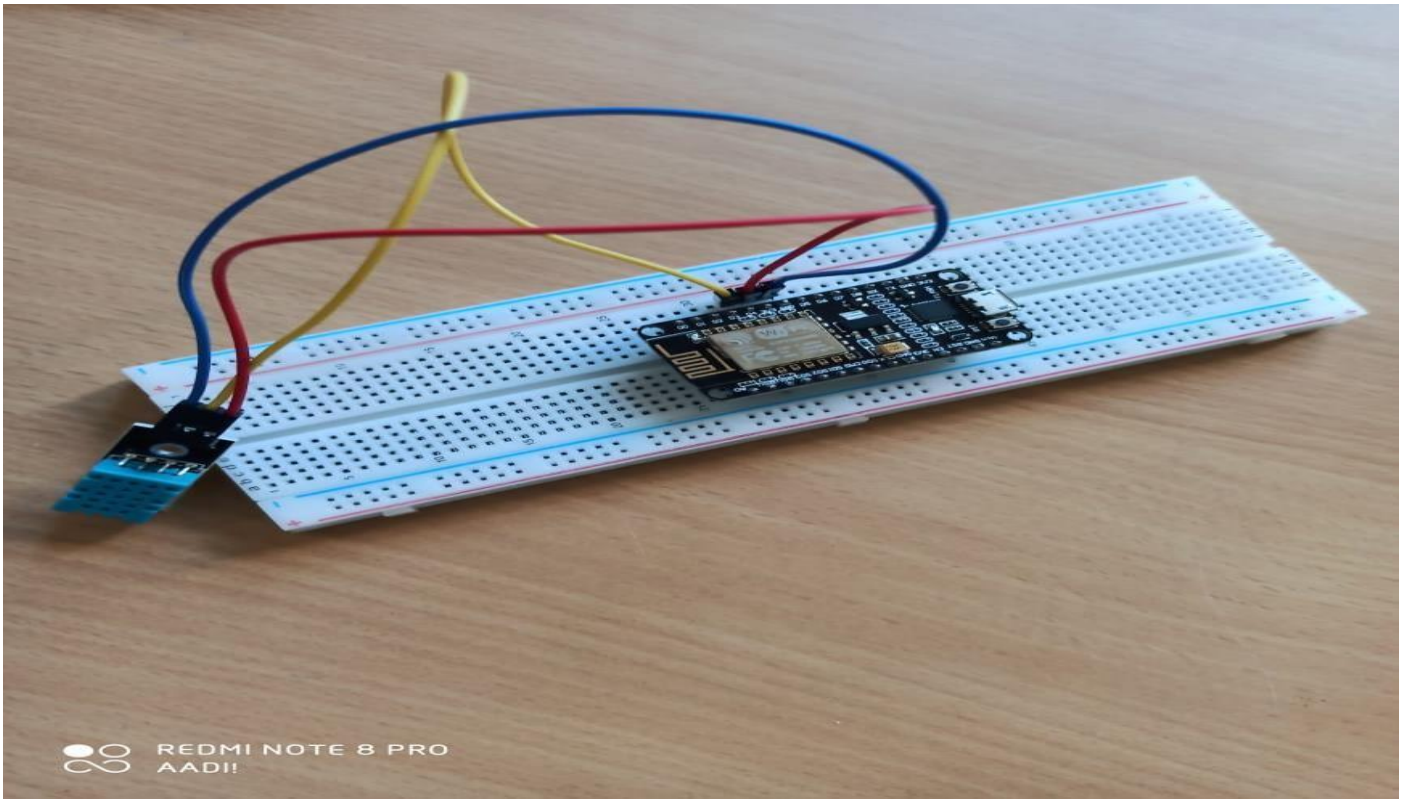

Fig 3.7 connection

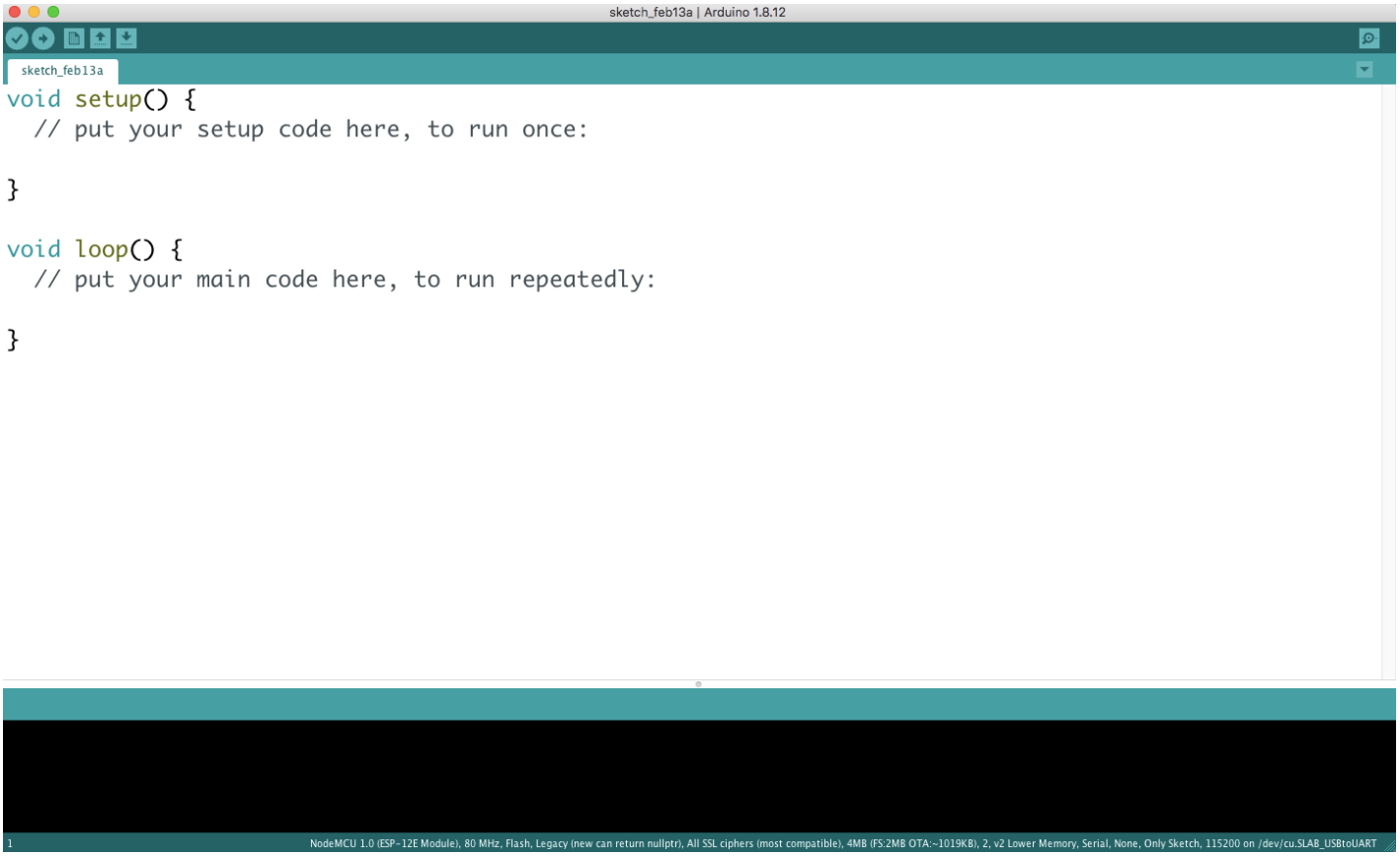

Fig 3.8 Arduino Ide Interface

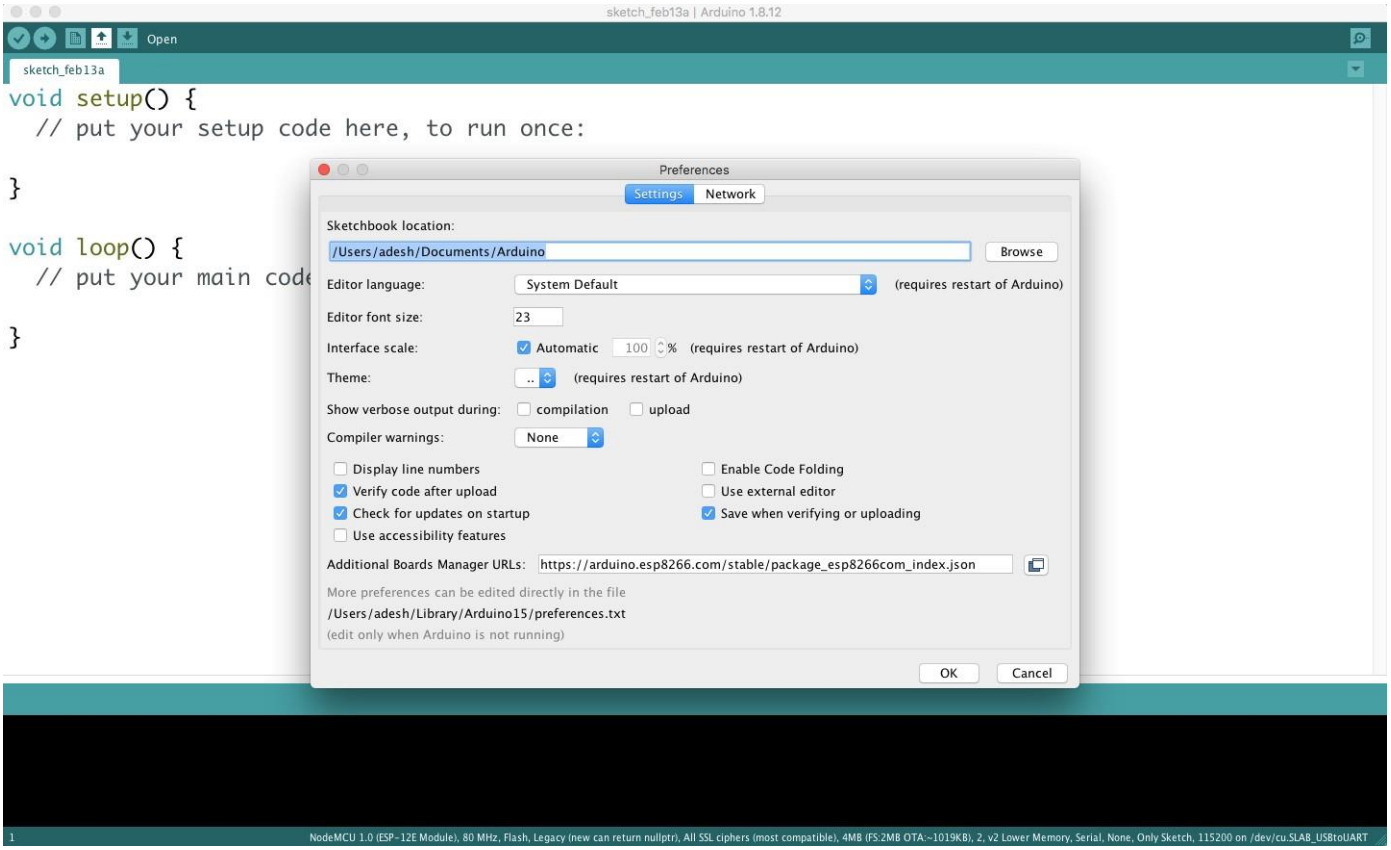

Fig 3.9 Arduino Ide Interface

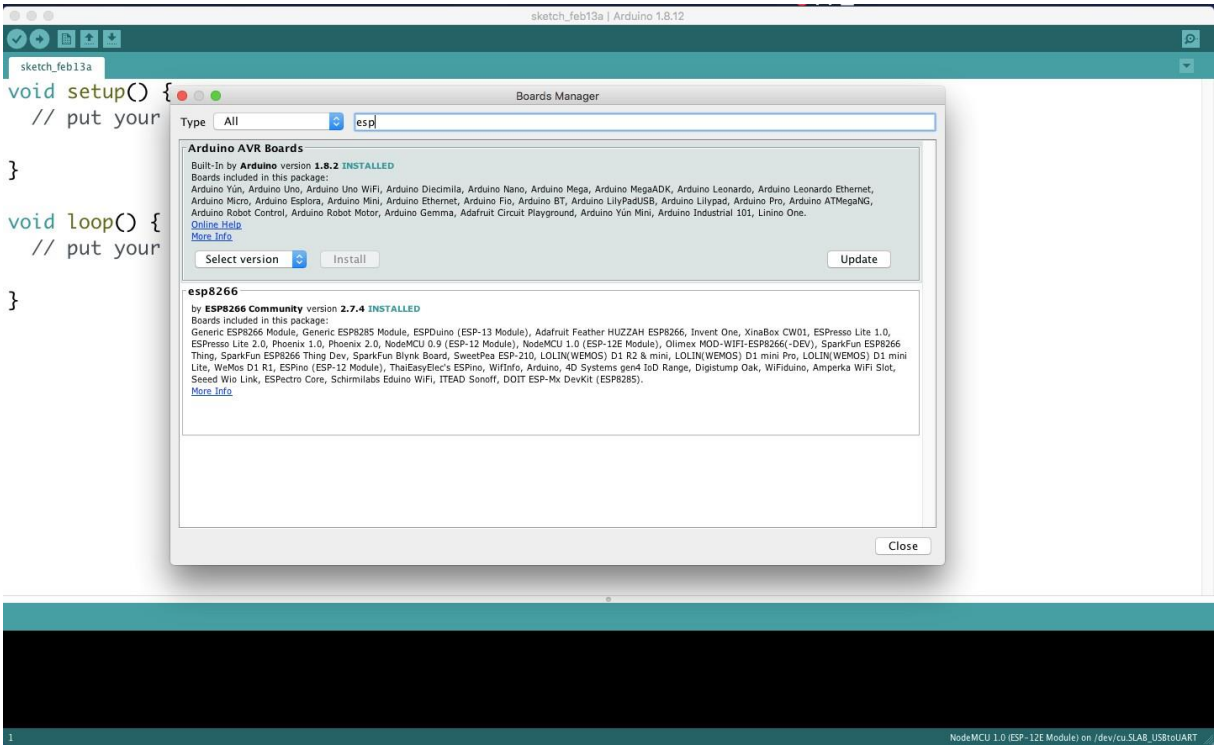

Fig 4.0 Adding Esp 32 board with arduino Ide

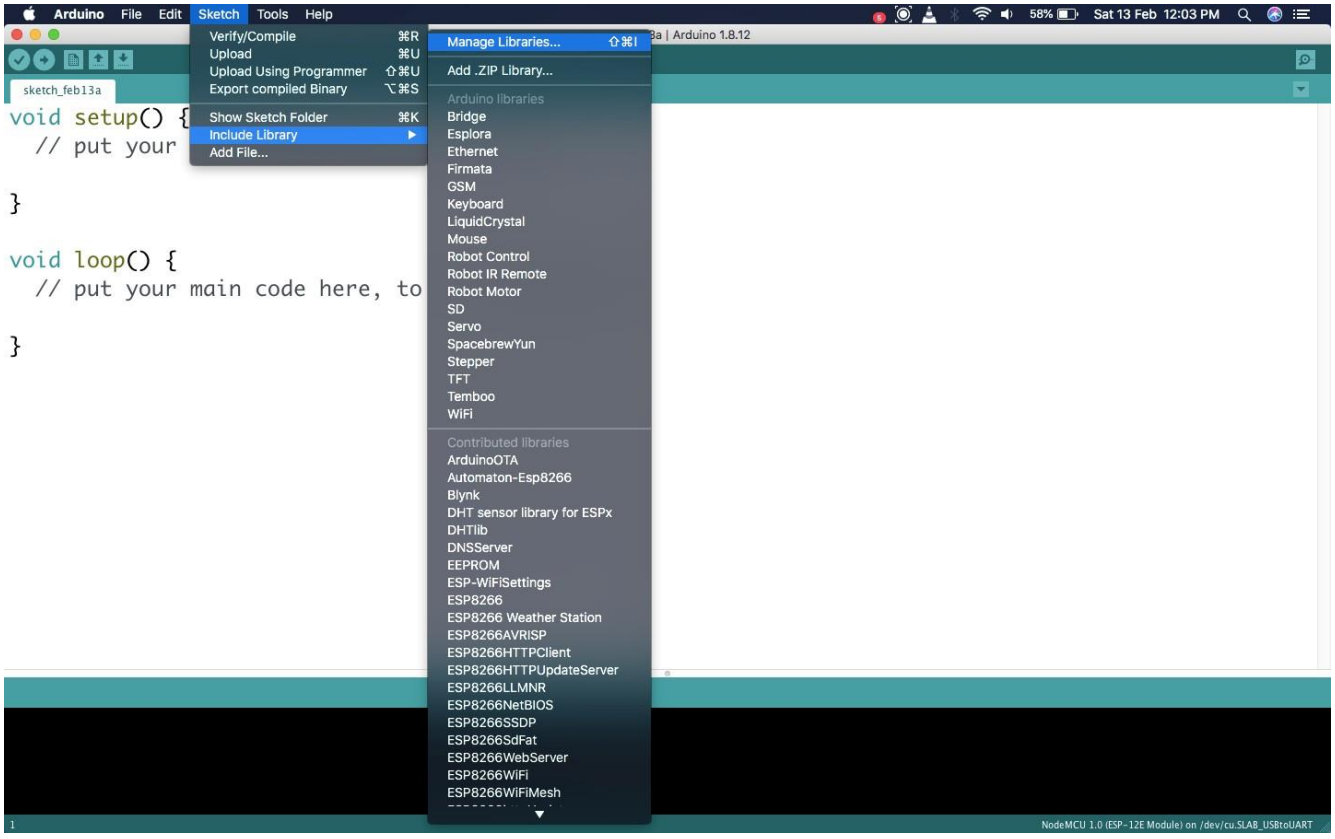

Fig4.1 Adding Esp 32 library in arduino ide

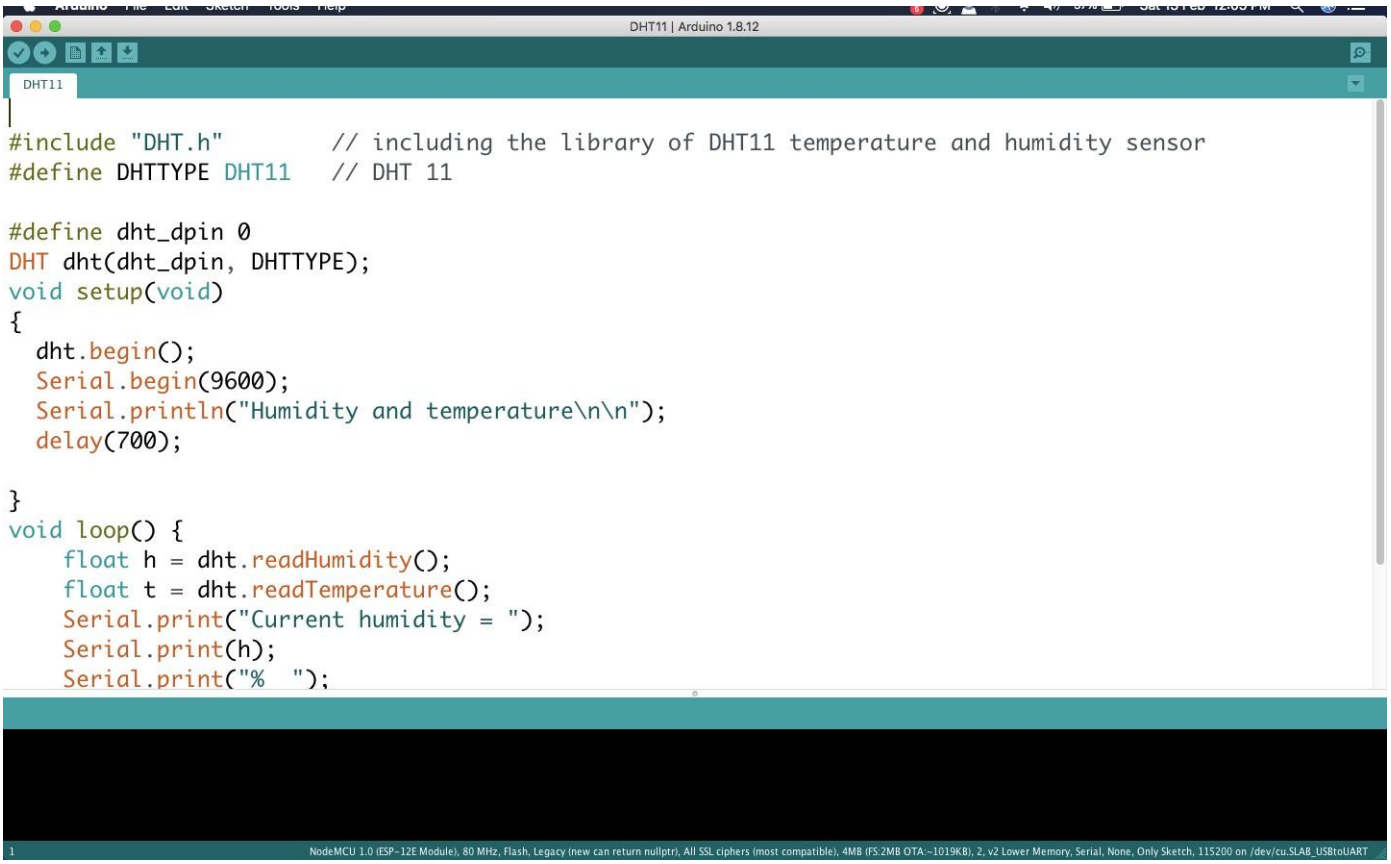

Fig 4.2 code

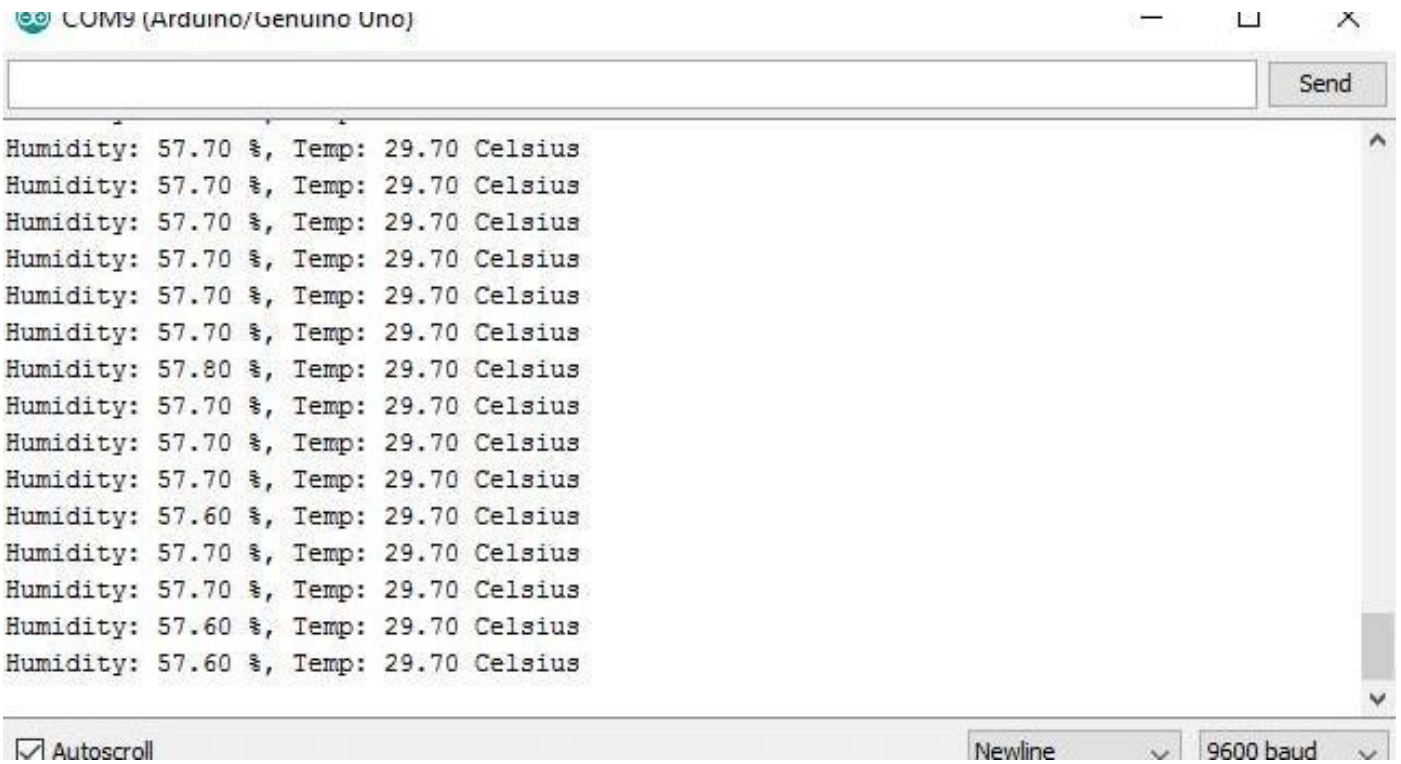

Fig 4.3 output on serial monitor

2.4Component Testing LDR Sensor with ESP32 In Arduino IDE Software:-Light sensetive sensor or LDR perform a specific activity due to changes in light sensitivity.For example photocell are used in street lights poles.Through USB cable we are connecting ESP 32 to Arduino IDE .In bread board we are connecting LDR and 10 k resistor serially with LDR.Since LDR gives analog output it is connected to the ADC pin of ESP 32 which convert analog input from 0-5v to 0-1023 range.

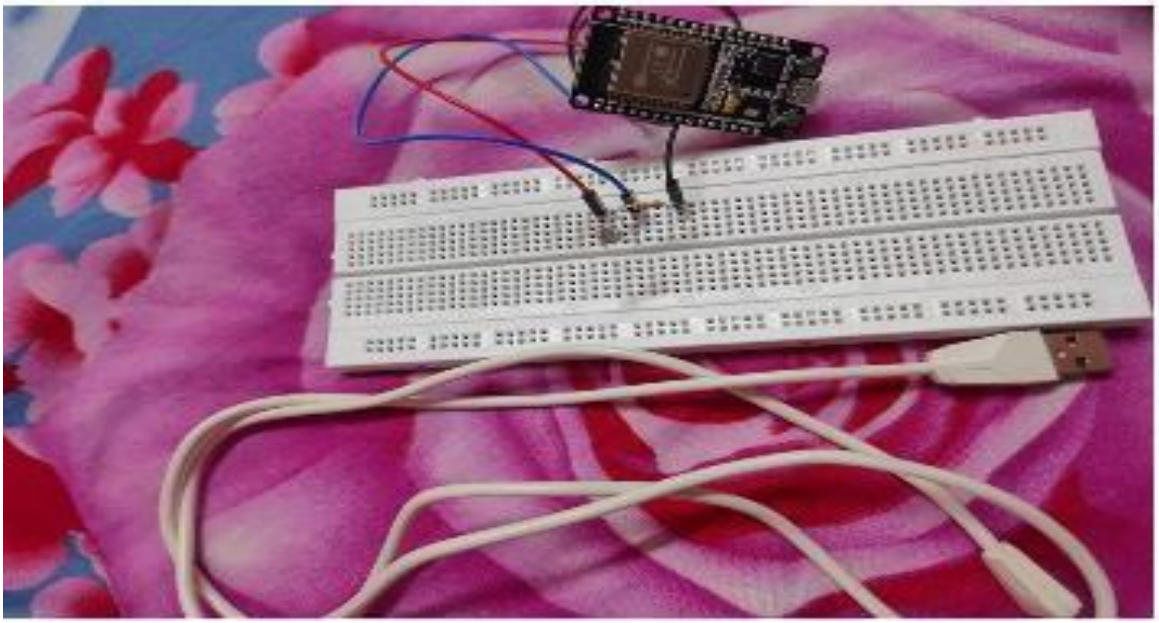

Fig 4.4 component required

Here The required component are esp32 ,LDR,USB cable,connecting wires,Bread board.

Fig 4.5 code

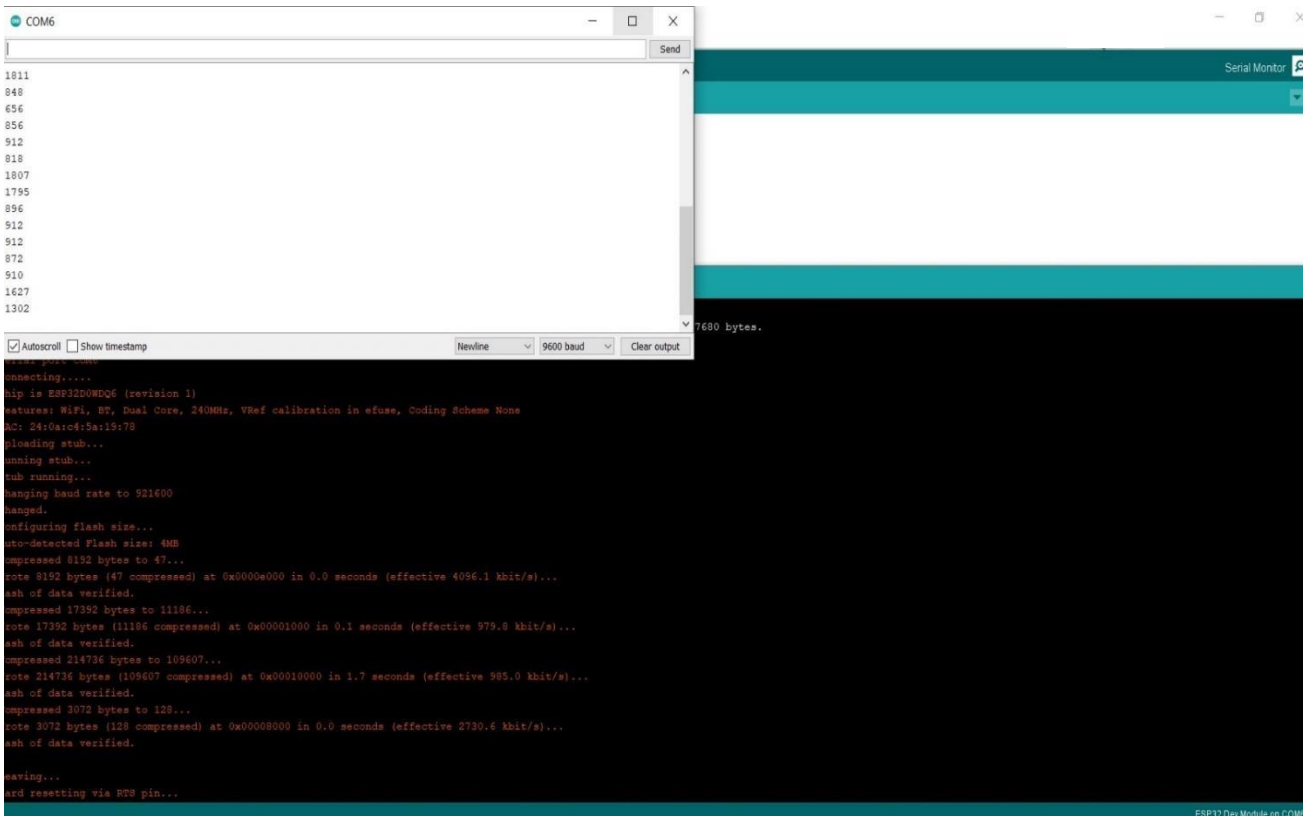

Fig 4.6 Output seen on serial monitor

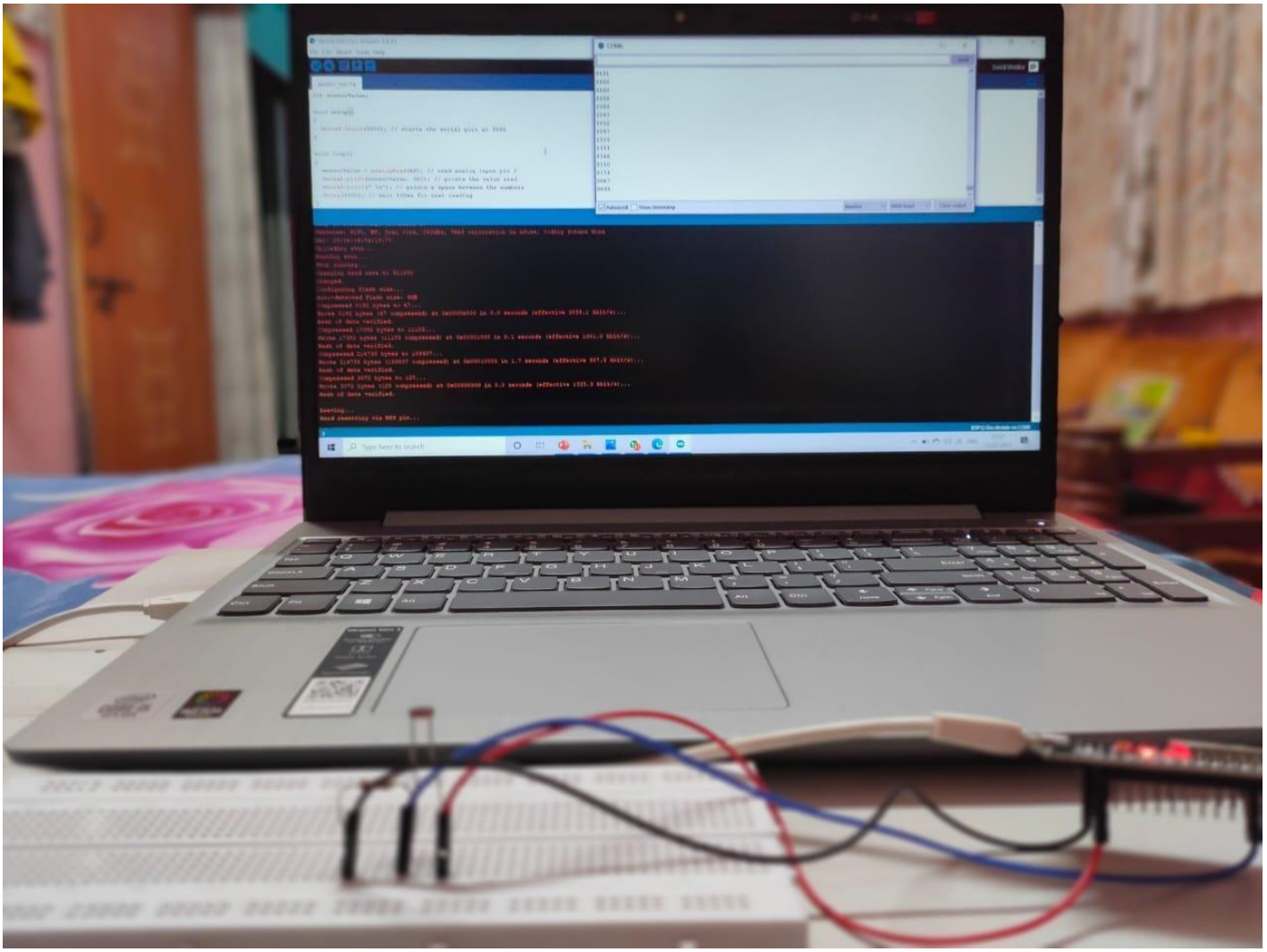

Fig 4.6 whole connection

Ph sensor Interface With ESP 32 Using Arduino IDE Software:- PH is measure of how acidic/basic water is.The range goes from 0-14 with 7 being neutral.The PH of water determine the solubility and biological avaliability of chemical constituents such as nutrients. Through USB cable we are connecting ESP 32 to Arduino IDE. Since LDR gives analog output it is connected to the ADC pin of ESP 32 which convert analog input from 0-5v to 0-1023 range.

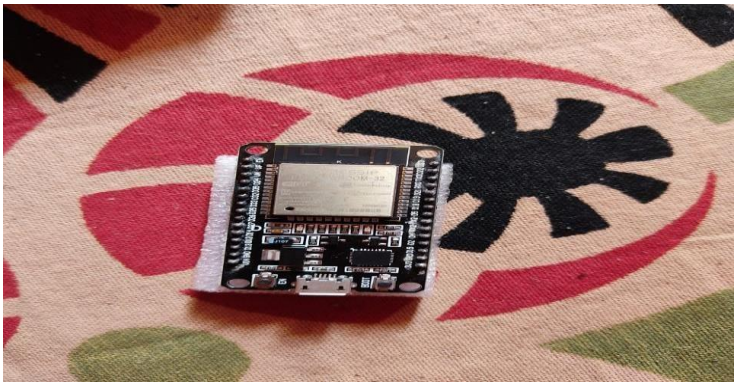

Fig 4.7 component required

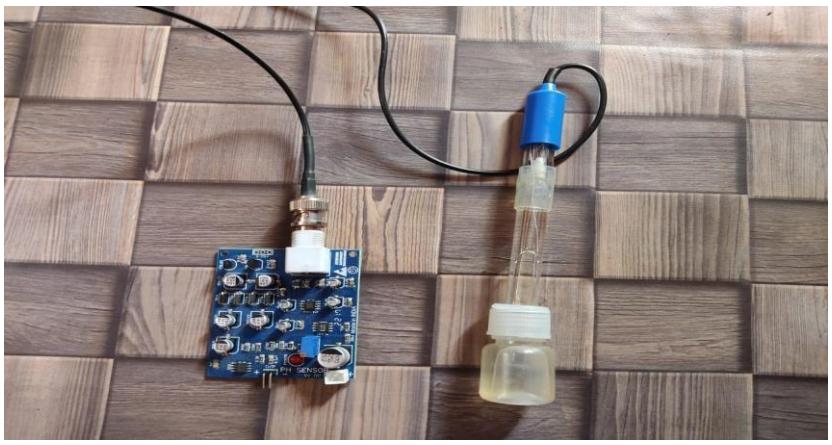

Fig 4.7 component required

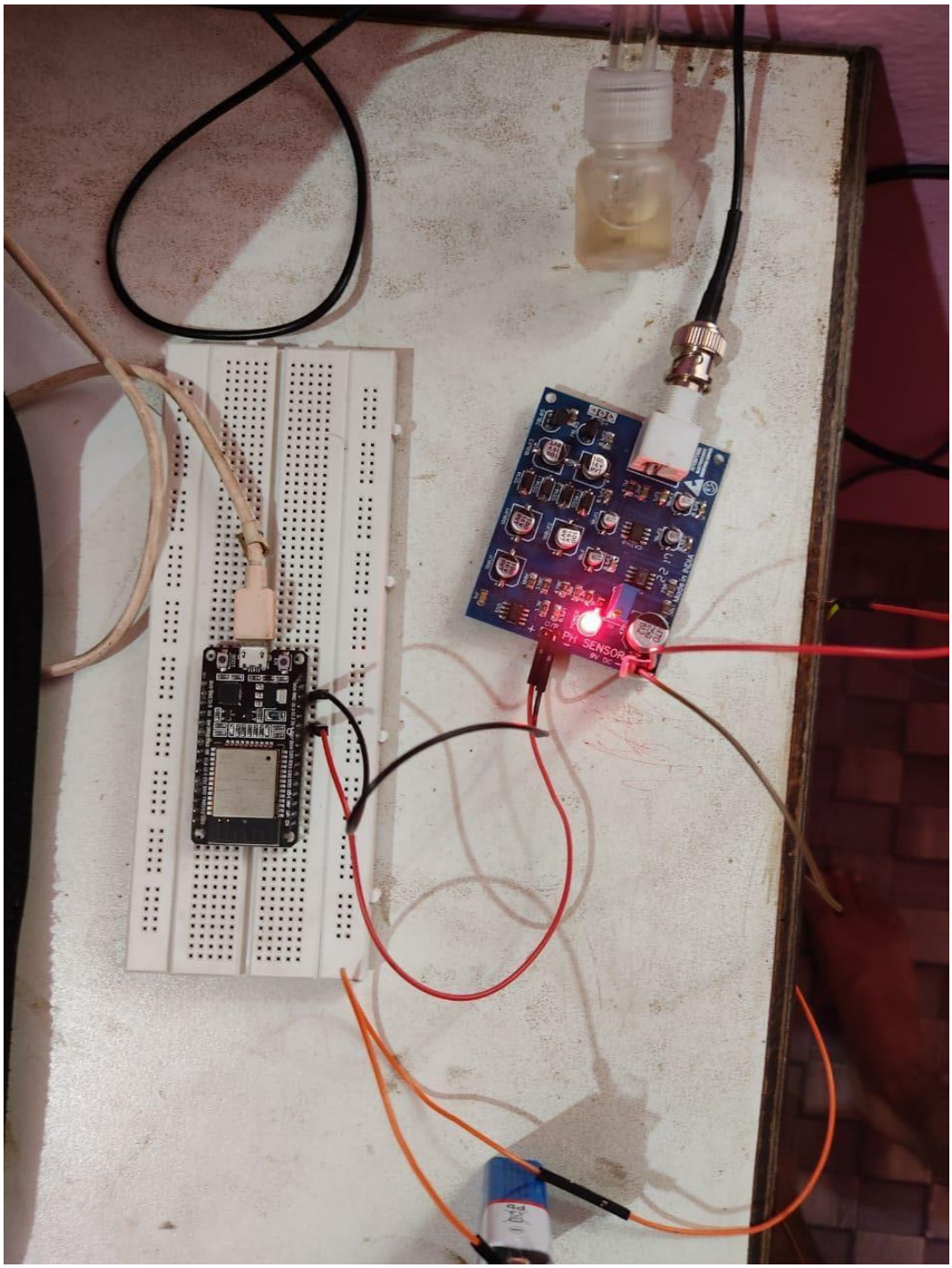

Fig 4.8 connection

Fig 4.9 code And Output

OUTPUT:-

vj | Arduino 1.8.13

File Edit Sketch Tools Help

vj

```
#define SensorPin 0          // the pH meter Analog output is connected with the Arduino's Analog
unsigned long int avgValue;  //Store the average value of the sensor feedback
float b;
int buf[10],temp;

void setup()
{
  pinMode(13,OUTPUT);
  Serial.begin(9600);
  Serial.println("Ready");    //Test the serial monitor
}
void loop()
{
  for(int i=0;i<10;i++)       //Get 10 sample value from the sensor for smooth the value
  {
    buf[i]=analogRead(SensorPin);
    delay(10);
  }
  for(int i=0;i<9;i++)        //sort the analog from small to large
  {
    for(int j=i+1;j<10;j++)
    {
      if(buf[i]>buf[j])
      {
        temp=buf[i];
        buf[i]=buf[j];
        buf[j]=temp;
      }
    }
  }
 avgValue=0;
  for(int i=2;i<8;i++)                      //take the average value of 6 center sample
    avgValue+=buf[i];
  float phValue=(float)avgValue*5.0/1024/6; //convert the analog into millivolt
  phValue=3.5*phValue;                      //convert the millivolt into pH value
```

Send

pH:7.55
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50
pH:7.50

2.6 Ultrasonic sensor interface with ESP 32:-Ultrasonic sensor is used to measure the distance to an object by using ultrasonic wave.Vcc pin need to be connected to 5v.TRIG pin receives the control signal from esp 32.Echo pin sends a signal to esp 32 .Esp 32 measure the duration of pulse to calculate the distance.The ultrasonic sensor automatically emits the ultrasonic wave.The ultrasonic wave reflected back after hitting an obstacle. The ultrasonic sensor detect reflected wave measure the travel time of the wave.

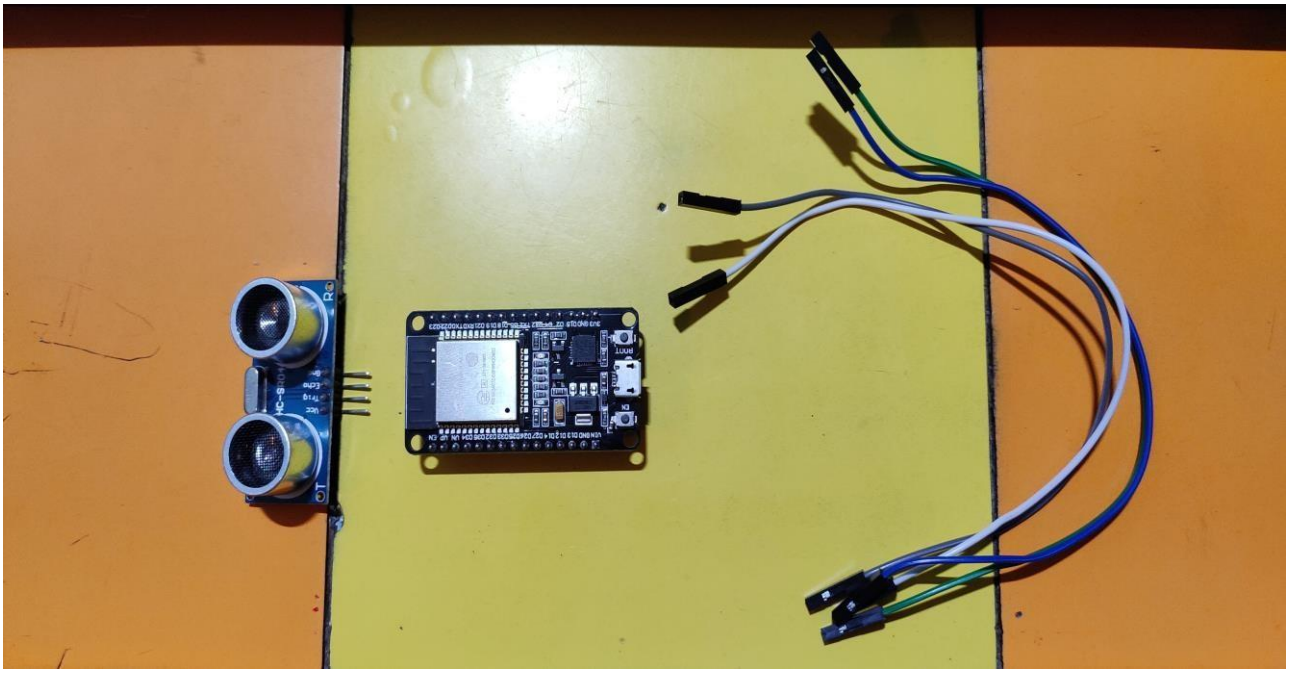

Fig 5.1 component required

fig 5.2 connection with esp 32

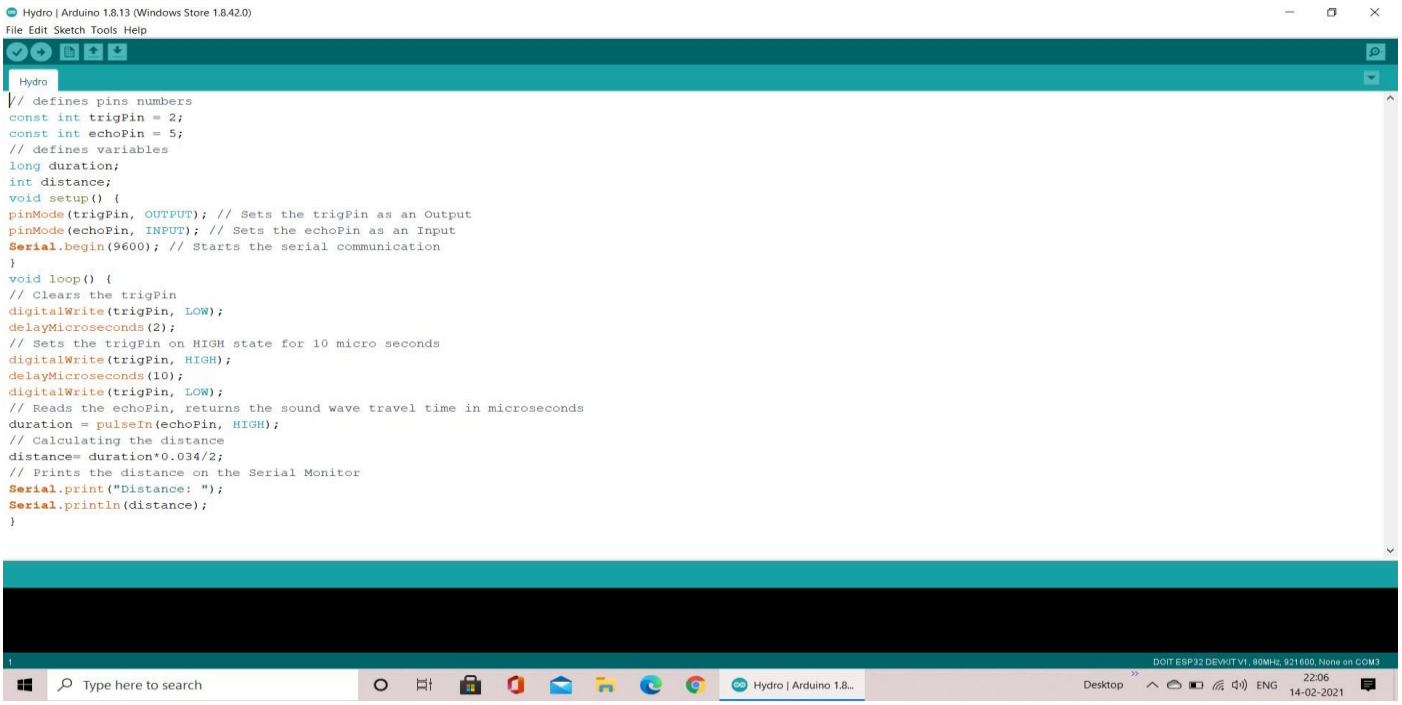

Fig 5.3 code

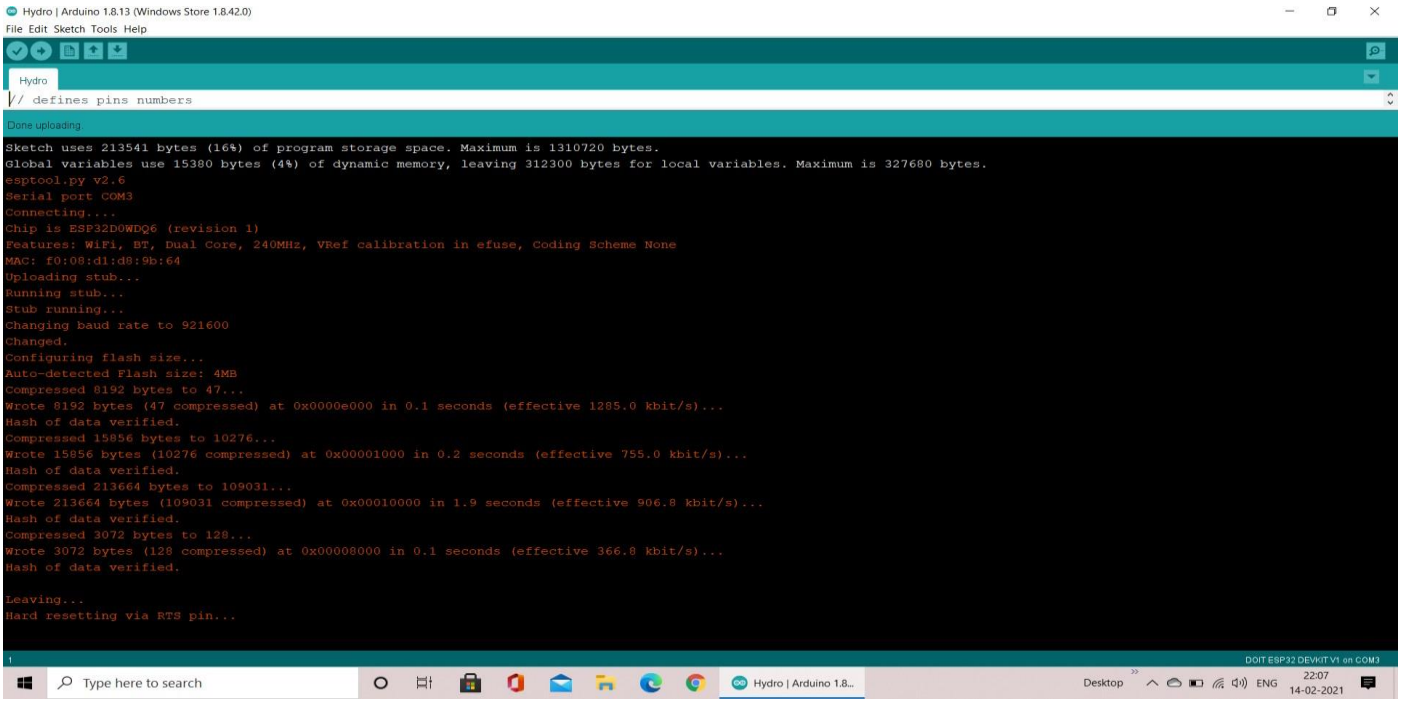

Fig5.4 after compiling

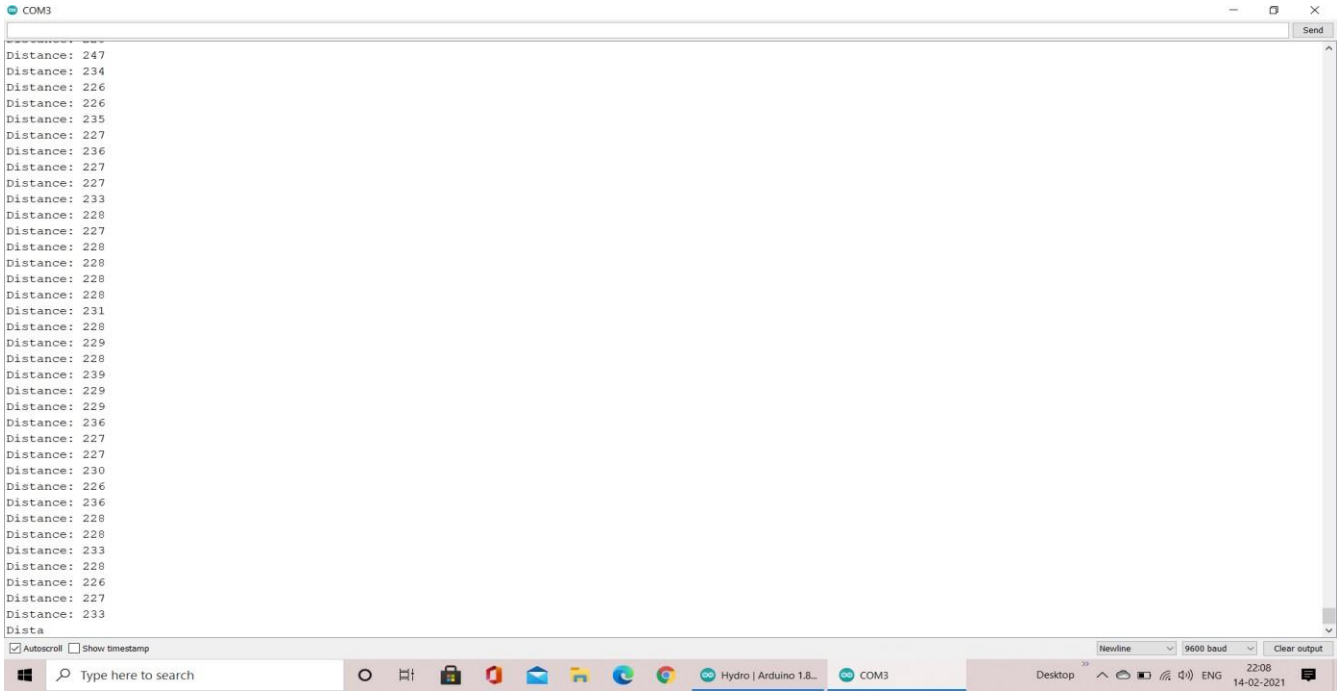

Fig 5.5 Output seen on serial monitor

3 Making Of Hydroponics Stand in SketchUp Software:- SketchUp is a 3D modeling computer program for a wide range of drawing applications such as architectural,interior design, landscape architecture, civil and mechanical engineering, film and video game design. It is available as a web-based application, SketchUp Free, and a paid versionwith additional functionality, SketchUp Pro. Previously, a freeware version, SketchUp Make, was also available. SketchUp is a computer-aided design or CAD software that canbe used by anyone, from professional engineers and architects to students. Using a patented"Push-and-Pull" method, it's easy to design and edit 2D and 3D models.

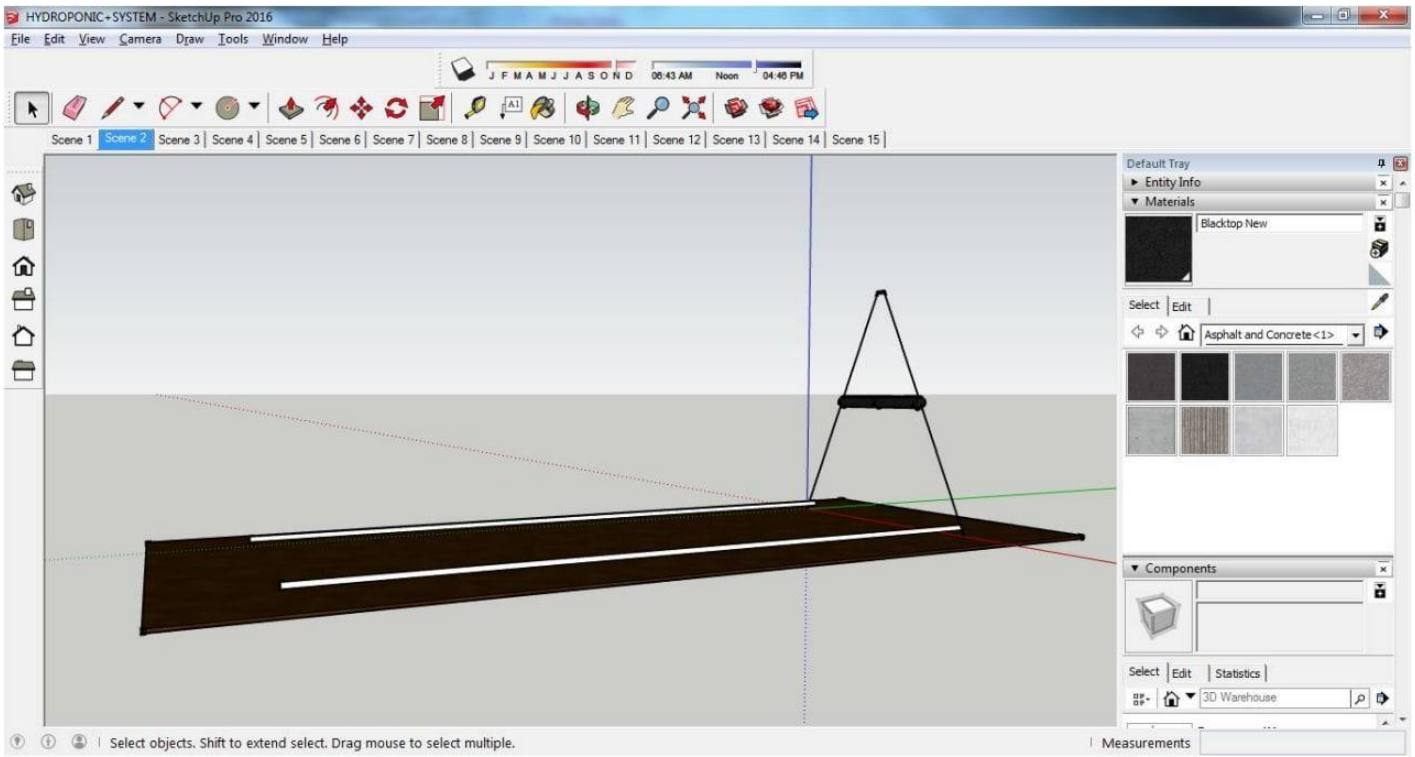

Fig 5.6 Making NFT Stand

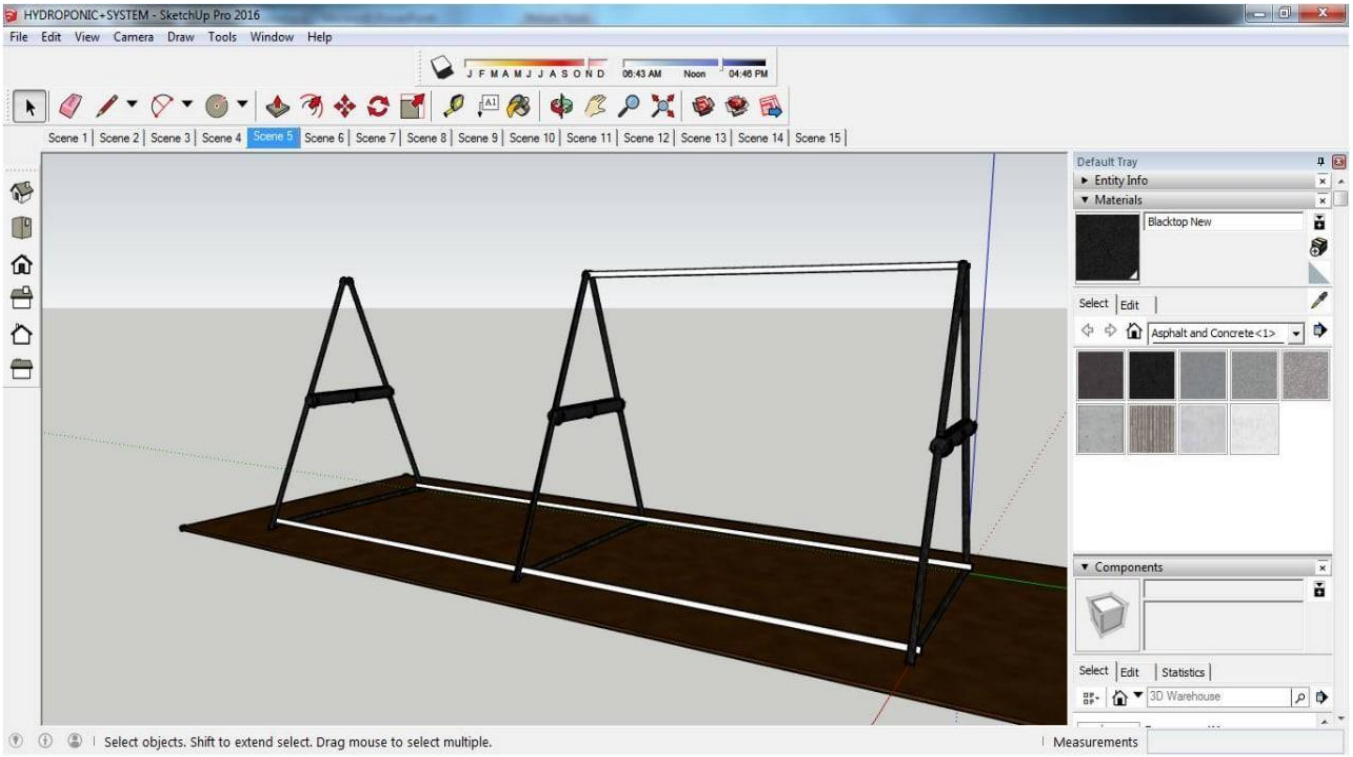

Fig 5.7 Making NFT Stand

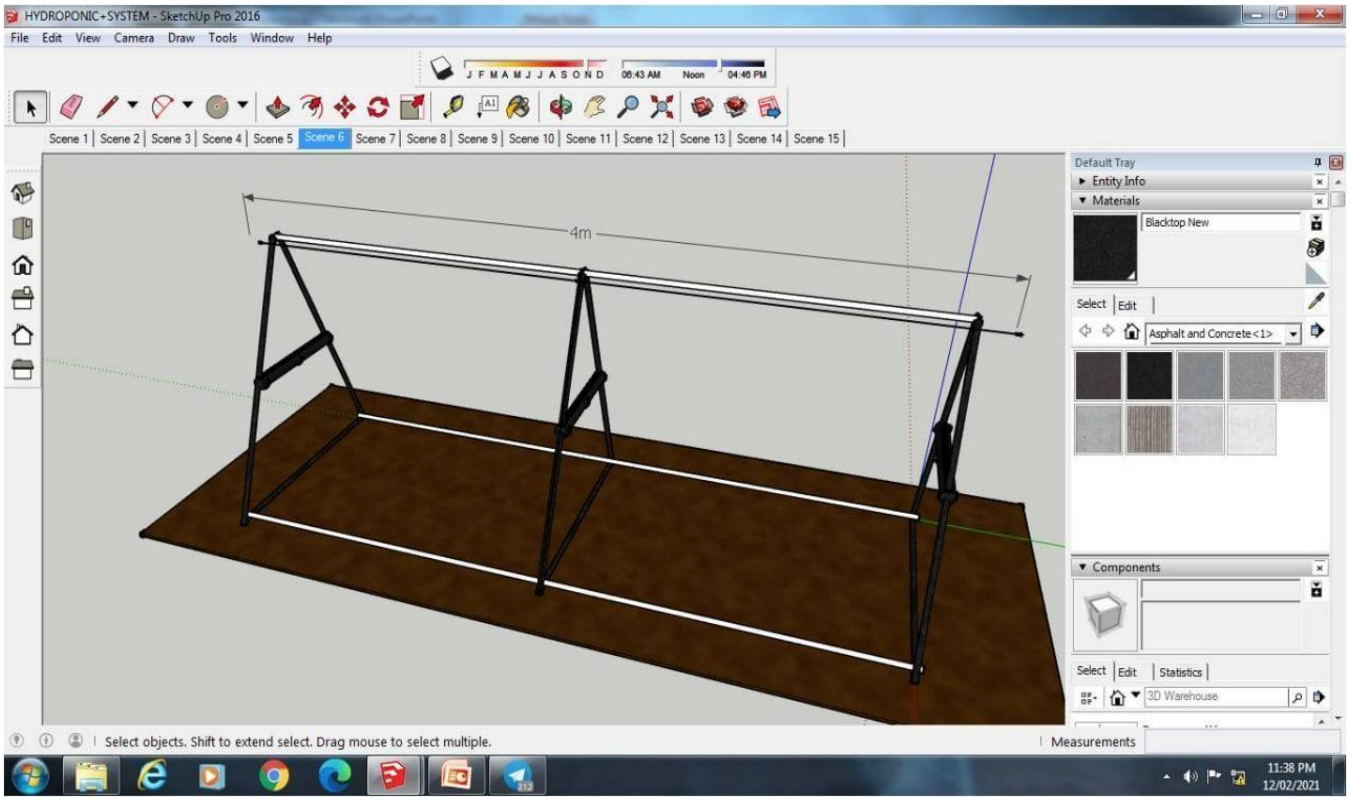

Fig 5.8 Making NFT Stand

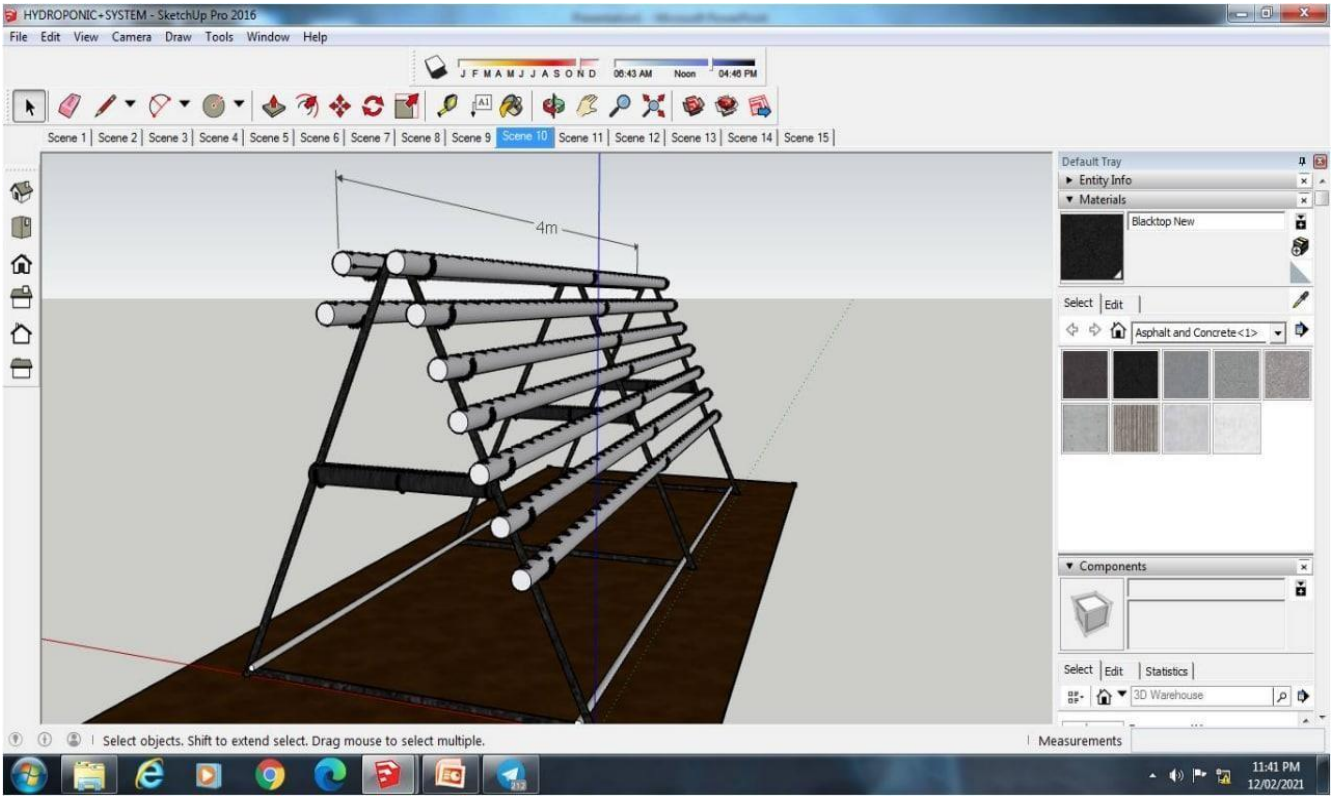

Fig 5.9 Making NFT Stand

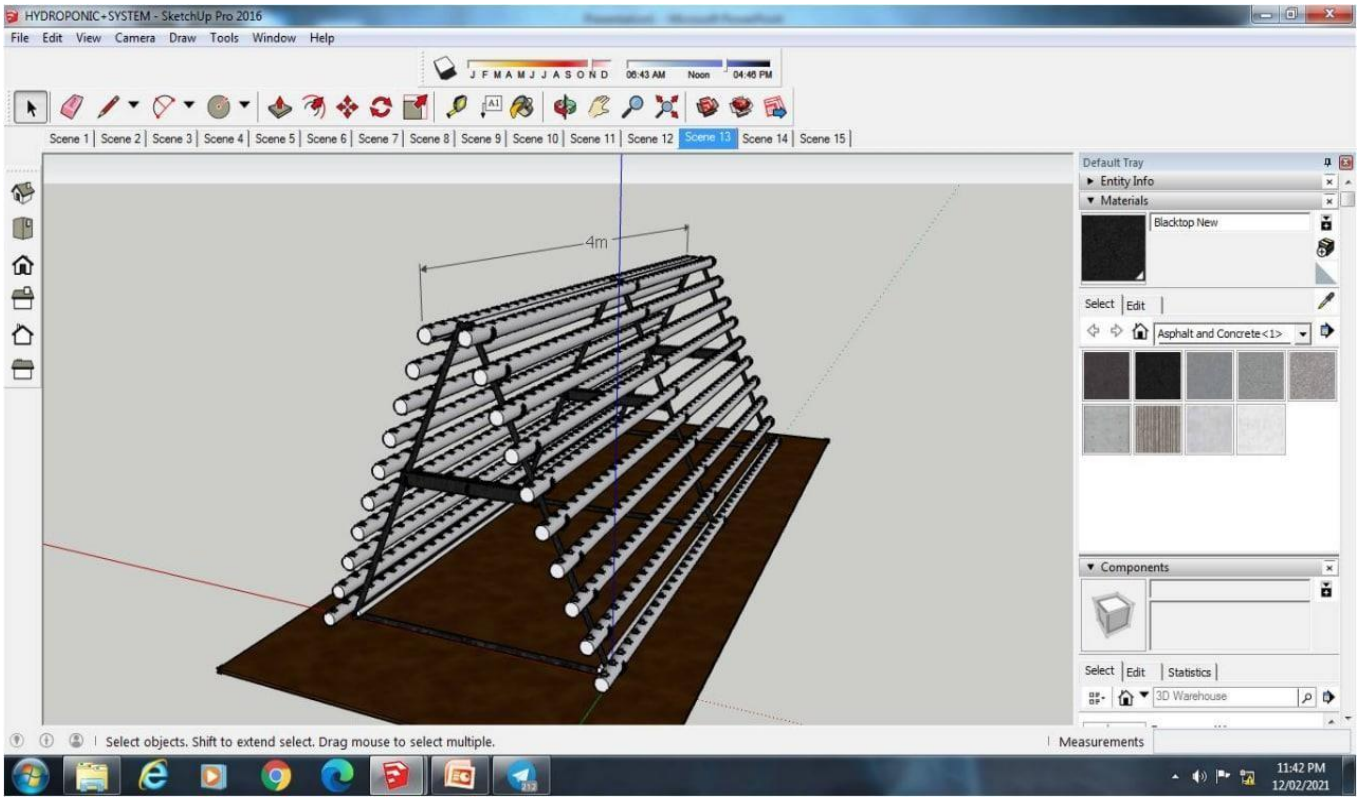

Fig 5.10 Making NFT Stand

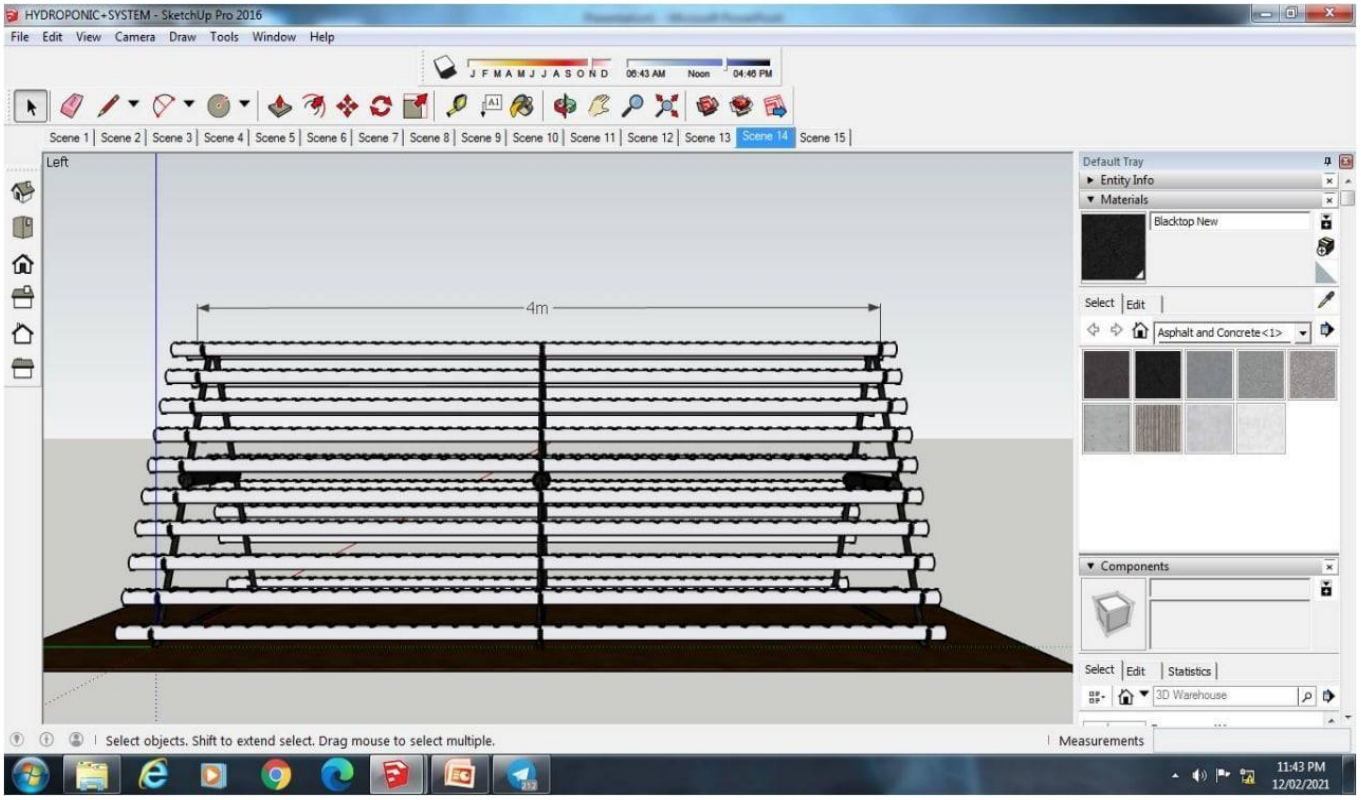

Fig 6.1 Making Of NFT Stand

4 Making of App and web server:-

Mobile app development is the act or process by which a mobile app is developed for mobile devices, such as personal digital assistants, enterprise digital assistants or mobile phones. These applications can be pre-installed on phones during manufacturing platforms, or delivered as web applications using server-side or client-side processing (e.g., JavaScript) to provide an "application-like" experience within a Web browser. Application software developers also must consider a long array of screen sizes, hardware specifications, and configurations because of intense competition in mobile software and changes within each of the platforms. Mobile app development has been steadily growing.

As part of the development process, mobile user interface (UI) design is also essential in the creation of mobile apps. Mobile UI considers constraints, contexts, screen, input, and mobility as outlines for design. The user is often the focus of interaction with their device, and the interface entails components of both hardware and software. User input allows for the users to manipulate a system, and device's output allows the system to indicate the effects of the users' manipulation. Mobile UI design constraints include limited attention and form factors, such as a mobile device's screen size for a user's hand(s). Mobile UI contexts signal cues from user activity, such as location and scheduling that can be shown from user interactions within a mobile app. Overall, mobile UI design's goal is mainly for an understandable, user-friendly interface.

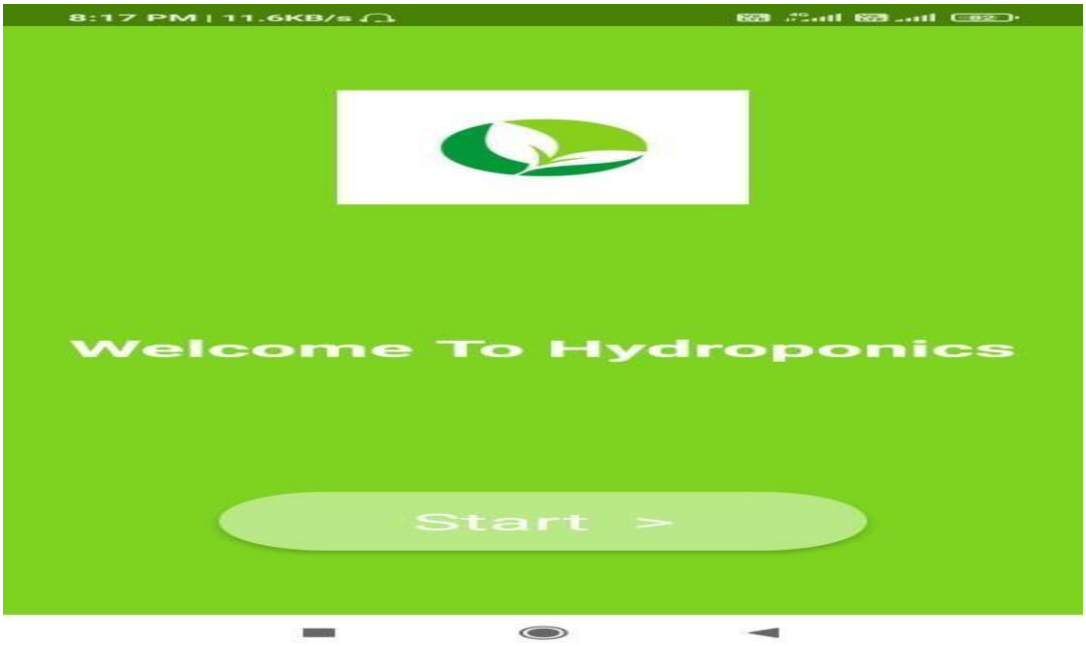

Fig 6.2

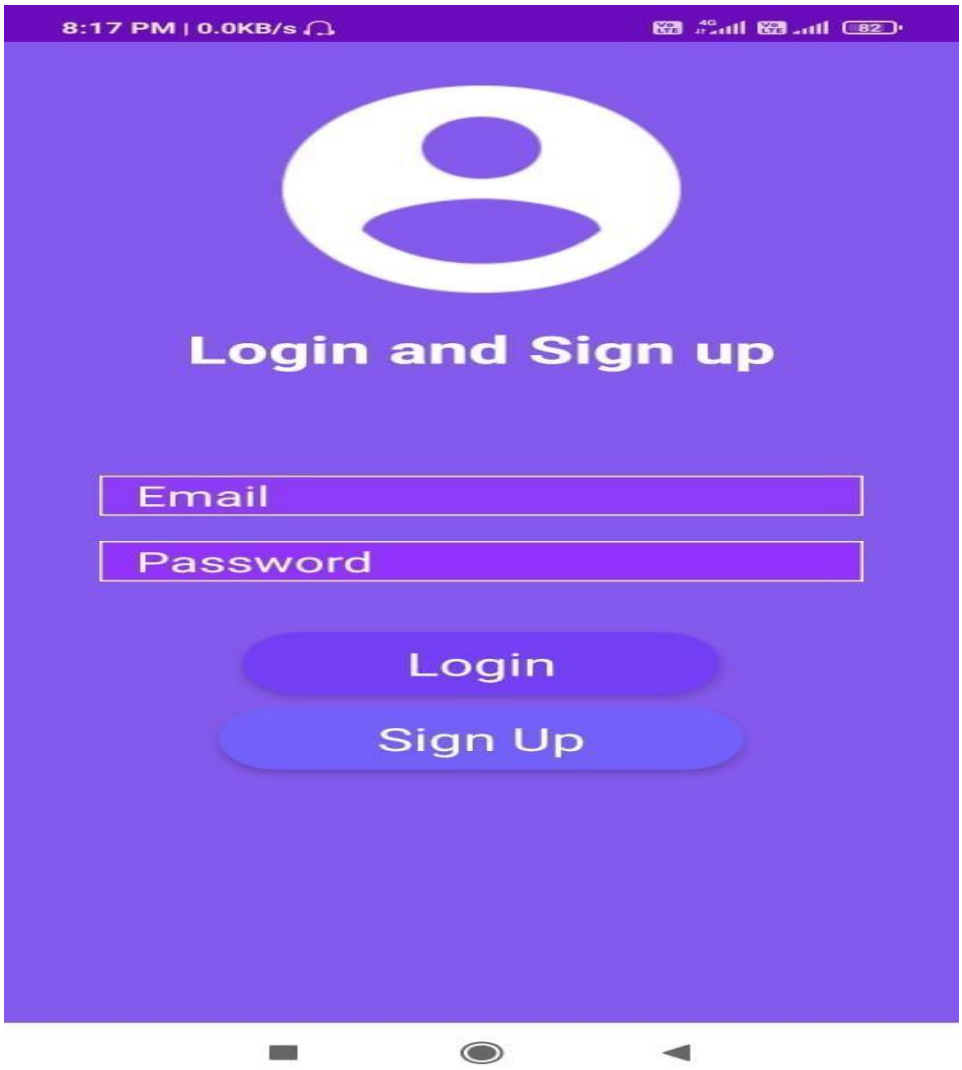

fig 6.3 Login page

In a app security, logging in (or logging on, signing in, or signing on) is the process by which an individual gains access to a app by identifying and authenticating themselves. The user credentials are typically some form of "username" and a matching "password", and these credentials themselves are sometimes referred to as a login (or logon, sign-in, sign-on).In practice, modern secure systems often require a second factor such as email or SMS confirmation for extra security.

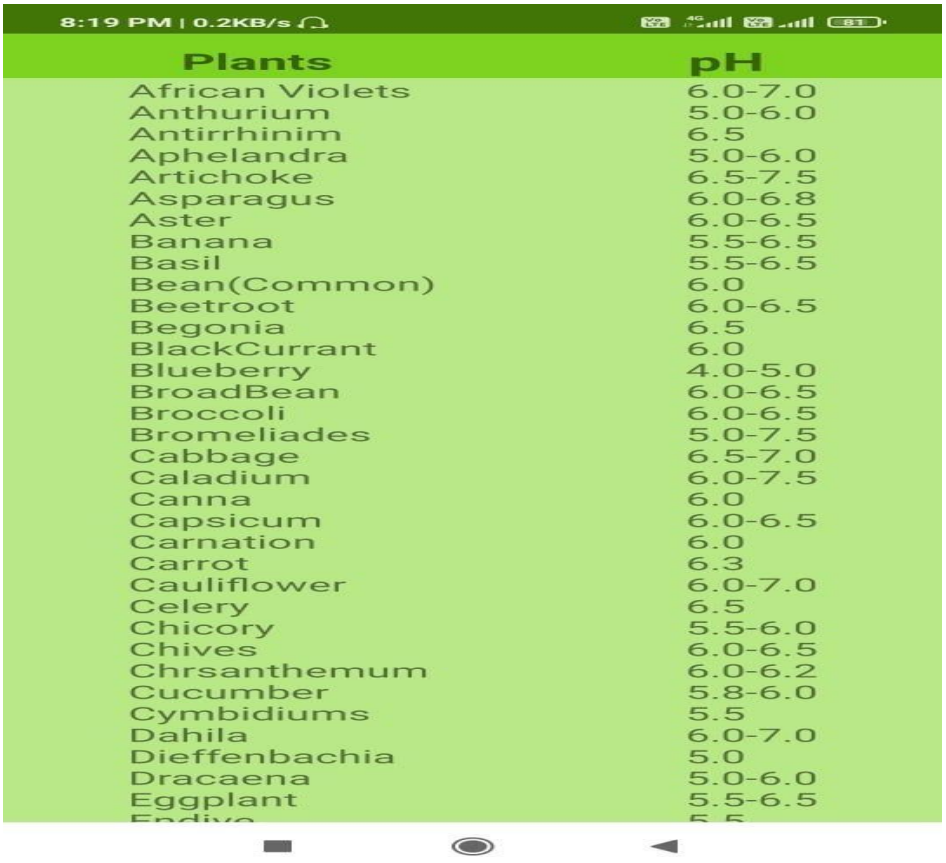

Fig 6.4 standard ph of various plants mentioned in our app

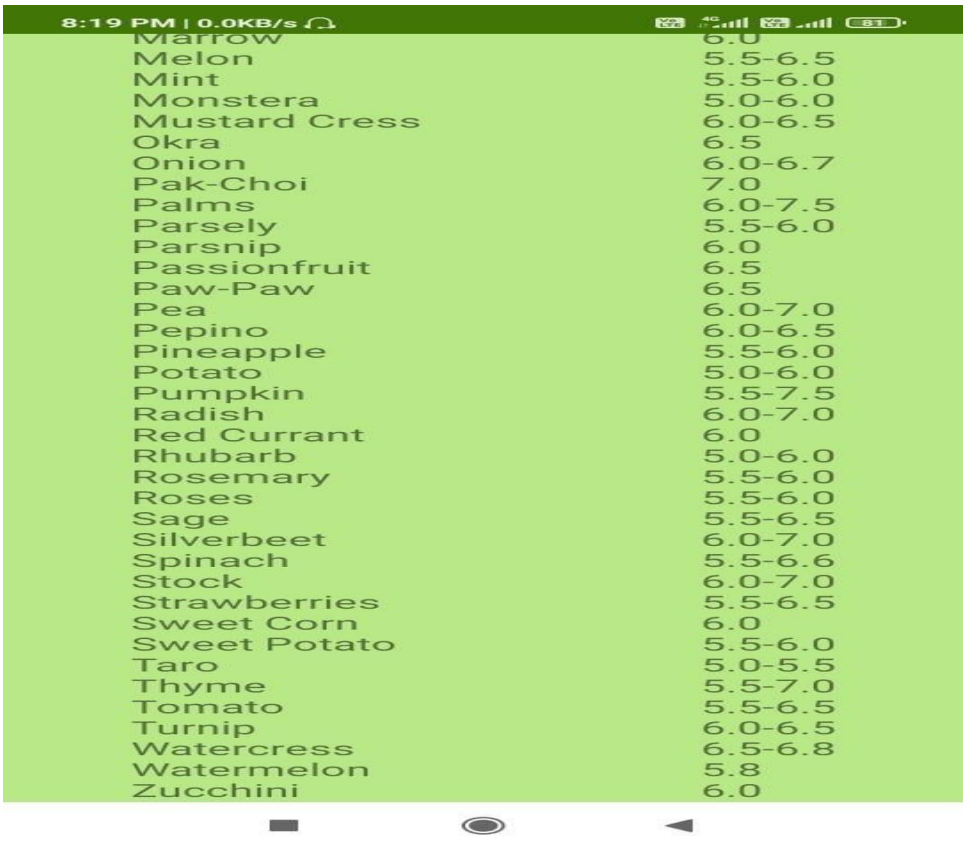

Fig 6.5 standard ph of various plants mentioned in our app

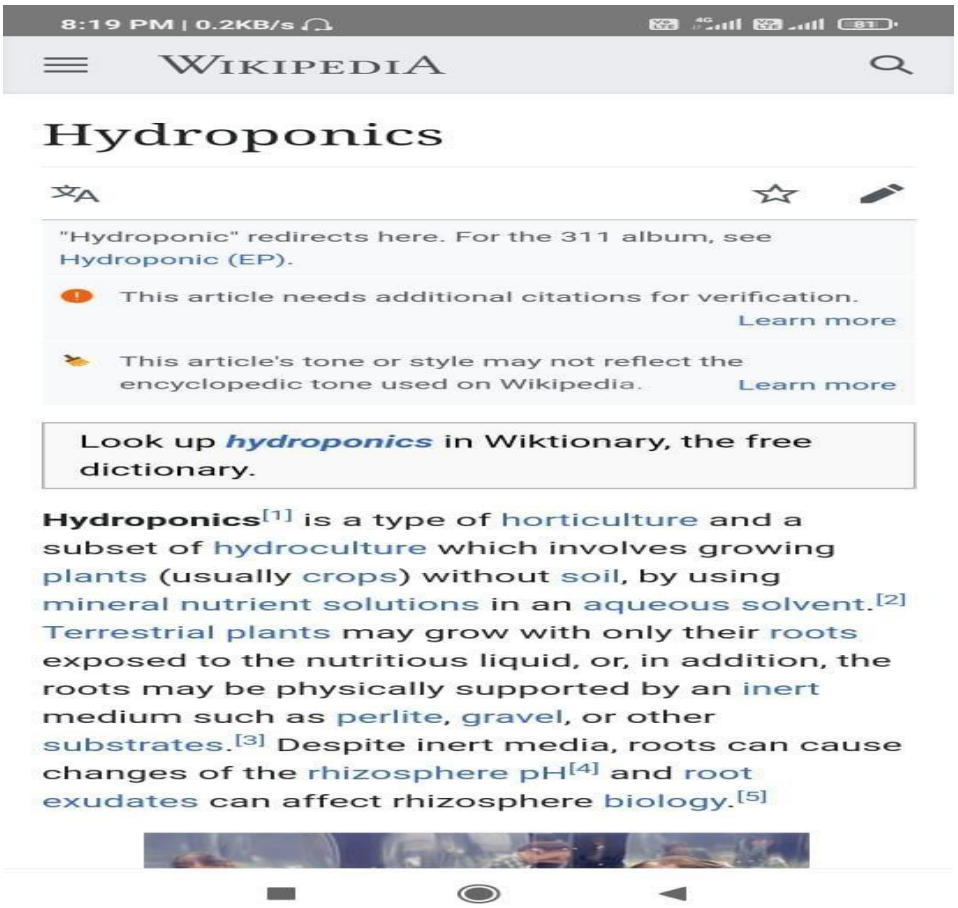

Fig 6.6 more information about hydronic

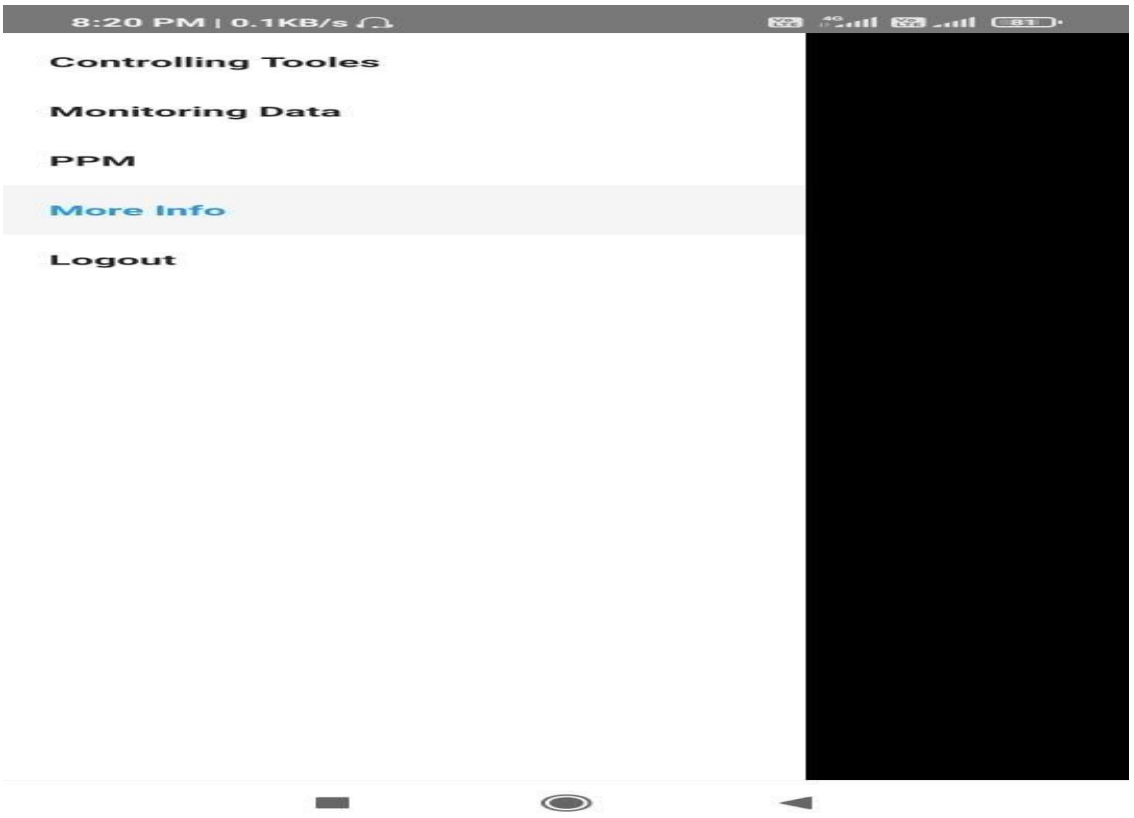

Fig 6.7 navigation bar for other screen

Fig 6.8 controlling of output device

Fig 6.9 sensor output

Fig 7.1 sensor output

Fig 7.2 sensor output

4.1 Interfacing of ultrasonic sensor with app:-

Fig 7.3

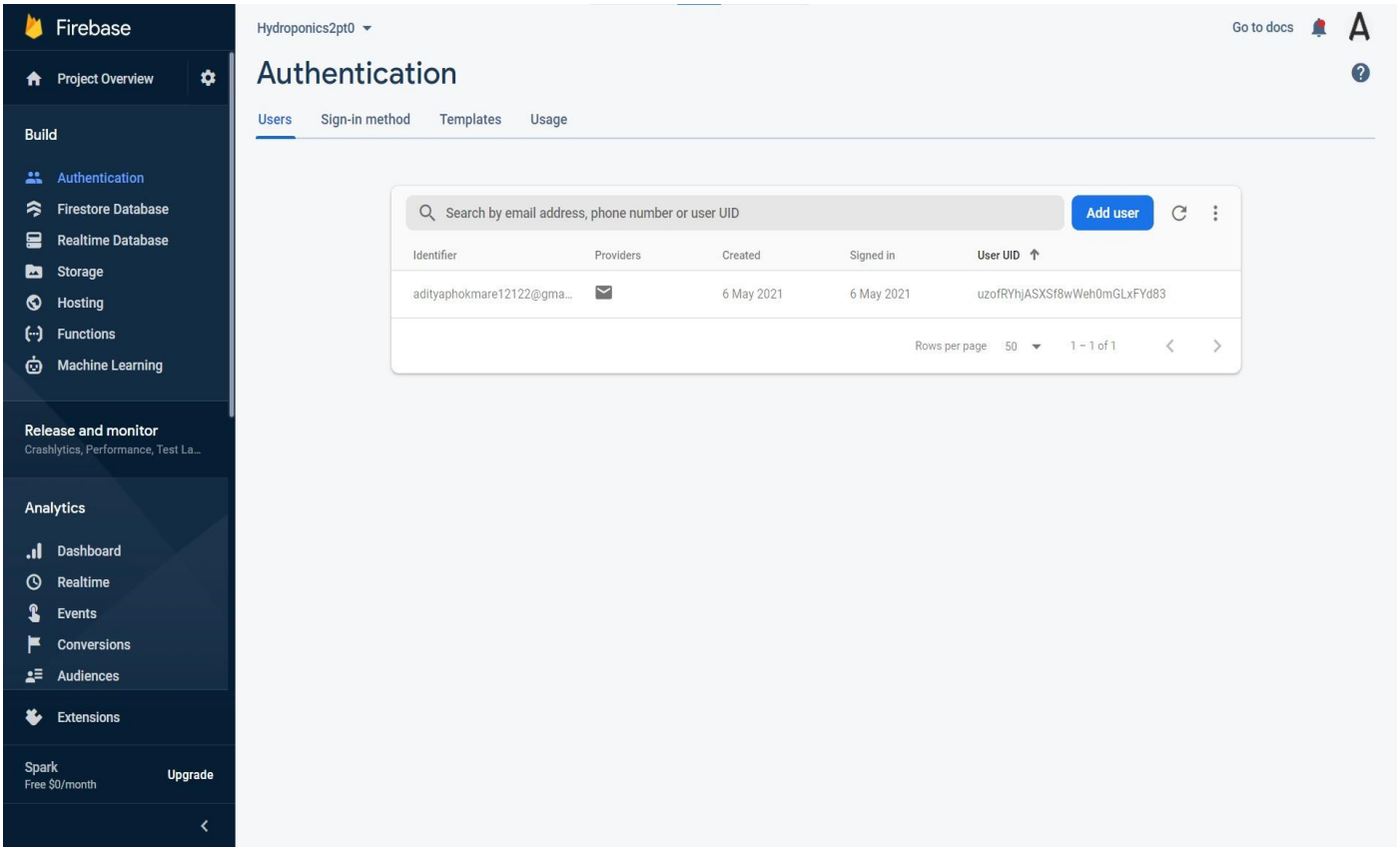

Fig 7.4

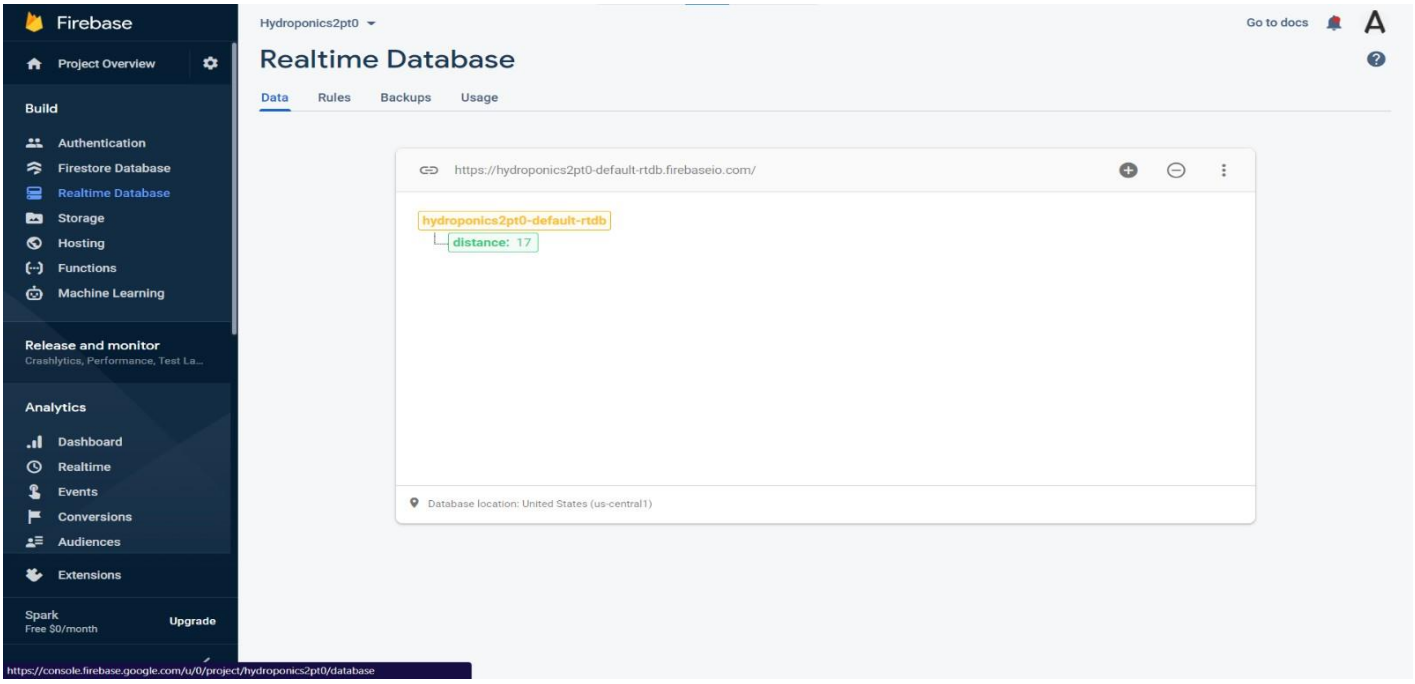

Fig 7.5 realtime Databse

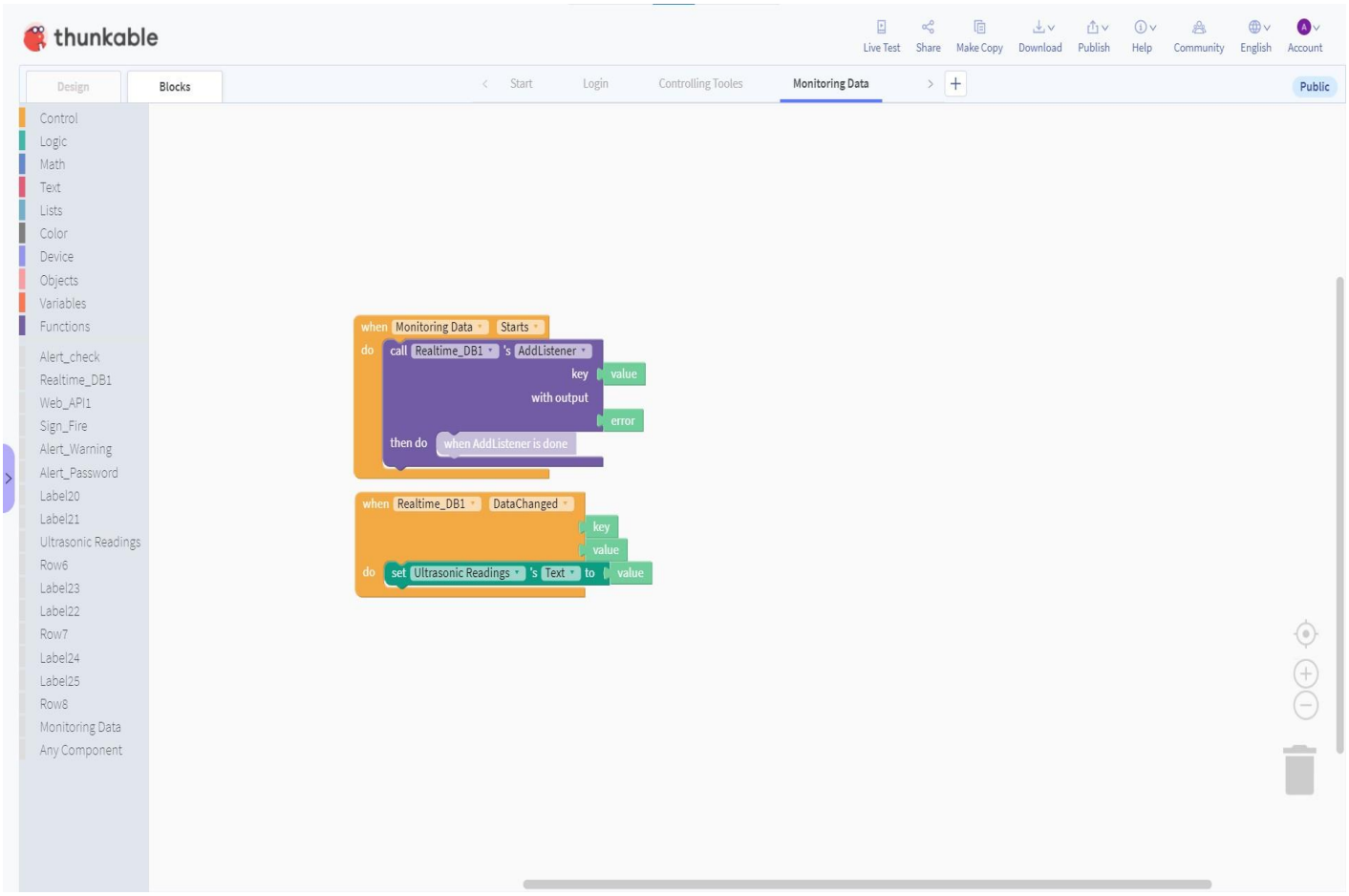

Fig 7.6 Backend For Monitoring Data

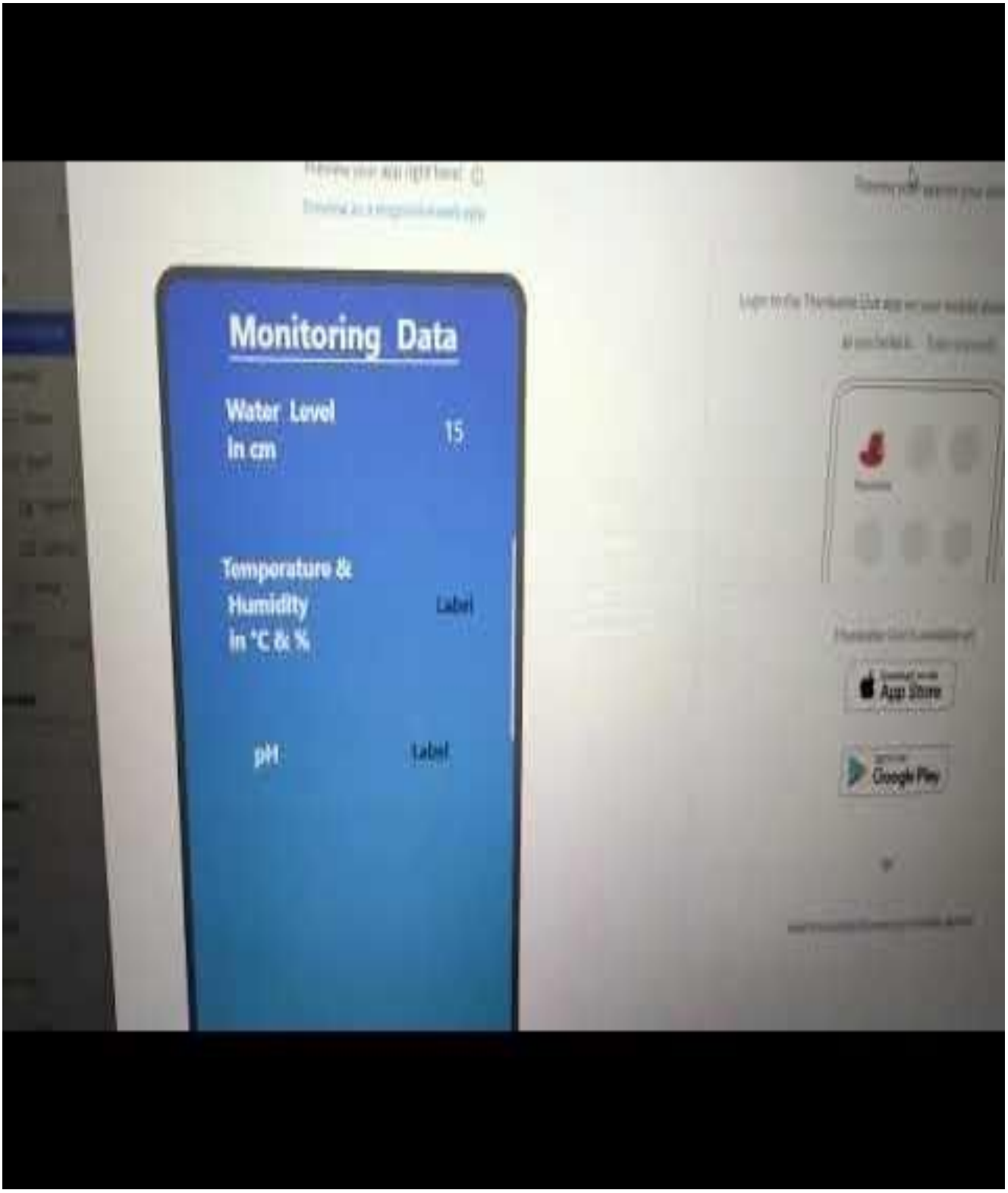

Fig 7.7 Monitoring Data

4.2 web server:- The development of World Wide Web applications using a client–server model typically use HTML, CSS and java script. Web development is the work involved in developing a Web site for the Internet (World Wide Web) or an intranet (a private network). Web development can range from developing a simple single static page of plain text to complex web applications, electronic businesses, and social network services. A website (also written as web site) is a collection of web pages and related content that is identified by a common domain name and published on at least one web server. All publicly accessible websites collectively constitute the World Wide Web. There are also private websites that can only be accessed on a private network, such as a company's internal website for its employees. Websites are typically dedicated to a particular topic or purpose, such as news, education, commerce, entertainment, or social networking. Hyperlinking between web pages guides the navigation of the site, which often starts with a home page. Users can access websites on a range of devices, including desktops, laptops, tablets, and smartphones. The app used on these devices is called a web browser. A dynamic website is one that changes or customizes itself frequently and automatically.

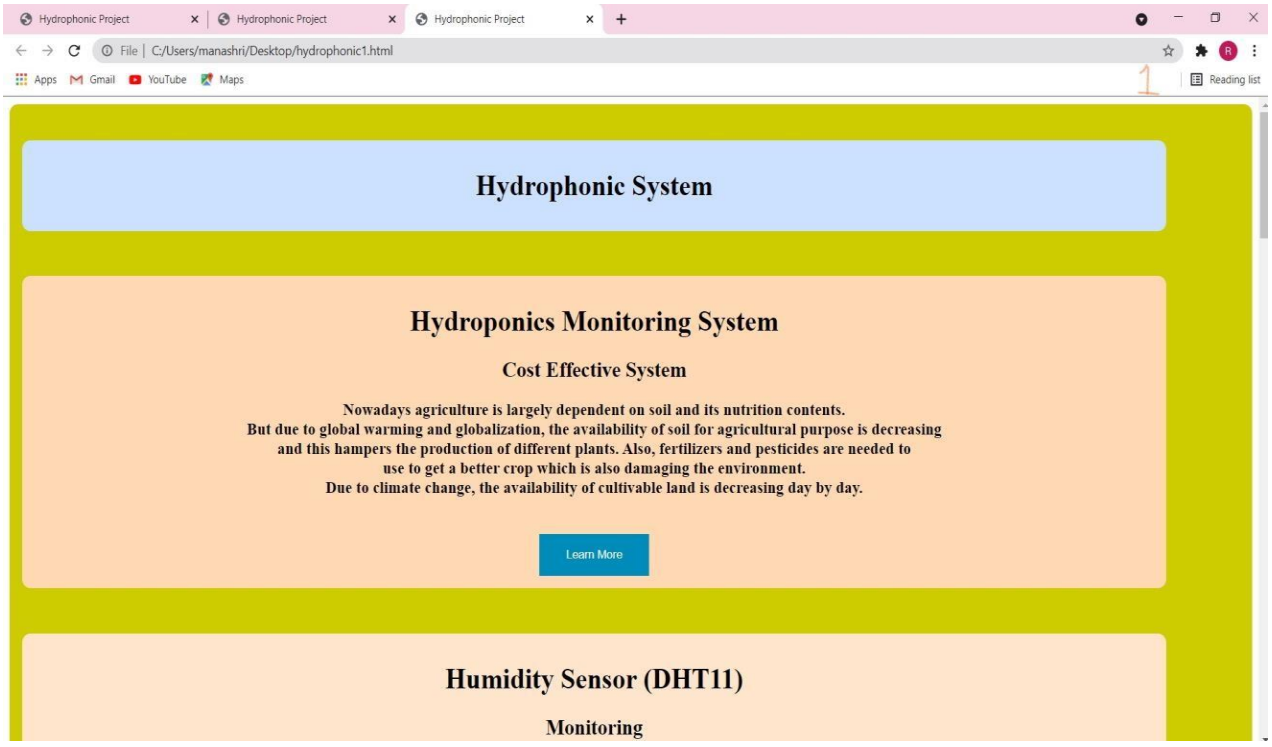

Fig 7.8

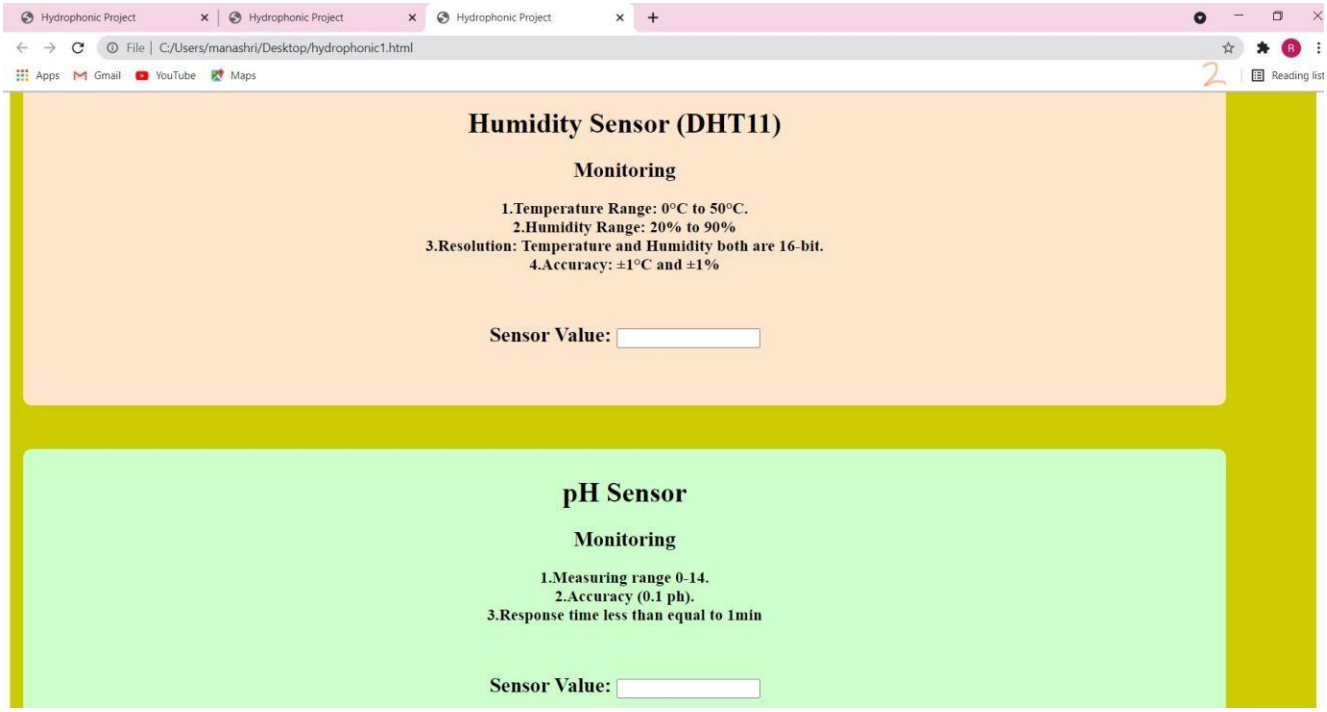
Hydrophonic Project
Hydrophonic Project
Hydrophonic Project
File | C:/Users/manashri/Desktop/hydrophonic1.html
Apps
Gmail
YouTube
Maps
Reading list
Humidity Sensor (DHT11)
Monitoring
1.Temperature Range: 0°C to 50°C.
2.Humidity Range: 20% to 90%
3.Resolution: Temperature and Humidity both are 16-bit.
4.Accuracy: ±1°C and ±1%
Sensor Value:
pH Sensor
Monitoring
1.Measuring range 0-14.
2.Accuracy (0.1 ph).
3.Response time less than equal to 1min
Sensor Value:

Fig 7.9

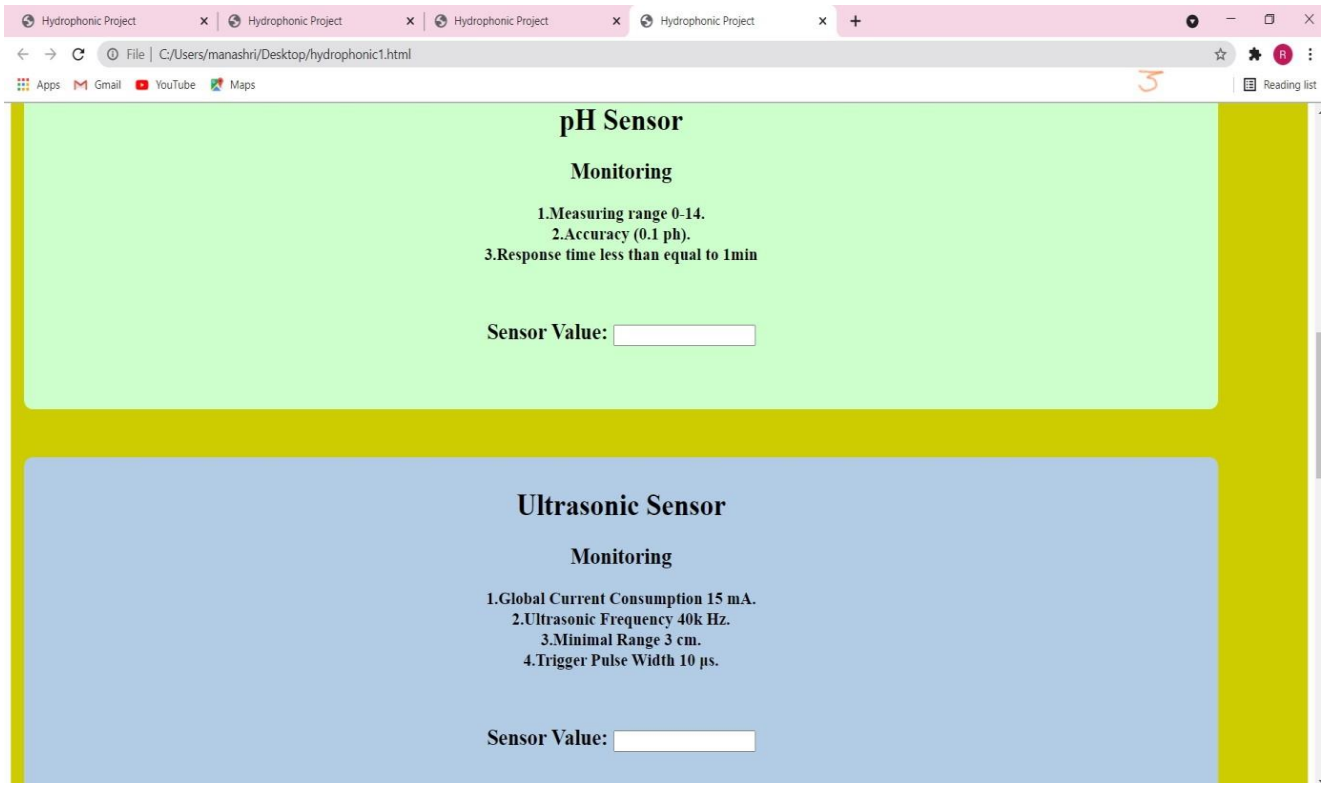
Hydrophonic Project
Hydrophonic Project
Hydrophonic Project
Hydrophonic Project
File | C:/Users/manashri/Desktop/hydrophonic1.html
Apps
Gmail
YouTube
Maps
Reading list
pH Sensor
Monitoring
1.Measuring range 0-14.
2.Accuracy (0.1 ph).
3.Response time less than equal to 1min
Sensor Value:
Ultrasonic Sensor
Monitoring
1.Global Current Consumption 15 mA.
2.Ultrasonic Frequency 40k Hz.
3.Minimal Range 3 cm.
4.Trigger Pulse Width 10 µs.
Sensor Value:

Fig 8.1

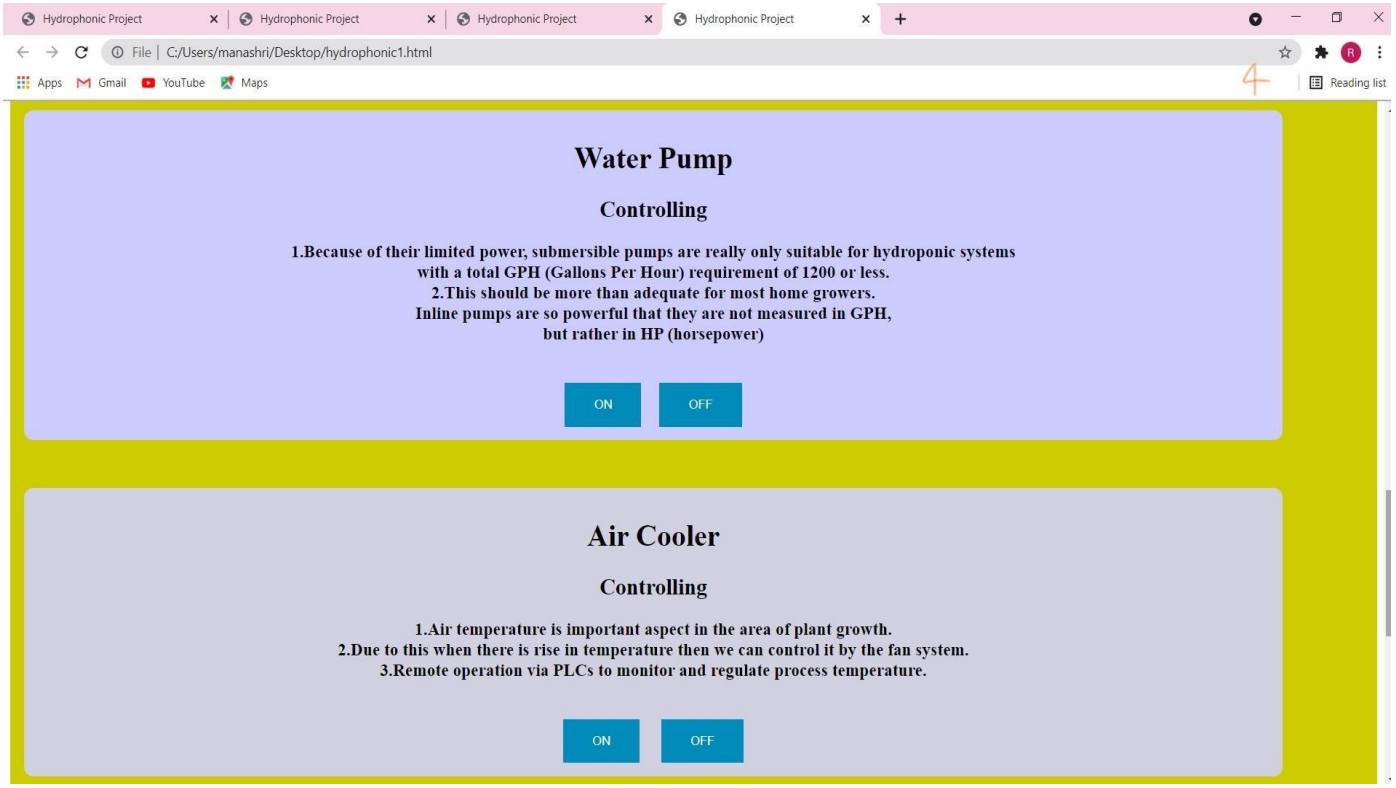
Hydrophonic Project
File | C:/Users/manashri/Desktop/hydrophonic1.html
Apps
Gmail
YouTube
Maps
Reading list
Water Pump
Controlling
1.Because of their limited power, submersible pumps are really only suitable for hydroponic systems with a total GPH (Gallons Per Hour) requirement of 1200 or less.
2.This should be more than adequate for most home growers.
Inline pumps are so powerful that they are not measured in GPH, but rather in HP (horsepower)
ON
OFF
Air Cooler
Controlling
1.Air temperature is important aspect in the area of plant growth.
2.Due to this when there is rise in temperature then we can control it by the fan system.
3.Remote operation via PLCs to monitor and regulate process temperature.
ON
OFF

Fig 8.2

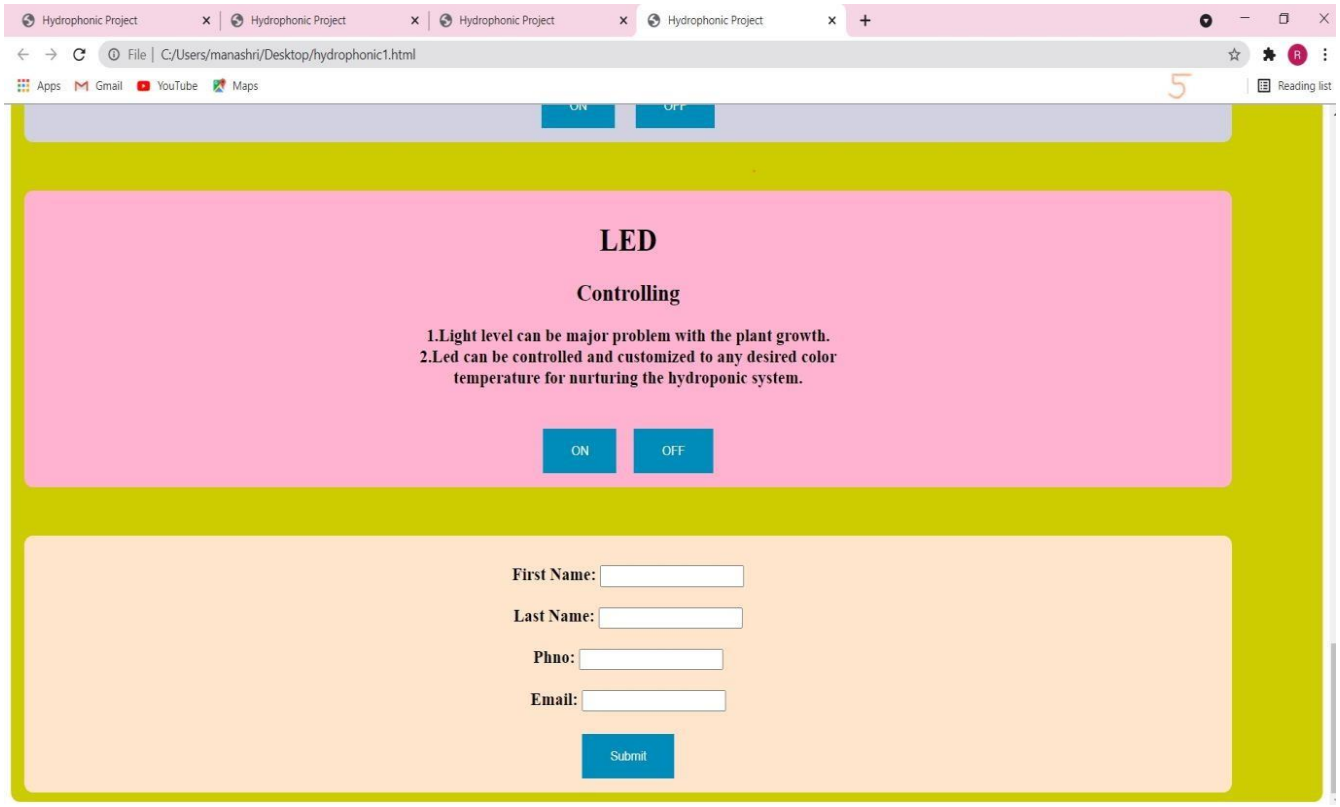
Hydrophonic Project
File | C:/Users/manashri/Desktop/hydrophonic1.html
Apps
Gmail
YouTube
Maps
Reading list
LED
Controlling
1.Light level can be major problem with the plant growth.
2.Led can be controlled and customized to any desired color temperature for nurturing the hydroponic system.
ON
OFF
First Name:
Last Name:
Phno:
Email:
Submit

Fig 8.3

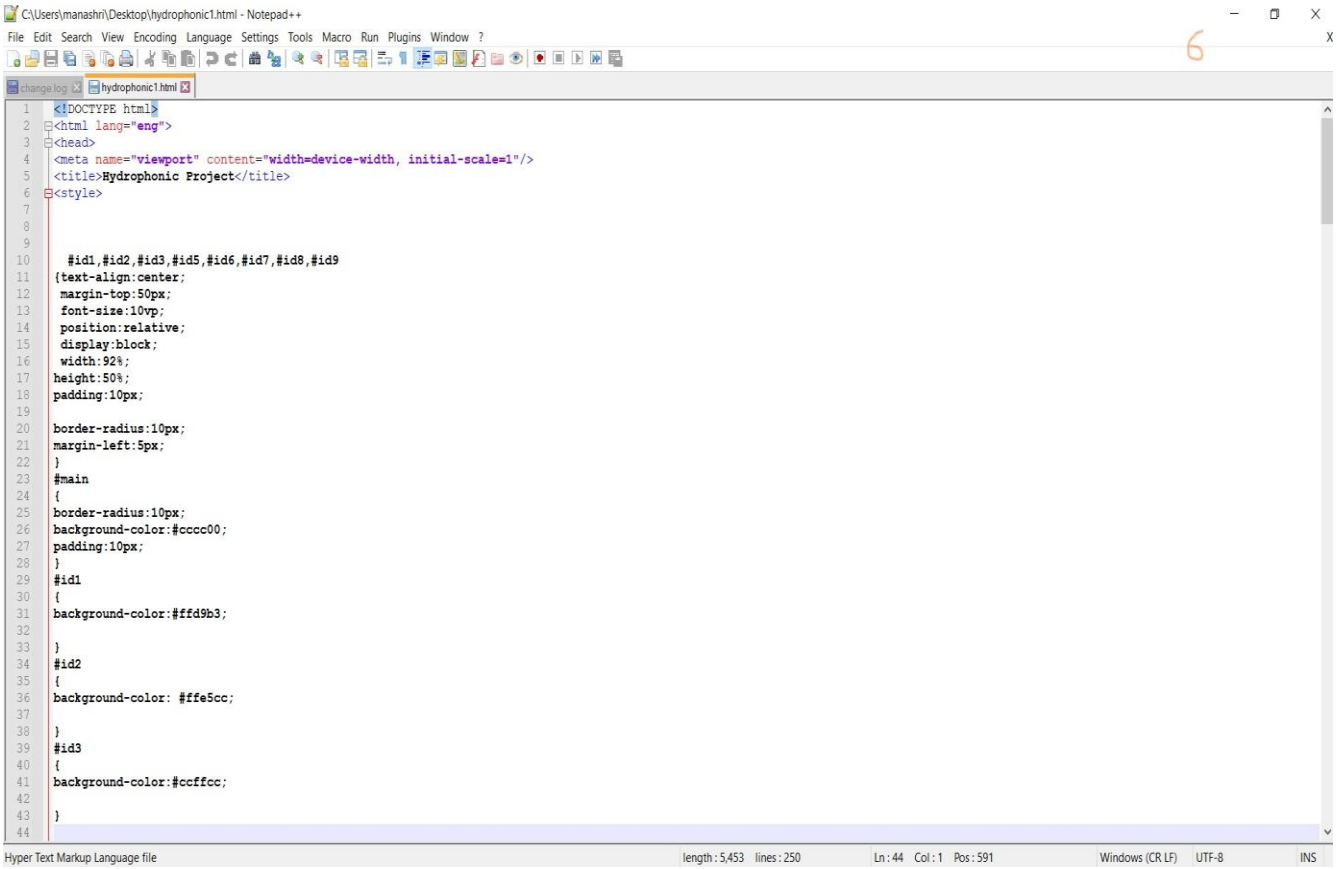

Fig 8.4 code for web server

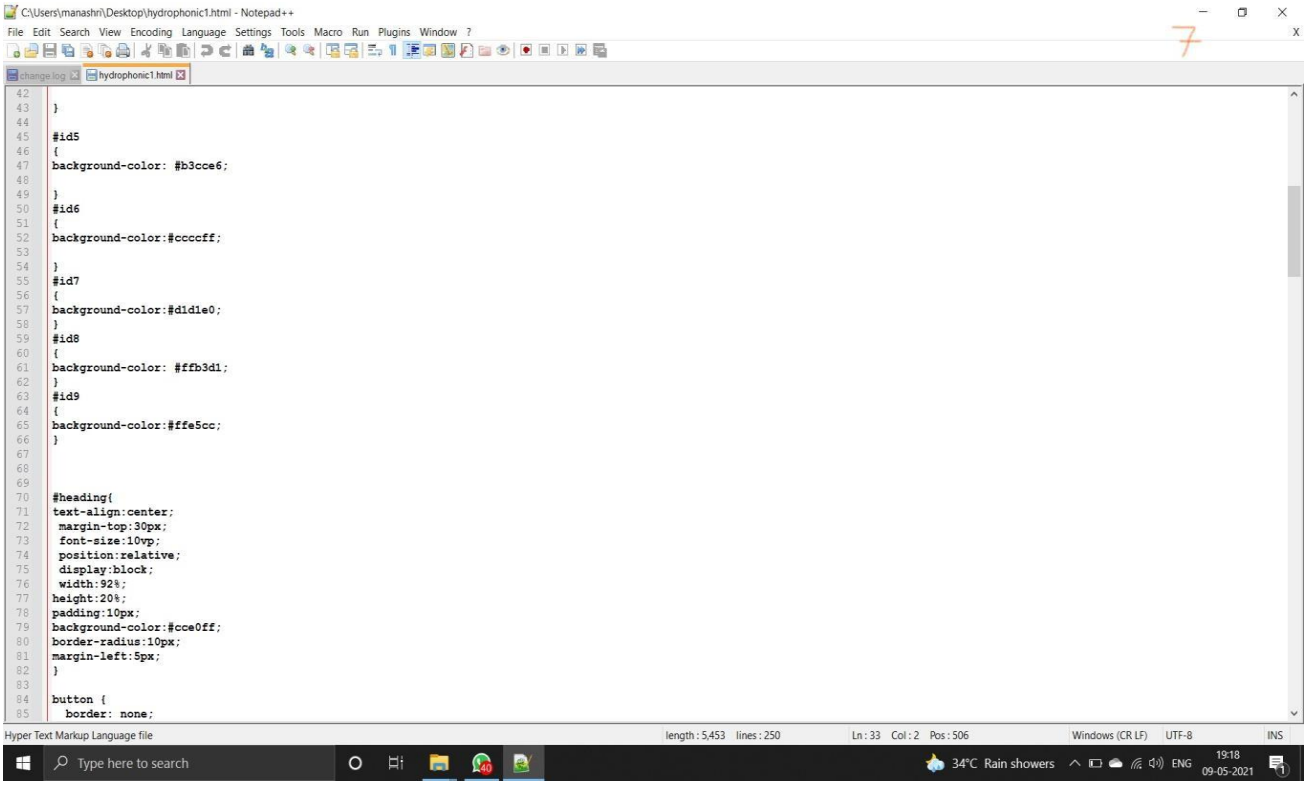

Fig 8.5 code for web server

C:\Users\manashri\Desktop\hydrophonic1.html - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

change.log | hydrophonic1.html

```
}

button {
  border: none;
  color:white;
  background-color: #008CBA;
  padding: 15px 32px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
  font-size: 20vp;
  margin: 4px 2px;
  cursor: pointer;
}


</style>

</head>
<body>
<script>
 function fun1()
{
 alert("Work in Progress.");
}
 function waterpumpon()
{
 alert("Water Pump is On.");
}
 function waterpumpoff()
{
 alert("Water Pump is Off.");
}
 function aircooleron()
{
 alert("Air Cooler is On.");
}
 function aircooleroff()
{
 alert("Air Cooler is Off.");
}
 function ledon()
{
 alert("LED is On.");
```

Hyper Text Markup Language file | length : 5,453 lines : 250 | Ln : 33 Col : 2 Pos : 506 | Windows (CR LF) | UTF-8 | INS

Fig 8.6 code for web server

4.3 Conclusion :-

- After illustration of soilless cultivation, a system to control and monitor hydroponics culture has been presented. For its characteristics, the system is a strong applicant for agriculture applications.

- As one of typical applications, more and more people recognize the application of the IoT (Internet of Things) which bring broad development to the smart life.

- Meanwhile, we have an idea of connecting hydroponic device with social network, where we can see a vision that people can interact with their hydroponic plants online through a mobile terminal.

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