A

Project Stage-II Report on

SMART FARMING SYSTEM USING IOT FOR EFFICIENT CROP GROWTH.

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have successfully completed the Project Stage – II entitled "**SMART FARMING SYSTEM USING IOT FOR EFFICIENT CROP GROWTH**" under guidance of Prof.Y.C.JADHAV in the partial fulfillment of *Bachelor of Engineering - Mechanical Engineering* of Savitribai Phule Pune *University.*

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Abstract

Smart farming, is an innovative technique that enables controlled and optimized agricultural production in a protected environment. This abstract provides an overview of a Smart farming project, focusing on its objectives, methodology, and expected outcomes.

The primary objective of the Smart farming project is to address the challenges faced by traditional agriculture, such as unpredictable weather conditions and limited arable land availability. By creating a controlled environment within a structure, Smart farming offers numerous benefits, including increased crop yields, extended growing seasons, and reduced water usage.

Key expected outcomes of the Smart farming project include higher crop productivity, reduced reliance on chemical inputs, and improved resource efficiency. By providing a protective shield against adverse weather conditions, Smart farming minimizes crop losses and enhances market competitiveness. The controlled environment also enables year-round cultivation, diversifying income streams for farmers and increasing the availability of fresh produce in the market.

Furthermore, Smart farming contributes to sustainable agriculture practices by conserving water through efficient irrigation systems and reducing the need for pesticides and fertilizers. It offers an opportunity for farmers to adopt eco-friendly approaches, minimizing environmental impact while meeting the growing demand for food.

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Chapter:
1. Introduction

1.1 Introduction

Agriculture is the primary occupation in India and is the backbone of Indian economic system. Agriculture provides employment opportunities to rural people on a large scale in-underdeveloped and developing countries in addition to providing food. It is the process of producing food, fiber and many other desired products by the cultivation and raising of domestic animals. Agriculture is the primary source of livelihood for about more than 58% of India's population. Climate changes will have significant impact on agriculture by increasing water demand and limiting crop productivity in areas where irrigation is most needed. Irrigation system, rain fed agriculture, groundwater irrigation is some of the methods introduced to produce healthier crops which may not use water efficiently. In order to use water efficiently a smart system is designed. In the system farmer need not make the water flow into fields manually, but the system automatically does that efficiently. The traditional methods practiced by people may result in huge wastage of water. Hence, the concept of robotized farming with mix of IoT has been developed. The technological advancements began to increase the efficiency of production remarkably thus, making it a reliable system. The knowledge of properties of soil determines the water supply to be driven in a smart way. The practice of agriculture in a smart way helps to acquire knowledge of soil and temperature conditions. Developing the smart agriculture using IoT based systems not only increases the production but also avoids wastage of water. The soil moisture sensor, humidity and temperature sensor continuously monitor the soil and environmental conditions, sends the live data to smartphone via cloud service. While raining, the moisture content may increase several times. A rain-drop detecting sensor intimates the controller if there is rainfall, making the water supply to reduce or stop depending upon the moisture content at the moment. The crop requirements such as amount of humidity, temperature and moisture content are to be studied and can be installed again in the controller to meet its circumstances. In this paper, the system uses few sensors which gives the amount of moisture in the soil, the humidity and temperature of the region, and a rain detecting sensor which and can be used in deciding whether the crop is suitable for growing. All these sensors along with NodeMCU are connected to the internet and a smartphone.

Smart farming is very relevant for encouraging organic farming. The implementation of polyhouse in our houses, offices, institutions etc. can cultivate crops in a closed and secured environment. Hence the dangerous usage of pesticides which lead to many deadly diseases can be avoided or minimized. Polyhouse farming can be done without depending on natural phenomena like rainfall so that production of crops can be increased. Since polyhouse is a closed environment, polyhouse automation of climatic parameters is established to acquire optimum level of climate in order to improve crop yield, growth and production. Nowadays, all are busy with their schedules. No one have time to look after their polyhouse garden. No matter whatever busy schedules we are in, we never forgets to use our e-gadgets. Mobile phones have become the part and parcel of life. For this reason, in this project, the polyhouse can be monitored and controlled by using the applications in remote devices like smartphones, laptops, PC and through Internet applications. This system consists of various sensors, namely soil moisture, temperature, relative humidity and light sensors.

1.2 Problem Definition

The problem statement for the Smart farming project is to address the limitations of traditional agriculture and develop a sustainable approach to enhance agricultural production. The project aims to overcome the following specific challenges:

1. Unpredictable Weather Conditions

2. Limited Arable Land Availability

3. Water Scarcity and Resource Efficiency:

Addressing these challenges through the adoption of polyhouse farming techniques can lead to improved agricultural productivity, reduced crop losses, enhanced resource efficiency, and a more sustainable and resilient food system. By creating a controlled environment that optimizes plant growth and minimizes external risks, polyhouse farming offers a promising solution to the limitations of traditional agriculture.

1.3 Objectives

1. Increase crop yield: One of the primary objectives of polyhouse farming is to maximize crop production. Polyhouses provide a controlled environment that allows for optimal growing conditions, such as temperature, humidity, and light, which can result in higher crop yields compared to traditional open-field farming.

2. Extend growing season: Polyhouses enable farmers to extend the growing season by protecting crops from adverse weather conditions, such as frost, excessive rainfall, or high winds. The objective is to have a longer period of productive cultivation and a continuous supply of fresh produce.

3. Protect crops from pests and diseases: Polyhouses act as a physical barrier against pests, insects, and diseases that can damage or destroy crops. By implementing appropriate pest management strategies, the objective is to minimize crop losses and reduce the need for chemical pesticides.

4. Optimize resource utilization: Polyhouses provide opportunities to optimize the use of resources such as water, fertilizers, and energy. The objective is to implement efficient irrigation systems, nutrient management practices, and energy-saving technologies to achieve sustainable and cost-effective production.

5. Diversify crop production: Polyhouses offer flexibility in crop selection and enable the cultivation of a wide range of crops, including high-value and off-season crops. The objective is to diversify the product portfolio and capture market opportunities for niche or specialty crops.

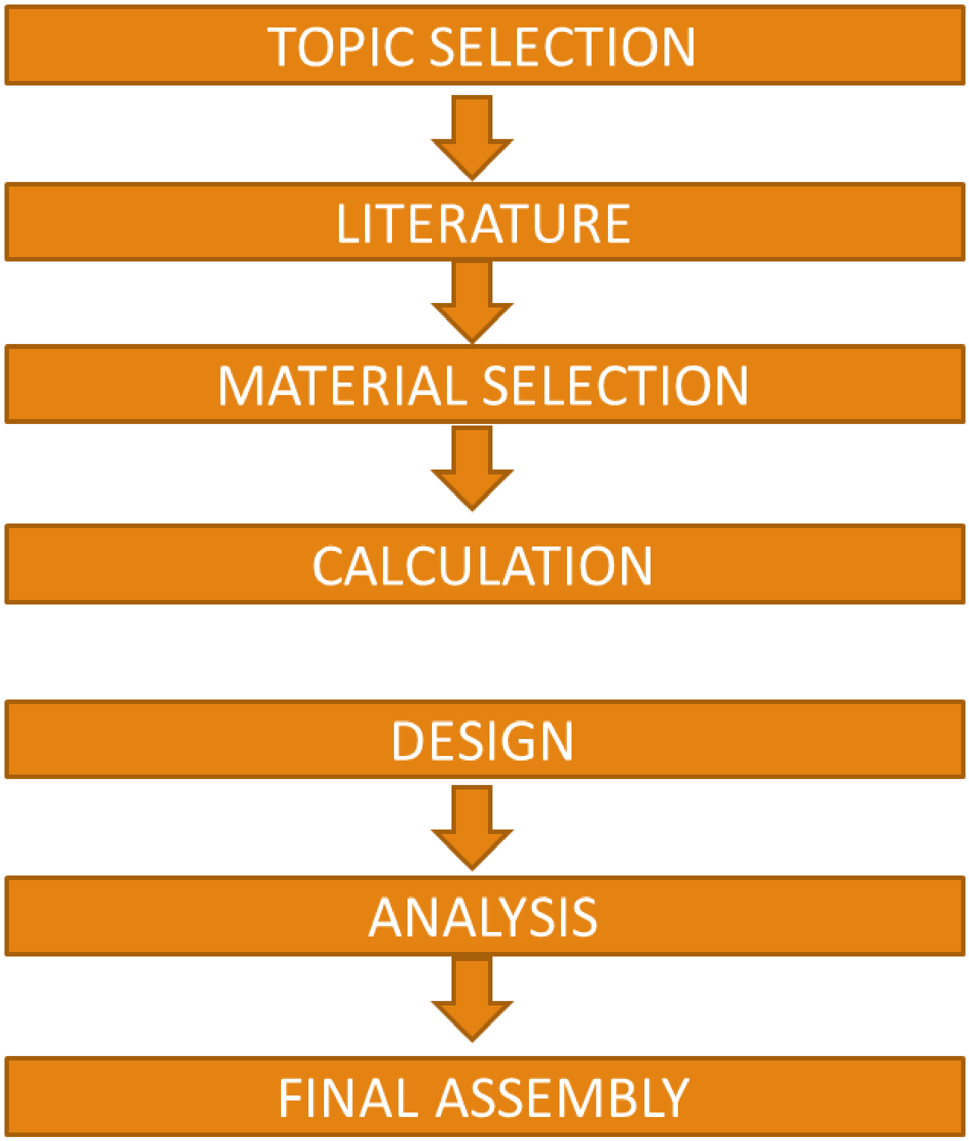
6. Improve crop quality: Polyhouses provide a controlled environment that can lead to improved crop quality, including better color, taste, texture, and nutritional content. The objective is to produce high-quality crops that meet consumer demands and fetch premium prices in the market.

7. Reduce environmental impact: Polyhouse farming can potentially reduce the environmental impact compared to conventional open-field farming. By implementing sustainable practices, such as efficient water and energy management, responsible waste management, and minimal chemical inputs, the objective is to minimize environmental degradation and promote ecological balance.

8. Enhance profitability: Ultimately, the objective of any farming project is to achieve economic viability and profitability. By optimizing production, reducing losses, diversifying crops, and capturing market opportunities, the objective is to maximize returns on investment and ensure the financial sustainability of the polyhouse farming project.

It's important to note that the specific objectives of a polyhouse farming project should be tailored to the local context, market demand, available resources, and the goals of the individual farmer or agricultural enterprise.

1.4 Methodology



Chapter:
2. LITERATURE SURVEY

2. LITERATURE SURVEY

G. S. Nagaraja et al[1] suggested that Crop output has grown as a result of the introduction of improved seed types, innovative agricultural technologies, and the use of effective fertilisers. However, without the use of wiser technologies, the agricultural domain will continue to be behind schedule. The traditional technique relies heavily on human instincts, which occasionally fail.

Jitendra Patidar et al[2] explained the benefits of iot based farming by using various parameters by using programming hardware over traditional farming.

Nisar Ahmad et al[3] proposed that With the passage of time, farmers' use of machinery to improve the quality and quantity of agricultural output has increased. This study presents a multi-parameter observation system that will notify farmers and users with the help of the Internet.

.**V. Palazzi et al[4]** presented a Leaf Compatible temp sensing
system using RFID

Sudhir K. Routray et al[5] presented Precision agriculture (PA) as the engineering of plants' exact requirements and productivity. In current times, PA collects data on the specific demands of plants and their productivity by using large quantity sensors in a networked design.

Pankaj Mohan Gupta et al[6] explained that Many farming cultures, such as Indians, continue to practise traditional farming methods. They must, however, contend with rising food demand (implying higher yields), water scarcity, arable land availability, insect assaults on crops, and climate change.

Rana Gill et al[7]
proposed For agriculture, a design of lowcost sensor nodes based on the IOT. To monitor critical factors linked to soil and environment within the greenhouse, the sensor node is built using NodeMCU and four distinct sensors.

Kamlesh Kalbande et al[8] submitted that In India, IoT for precision farming is mixed in with the introduction of ultralow-power and modern technology. A basic identity to overcome is assisting farmers in dealing with issues such as unstructured process automation, inefficient goods, insufficient resources resulting in machine damage, and so on.

R. Nageswara Rao et al[9] proposed a way for making farming smarter through the use of automation and IoT. Crop growth monitoring and selection, irrigation decision assistance, and other applications are enabled by the Internet of Things (IoT).

Sebastian Sadowski et al[10] proposed Precision farming , which entails employing revolutionary technology and measuring instruments to observe crops and offer exact treatments as needed, is one way to accomplish smart farming.

Sashant Suhag et al[11] proposed an IoT framework for soil nutriment and plant disease observation. It uses different sensors and uses smart sensors to gather the information in the form of images over different time periods.

Yash Bhojwani et al[12] proposed that Working accomplishes this by monitoring the environmental elements such as temperature, soil moisture, and other factors that impact crop development, as well as assisting farmers in determining the ideal crop that is suitable for the farmers based on the data gathered and environmental circumstances.

N Sneha et al[13]

research concentrates on the expansion of two studies that focus on applying Data mining technologies such as DBSCAN, PAM, CLARA, Chameleon and a regression approach to improve agriculture.

Carlos Kamienski et al[14] presented the The project's SWAMP perspective, pilots, and scenario-based development method.

M. Suresh et al[15] proposed that The goal is to complete the adoption of mechanisation to handle electrical motors in the agricultural area. As a result of the sparse distribution of devices, it is a natural work. Farmers' ability to run and control these gadgets in real time is quite difficult.

Dr. Akey Sungheetha et al[16] proposed that to improve the accuracy of the system, integration of image processing schemes is done in this system. The rules are formulated such that the true detection rate is improved.

Chapter:
3. Design and Calculation

3.1 Construction

Frame

Material used: Mild Steel Reasons:

1. Mild steel is readily available in market.
2. It is economical to use.
3. It is available in standard sizes.
4. It has good mechanical properties i.e., it is easily machinable.
5. It has moderate factor of safety, because factor of safety results unnecessary wastage of material and heavy selection. Low factor of safety results in unnecessary risk of failure.
6. It has high tensile strength.
7. Low co-efficient of thermal expansion.

Properties of Mild Steel

M.S. has a carbon content from 0.15% to 0.30%. They are easily wieldable thus can be hardened only. They are similar to wrought iron in properties. Both ultimate tensile and compressive strength of these steel increases with increasing carbon content. They can be easily gas welded or electric or arc welded. With increase in the carbon percentage weld ability decreases. Mild steel serves the purpose and was hence was selected because of the above purpose

Basic Frame The mild steel angles of material of mild steel are selected for the frame. The MS angles are cut into required size by cutting machine. The end of the MS angles cut into 90 degrees(angle) to form rectangular frame. After cutting, the end of the MS angles is grinded so that it became smooth and convenient for welding. The MS angles are welded together to form a rectangular basic frame.

DC gear motor:

It is a simple DC motor featuring metal gearbox for driving the shaft of the motor, so it is a mechanically commutated electric motor which is powered from DC supply. The Geared Motors are known for their compact size and massive torque-speed characteristic.

The Motor comes with side shaft also known as an off-centered shaft and six M3 mounting holes. The shaft of the motor equips metal bushes which makes these DC gear motors Shaft wear resistant. The shaft of the motor has a hole for better coupling. The motor will run smoothly between the voltage range 6 to 18 V DC and give you 10 RPM at 12V supply. It provides the torque of 11.7 kg-cm at 10 RPM. The Geared Motor gives very good torque at an affordable price hence they are widely applicable in Pan/Tilt camera, auto shutter, welding machines, water meter IC card, grill, oven, cleaning machine garbage disposers, household appliances, slot machines, money detector, automatic actuator, coffee machine, towel disposal, lighting coin refund devices, the peristaltic pump and so on. The motor has sturdy construction. Shaft equips metal bushes for long life. It comes with High-Quality gears. The shaft has a hole for better coupling.

Power Supply: 12V DC
RPM: 30
Rated Torque: 11.7 Kg-cm
6mm Día shaft with M3 thread hole
Gearbox diameter: 37 mm
Motor Diameter: 28.5 mm
Length without shaft: 63 mm
Shaft length: 30mm
Weight: 180gm
No-load current = 800 mA, Load current = up to 7.5 A(Max) Recommended to be used with DC Motor Driver 20A or Dual DC Motor Driver 2S0A Also, they are best suitable with highly developing capable robots or robotic platform, various automation purposes.

Battery:

The battery is an electrochemical converting chemical energy into electrical energy. The main purpose of the battery is to provide a supply of current for operating the cranking motor and other electrical units.

Specification,

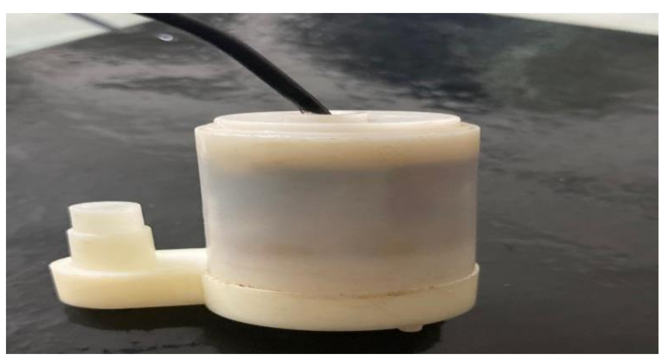
1. Voltage 12v
2. Current 7.2Ah

Water pump:

A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action, typically converted from electrical energy into hydraulic energy.

Specification:

1. Voltage 12V



Linear Actuator:

This actuators is used to actuate central locking mechanisms in cars.

They use a motor with a rack and pinion to get the linear motion. Powering with one polarity extends the rack and reversing it retracts it.

Current draw is in the vicinity of 5Amps @ 12V DC. They are only meant to be powered for very short periods, otherwise they will overheat and burn out. Here we are using it to produce power by wind turbine.

Arduino board

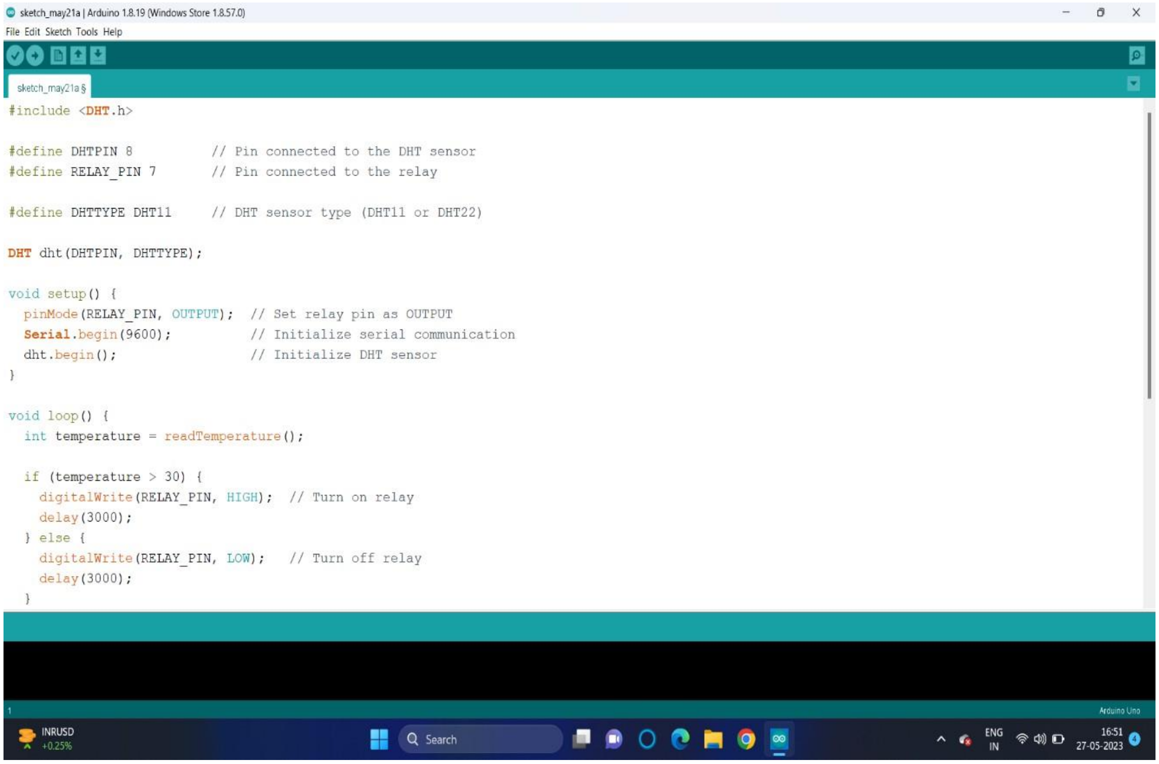
Table 2 Atmega Summary

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

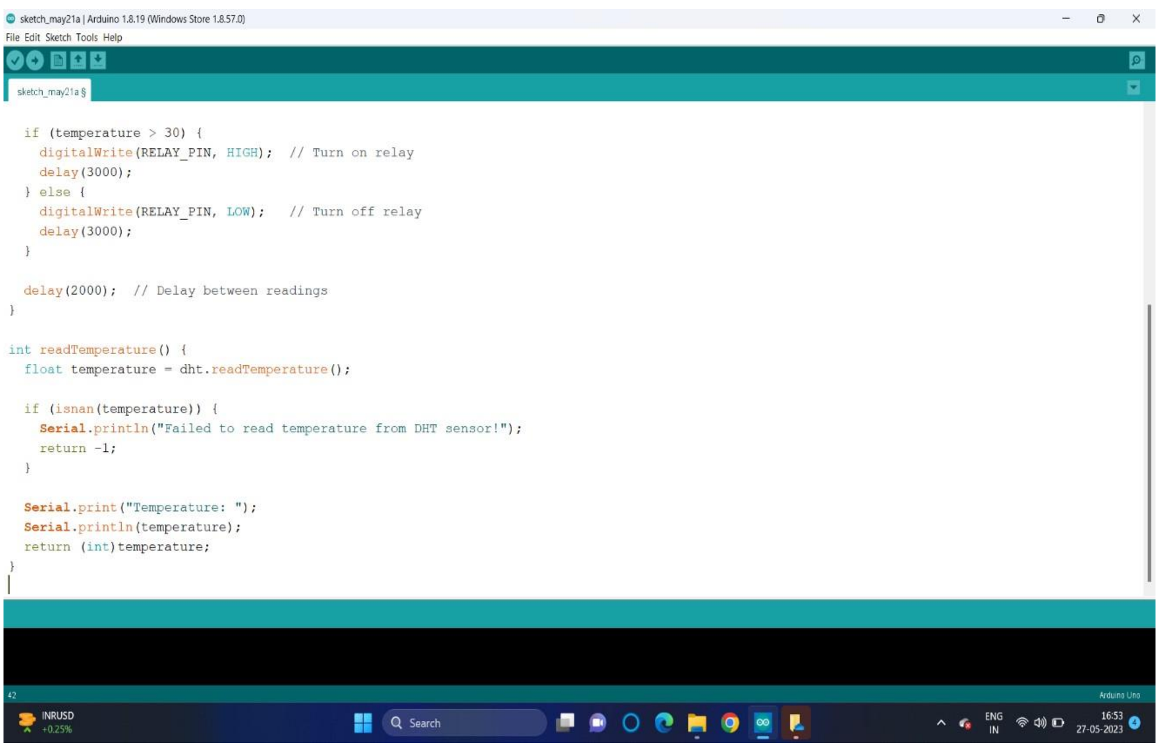
Features:

1. ATmega328 microcontroller
2. Input voltage - 7-12V
3. 14 Digital I/O Pins (6 PWM outputs)
4. 6 Analog Inputs
5. 32k Flash Memory

6.16Mhz Clock Speed

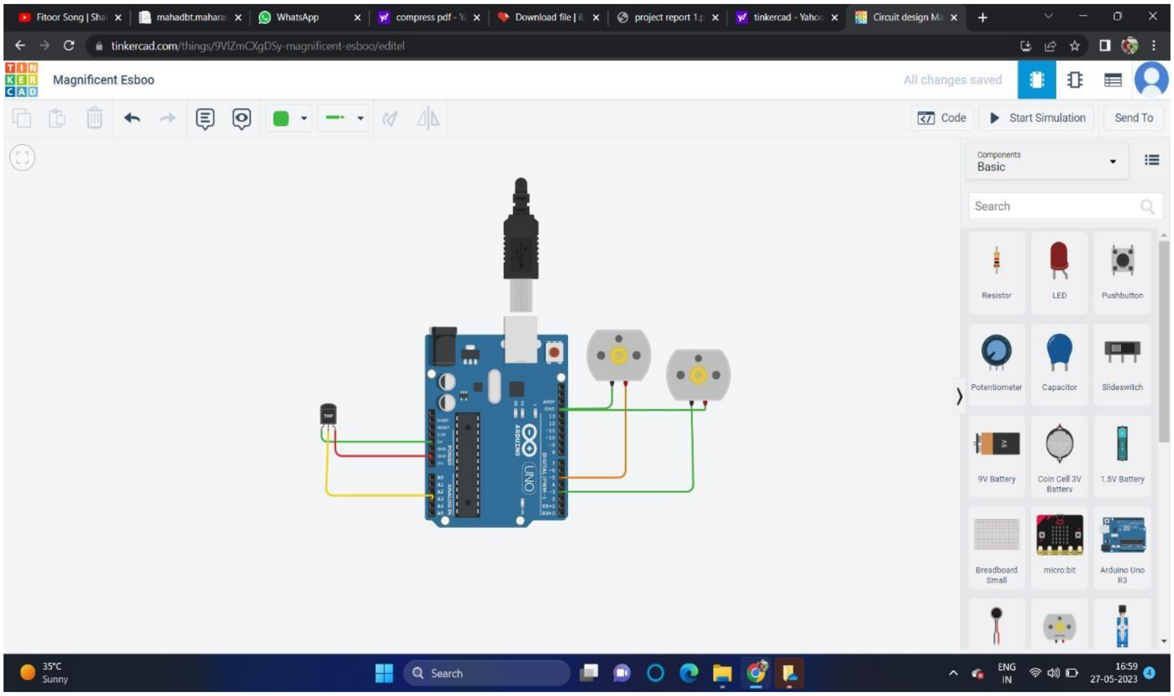


```
#include <DHT.h>

#define DHTPIN 8          // Pin connected to the DHT sensor
#define RELAY_PIN 7       // Pin connected to the relay

#define DHTTYPE DHT11     // DHT sensor type (DHT11 or DHT22)

DHT dht(DHTPIN, DHTTYPE);

void setup() {
  pinMode(RELAY_PIN, OUTPUT);  // Set relay pin as OUTPUT
  Serial.begin(9600);          // Initialize serial communication
  dht.begin();                 // Initialize DHT sensor
}

void loop() {
  int temperature = readTemperature();

  if (temperature > 30) {
    digitalWrite(RELAY_PIN, HIGH);  // Turn on relay
    delay(3000);
  } else {
    digitalWrite(RELAY_PIN, LOW);   // Turn off relay
    delay(3000);
  }
```



```
  if (temperature > 30) {
    digitalWrite(RELAY_PIN, HIGH);  // Turn on relay
    delay(3000);
  } else {
    digitalWrite(RELAY_PIN, LOW);   // Turn off relay
    delay(3000);
  }

  delay(2000);  // Delay between readings
}

int readTemperature() {
  float temperature = dht.readTemperature();

  if (isnan(temperature)) {
    Serial.println("Failed to read temperature from DHT sensor!");
    return -1;
  }

  Serial.print("Temperature: ");
  Serial.println(temperature);
  return (int)temperature;
}
```

Fig: Aurdino Programming Window



Aurdino connections in Tinkercad

HC-05 Bluetooth module

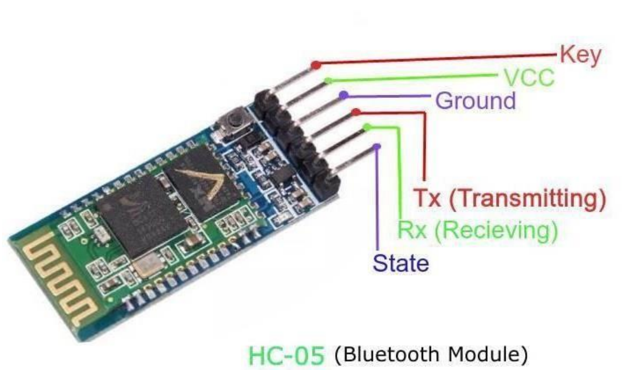


Figure 18 HC-05 Bluetooth module

Name: HC-05

Password: 1234 (or

0000) Type: Slave

Mode: Data

Baud Rate: 9600 with 8 data bits, no parity and 1 stop bit

Humidity and temperature sensor (DHT11)

Figure 19 Humidity and temperature sensor.

It consists of a thermistor, humidity sensing component and an IC. Thermistor calculates the temperature of its surrounding medium from its capability of varying its resistance due to temperature. A moisture holding substrate is placed between two electrodes in humidity sensing component. The variation in humidity produces a variation in resistance between electrodes. The variation in resistance is measured and processed by the IC which gives the humidity value to the NodeMCU. This sensor operates at a voltage range of 3.3V to 5V. The range of temperature is 0 - 50°C, range of humidity is 20 - 90% RH.

Relay:

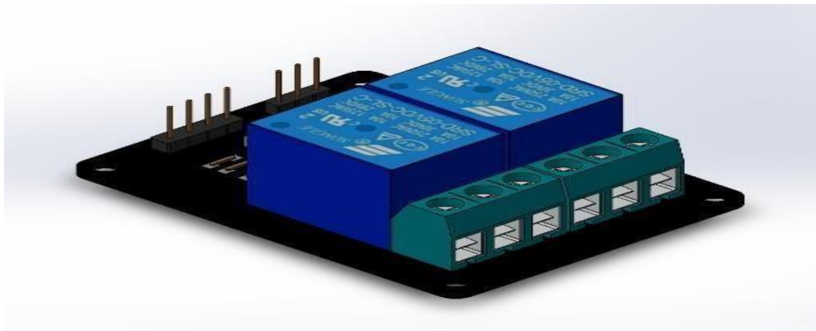


Figure 20 Relay Module

The Arduino relay module has total of six pins: three on one side and three on other side. On the bottom side, there are three pins which are signal, 12V and ground. We will connect these pins with the Arduino. While on the other side, there are NC (Normally close), C (Common) and the NO (normally open) which are the output pins of the 12V relay. There, we will connect the output device.

Soil moisture sensor:

The Soil Moisture Sensor in Fig. calculates the average of dielectric permittivity along the length of the sensor. Here, dielectric permittivity is function of water. The temperature range for the working of this sensor is 10 - 30°C and voltage applied is 5V.

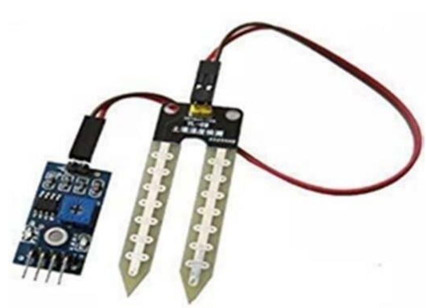
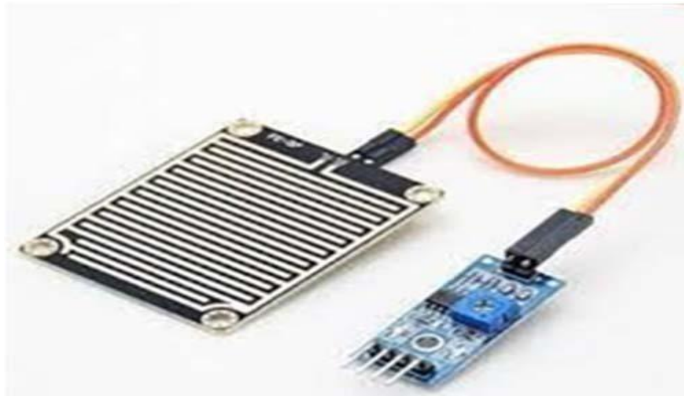


Figure 21 Soil moisture sensor

Raindrop Sensor:



In raindrop sensor shown in Fig. as raindrops fall on the nickel lines the drop connects these lines in parallel which reduces the resistance and hence the voltage drop across the lines is also reduced. This happens because water is a good conductor of electricity. So when the voltage drop is less than a certain value it indicates that it’s raining. The module has a rain board, a control board, power indicator LED, and an adjustable sensitivity through a potentiometer. Its operating voltage is 5V. The range of resistance is from 100KOhm to 2MOhm

Node mcu:

NodeMCU in Fig. 7 is an open source IoT platform which includes firmware that runs on ESP8266 Wi-Fi module. Programming is done in Arduino IDE using C/C++ language or Lua script. NodeMCU has 16 GPIO pins which can be used to control other peripheral devices like sensors, LEDs, switches etc. These pins can also be used as PWM pins. It has two UART interfaces and uses XTOS operating system [7]. It can store 4M Bytes of data. The operating voltage of NodeMCU is 5V. It uses L106 32-bit processor, and the processor's speed is 80-160MHz.

The various machining operations conducted after material selection are as follows:

3.2 PROCESS SHEET:

Following operations were while fabricating the project:

Cutting:

The material is cut according to our required size. The machine used for this operation is power chop saw. A power chop saw, also known as a drop saw, is a power tool used to make a quick, accurate crosscut in a work piece at a selected angle. Common uses include framing operations and the cutting of moulding. Most chop saws are relatively small and portable, with common blade sizes ranging from eight to twelve inches.

Welding:

Square pipes of different lengths to make frame. The machine used for this operation is electric arc welding. Electrical arc welding is the procedure used to join two metal parts, taking advantage of the heat developed by the electric arc that forms between an electrode (metal filler) and the material to be welded. The welding arc may be powered by an alternating current generator machine (welder). This welding machine is basically a singlephase static transformer Suitable for melting RUTILE (sliding) acid electrodes. Alkaline electrodes may also be melted by alternating current.

3.3 CAD Drawing:

Procedure:

- The entire model has been designed with the help of designing software solid works.
- With the help of colour feature the colours are given to the entire model.

Figure- Cad model of the assembled project is designed on Solid works 2022 software

SOLID MODELING

The entire model has been designed with the help of designing software solid works.

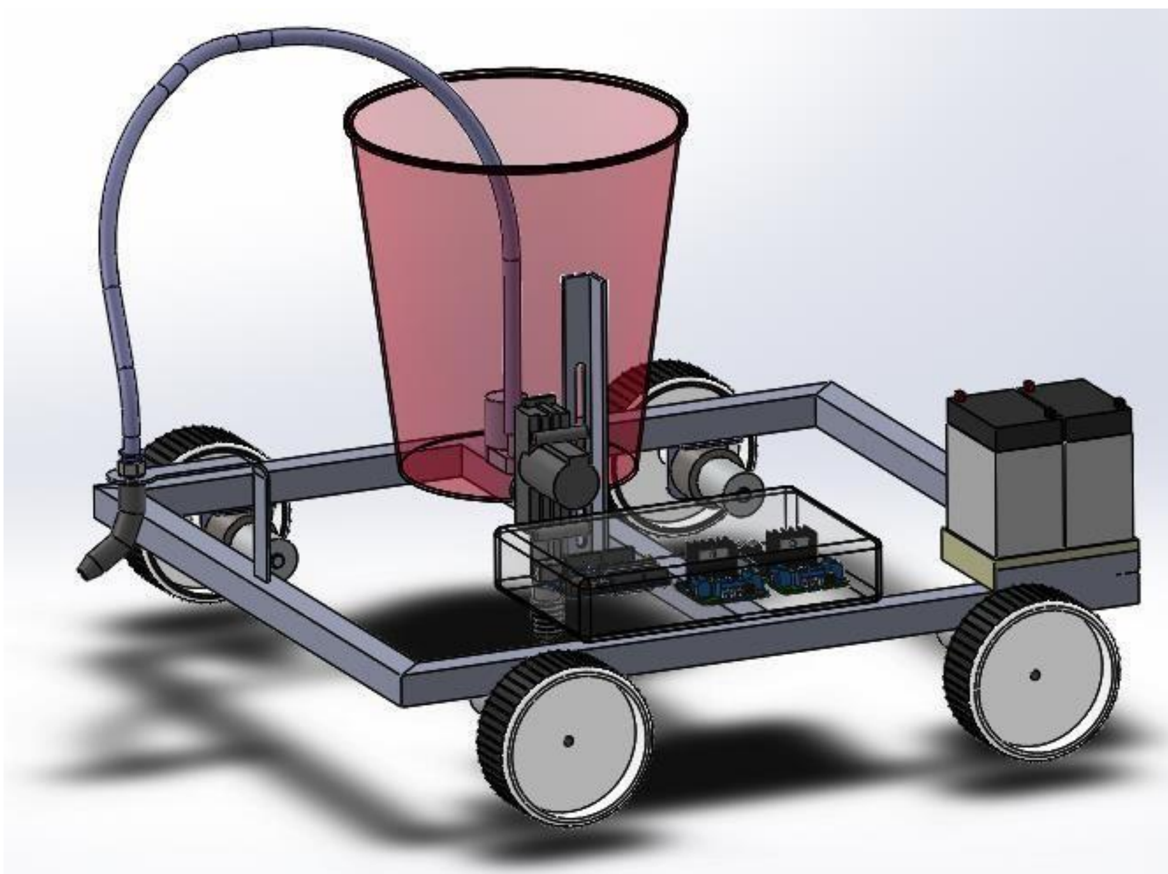
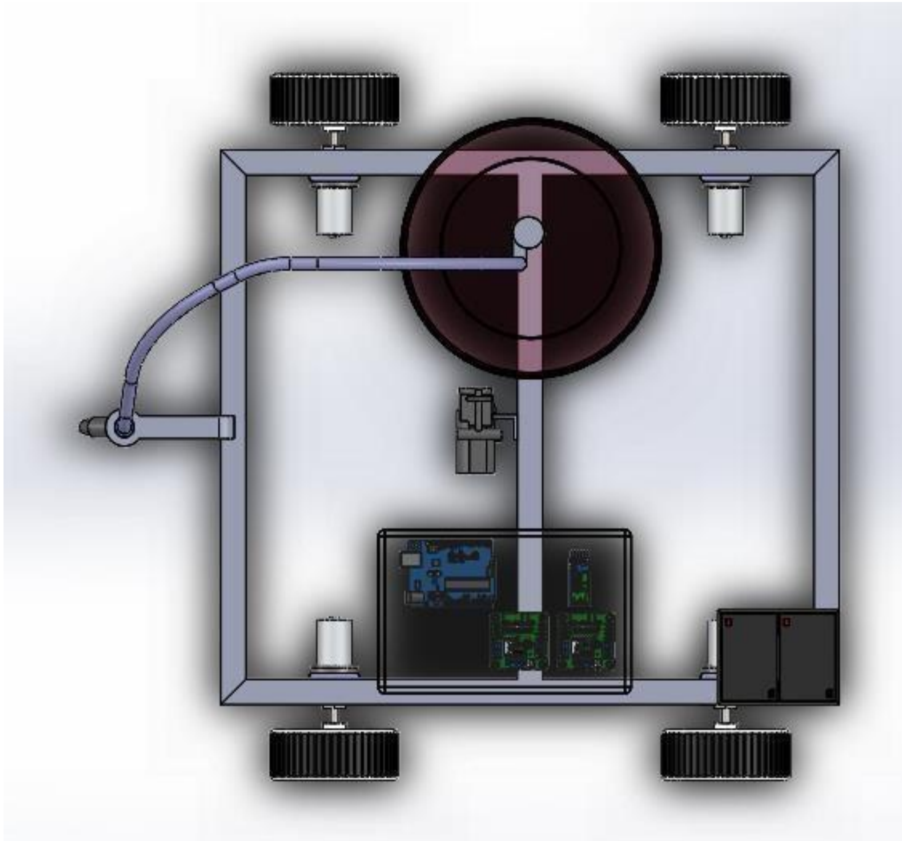
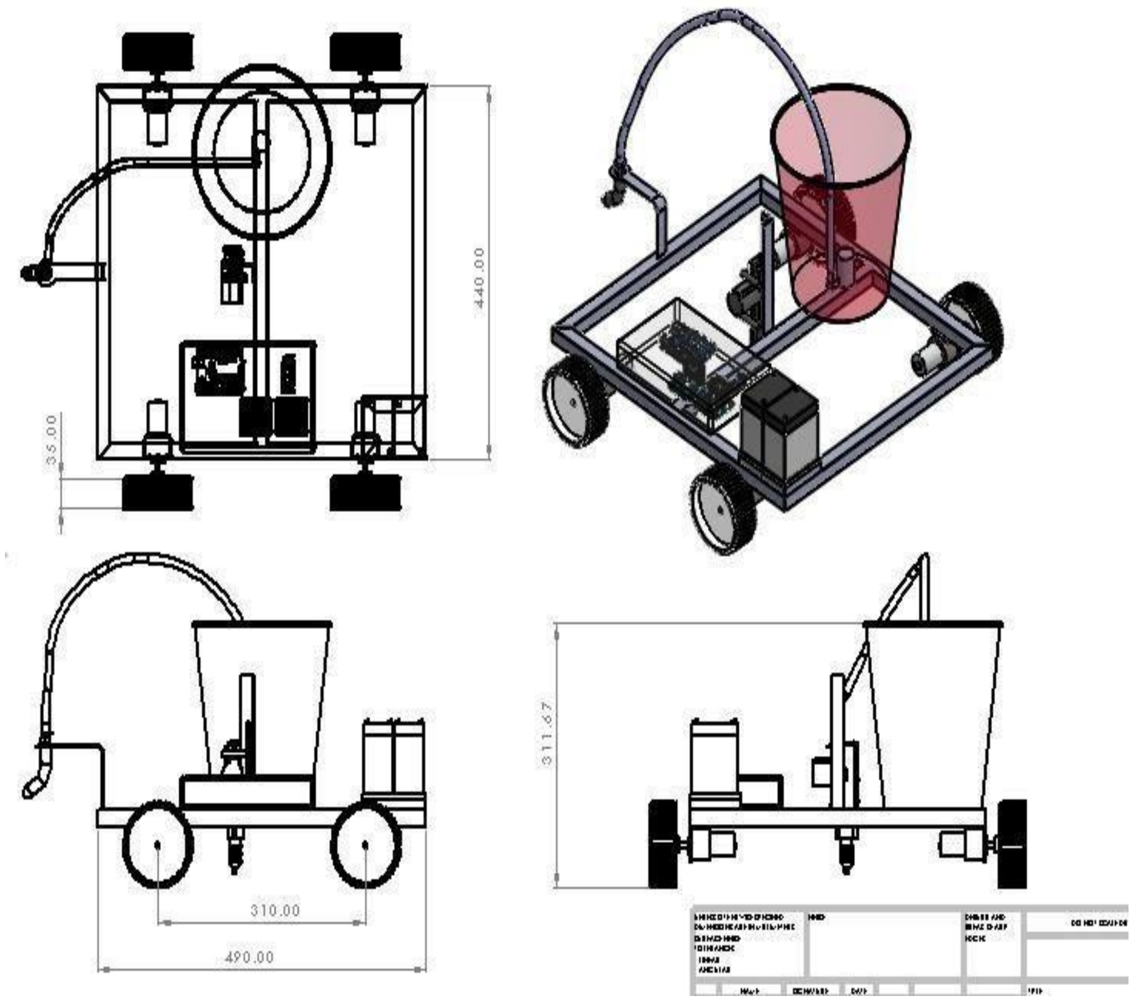


Figure 33 Isometric front view



Isometric top view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490.00

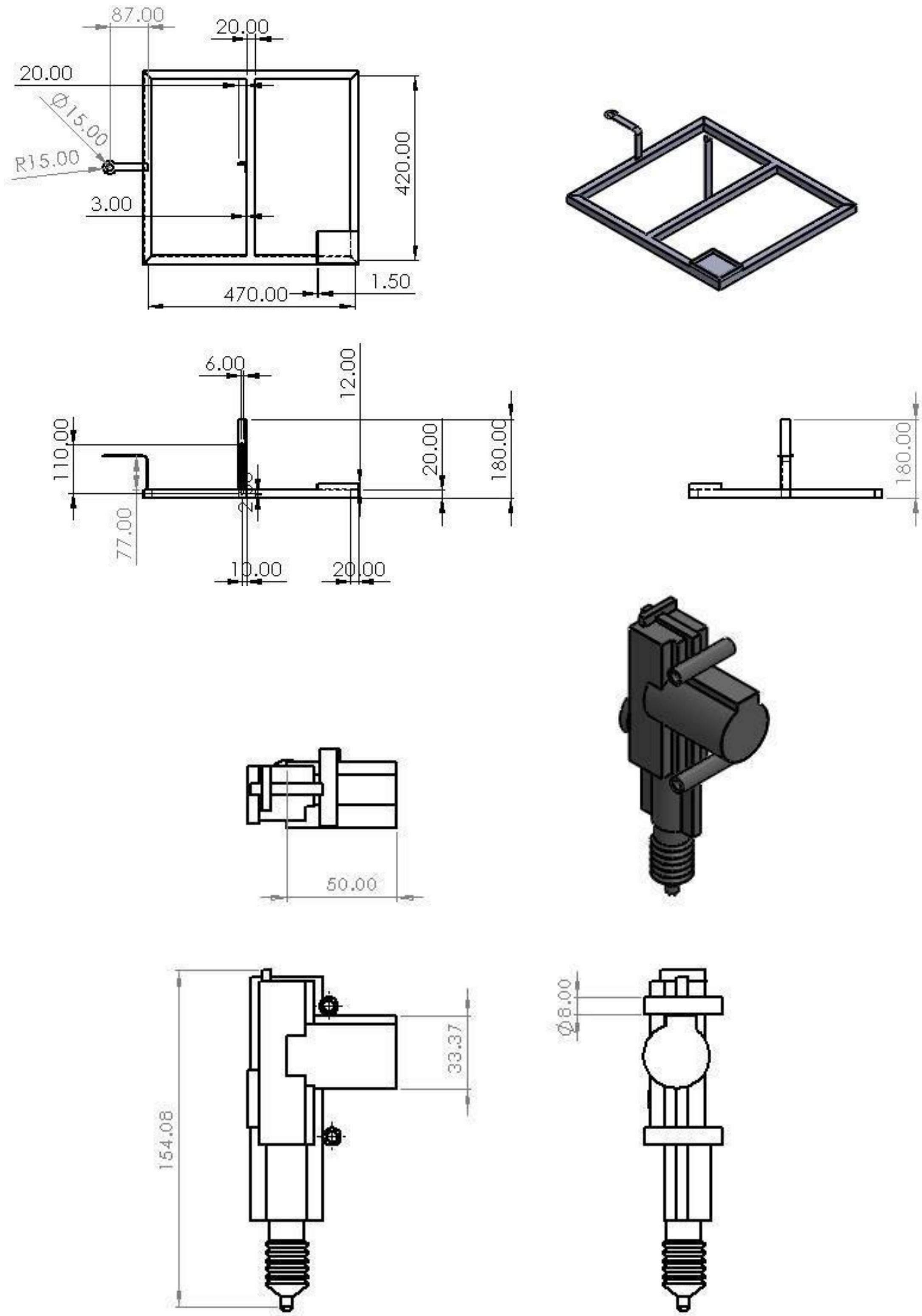


Fig: linear actuator

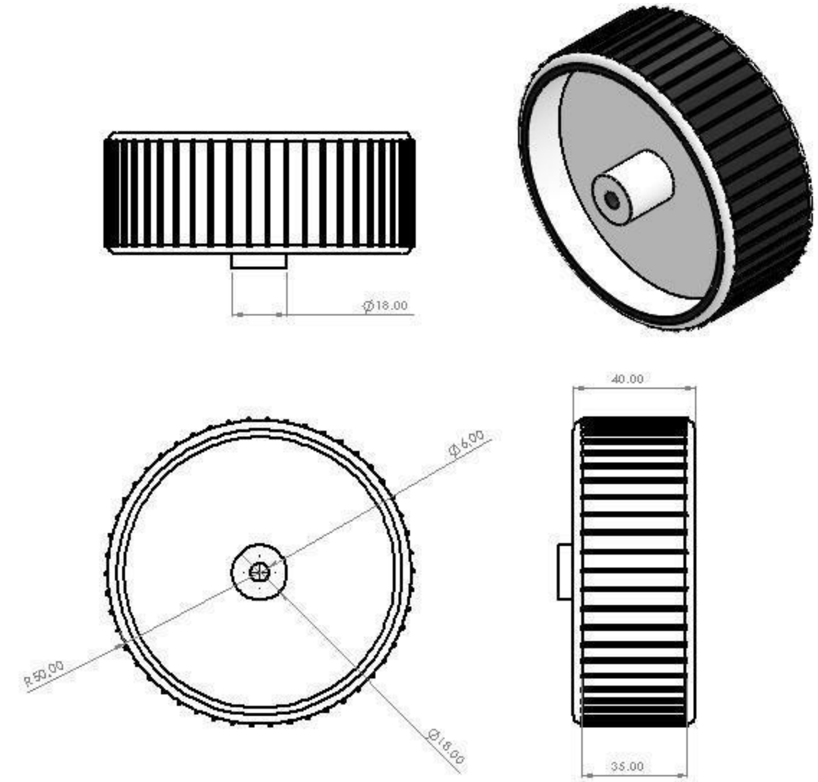


Fig: wheels

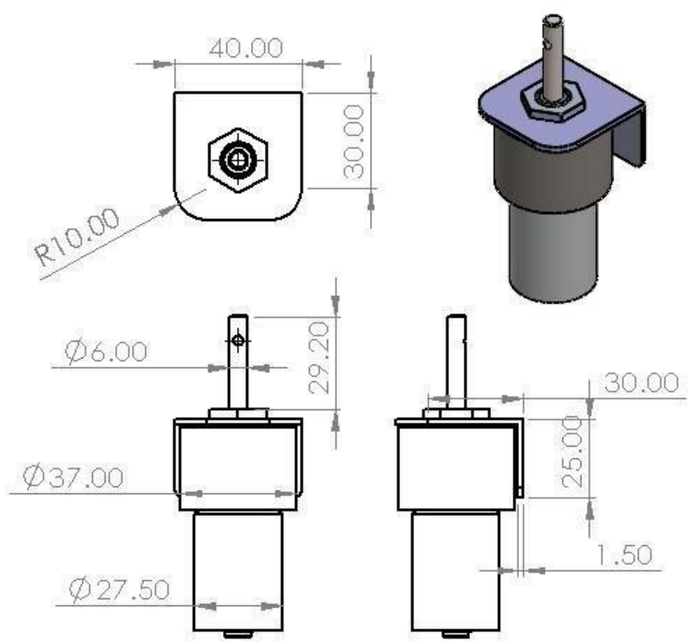


Fig: motor

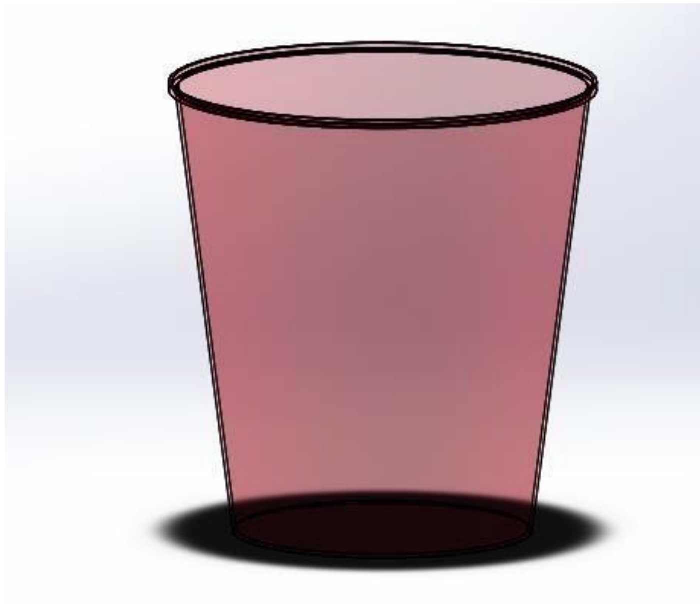


Fig: Bucket

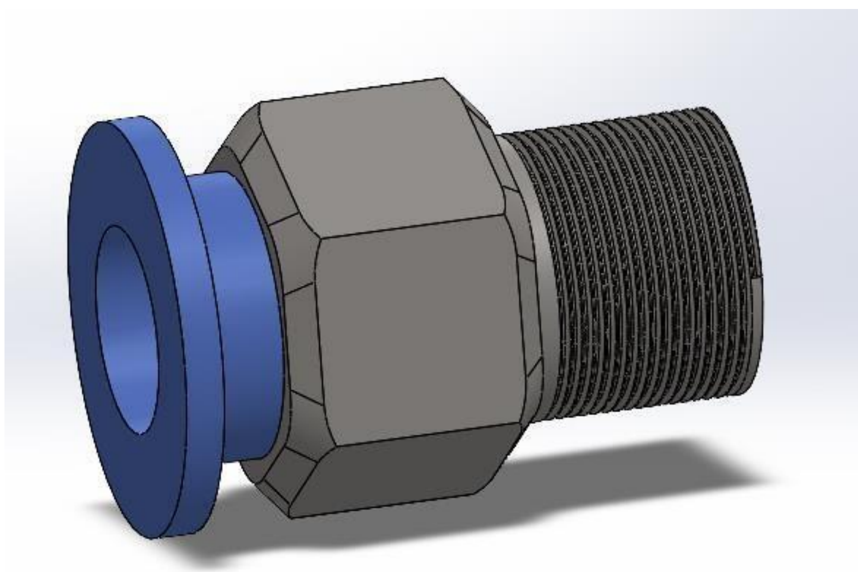


Fig: push connector

3.4 Calculations

Why Mild Steel C-45 is selected in our project.

- Easily available in all sections.
- Welding ability
- Machinability
- Cutting ability • Cheapest in all other metals.

Material = C 45 (mild steel)

Take factor of safety 2

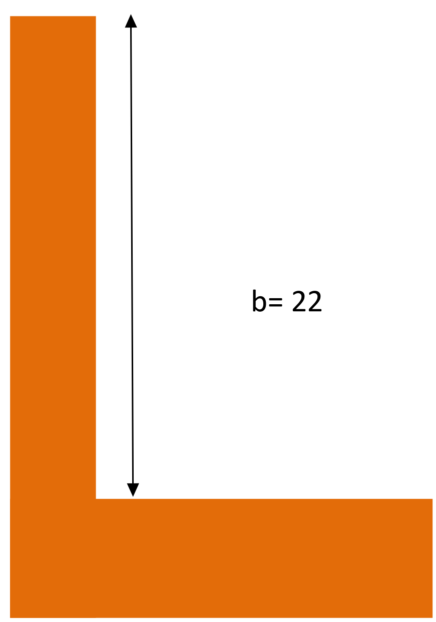
$\sigma_t = \sigma_b = 540/fos = 270\ N/mm^2\ \sigma_s$

$= 0.5\ \sigma_t$

= 0.5 x 270

= 135 N/mm^2

Let the total weight (P) of our machine be 40 kg, now this 40 kg weight is kept on four angles, so it may fail under bending.



P = 40 kg.

P = 40 x

9.8 = 392

N. L =

610 mm.

$M = WL/4 = 392 \times 610/4$

$= 59780$ N-mm

$Z = B^3/6 - b^4/(6 \times B)$

$Z = 25^3/6 - 22^4/(6 \times 25)$

$Z = 1042\ mm^3$

$= M/Z = 59780/1042 = 57.37\ N/mm^2$

As induced bending stress is less then allowable bending stress design is safe.

DESIGN OF DC MOTOR

Power of motor = 10 N- m /s
Rpm of motor = 30 rpm

CALCULATION FO FINAL SPEED & TORQUE OF MOTOR

Power of motor = P = 10 watt.

$$P = \frac{2\pi N T}{60}$$

Where, N→ Rpm of motor = 30

T →Torque transmitted

$10 = 2\pi \times 30 \times T / 60$

T= 3.182696317 N-m

T= 3182.696 N-mm
T = Force × radius

3182 = F × 50

F = 63.64 N

F = 63.64/
9.81N

F = 6.4 Kg

This the force generated by individual motor, total force generated will be 25.6 kg

V= πDN/60

V = 3.142 x 0.1 x 30 / 60

V = 0.157 m/s

1 m/s = 3.6 km/hr So,

V = 0.5652 km/hr

Design of shaft

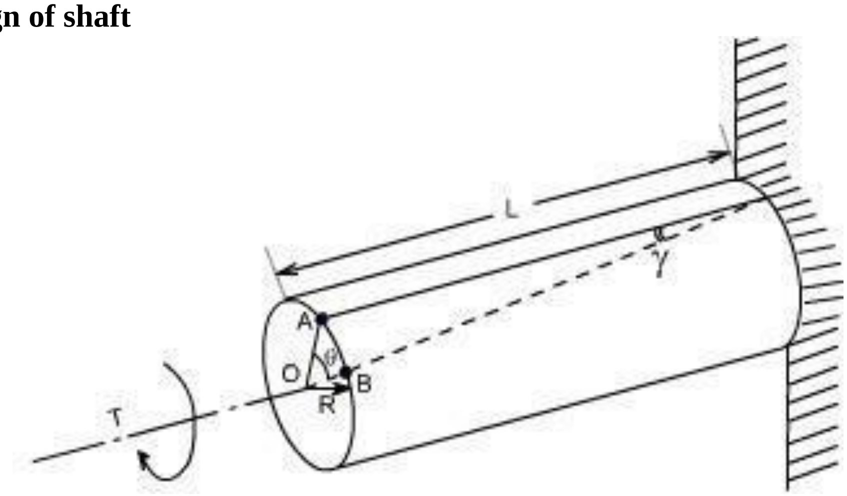


Figure: Shaft

Now, T is the maximum torque among all shafts, so we will check shaft for failure here.

$T = \pi/16 \ \ x135xd^3 \ \ d^3 = 3182$

$x\ 16/\ 3.142\ x\ 135$

d= 4.93 mm

But we are using 8 mm shaft so our motor so design is safe.

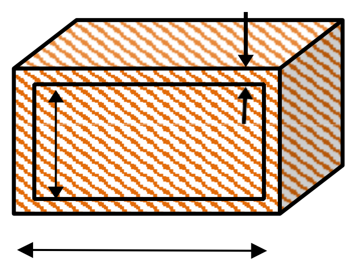
Square pipe of 20x20 section is used horizontally for chassis, we will check for its bending load.

The total load of equipment coming on chasis is not more than 5

kg So, load on each pipe is 5/4 = 1.25 kg = 12.5 N

M = W L / 4 = 12.5 x 470/ 4 =1468.75 N/mm

$Z = B^3 – b^3 / 6 = 20^3 - 17^3 / 6 = 514.5\ mm^3$ $\sigma_b = M / Z$



$\sigma_b = 1468.75 / 514.5 = 2.85\ N/mm2$

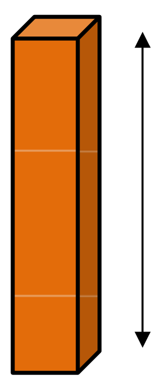
20 mm

$\sigma_{b\ INDUCED} < \sigma_{b\ ALLOWED}$

$2.85\ N/mm^2 < 270\ N/mm^2$

Hence our design is safe.

470 mm



COST ESTIMATION

RAW MATERIAL & STANDARD MATERIAL

SR NO	PART NAME	MAT	QTY	COST
1.	ANGLES	MILD STEEL	3 KG	330
2.	SQUARE TUBE	MILD STEEL	10 KG	1100
3.	WHEELL	STD	4 NO	480
4.	LINEAR ACTUATOR	STD	1 NO	1200
5.	PIPE	STD	3 M	120
6.	CIRCUIT	STD	ALL	6250
7.	SPRAY PAINT	STD	1 NO	350
8.	NUT BOLTS	STD	1 KG	120
9.	MOTOR	STD	1 NO	1200
10	FLATS	MILD STEEL	3 KG	330
11	BATTERY 6V	LEAD ACID	2 NOS	650
12	CHARGER	STD	1 NO	450
13	WIRES	COPPER	5 M	150
14	MISCELLINOUS			500
	TOTAL			13230

Table: raw material cost

Chapter:
4. Working

4.1 Working:

The system is a solution in a way for the things discussed in problem statement. The architecture is designed using a open source hardware, which helps the developer build the system in very lesser time. Here the Arduino is the open source hardware and Arduino IDE is the tool used. Three sensors are used to monitor the things inside the greenhouse and three actuators for controlling the environment inside the greenhouse. The sensors perform three operation that is, knowing the temperature inside the greenhouse, testing the moist content of the soil and checking the lighting conditions inside the greenhouse. The actuators perform their operation based on sensor values.

The system uses a microcontroller (NodeMCU) which has a Wi-Fi module (ESP8266) over it. Smartphone with blynk is used as user interface. Soil moisture sensor, humidity and temperature sensor (DHT11) and rain detection sensors along with DC motor and deek robot are used. This DC motor is connected to a water pump which pumps water to the crops when the DC motor is ON. The soil moisture sensor senses the moisture level in the soil. Depending on the level of moisture, NodeMCU decides whether to water the crop or not. By using appropriate functions and conditional statements in the code written for the NodeMCU functioning, the watering of the crop starts by NodeMCU making DC motor ON when the moisture content is below a threshold value and is made OFF when there is enough moisture content in the soil. The humidity and temperature sensor gives the humidity and temperature values of the atmosphere which determine whether the crop is suitable forgrowth. Some crops grow only in particular weather conditions and some give better yield only for a particular temperature range. The raindrop sensor measures the intensity of rain. If there is enough rainfall to provide soil with required water, the crops are not watered. Even after raining, if the crops are not having sufficient water, then water is pumped again by making DC motor ON. Data reaches the blynk cloud from Node MCU hrough Wi-Fi from Wi-Fi module present on Node MCU. The data then goes to blynk app in smartphone where the user can see the humidity, temperature, soil moisture levels and get the notifications if there is rainfall and if the DC motor is ON.From this app, the farmer can control the DC motor through various buttons and switches. When the Node MCU gets the command from the app then the appropriate analysis is done and the DC motor is controlled. The data again travels through Wi-Fi again in the same path. The flow of the Smart farming system is as shown in the Figure.

4.2 Working flow chart:

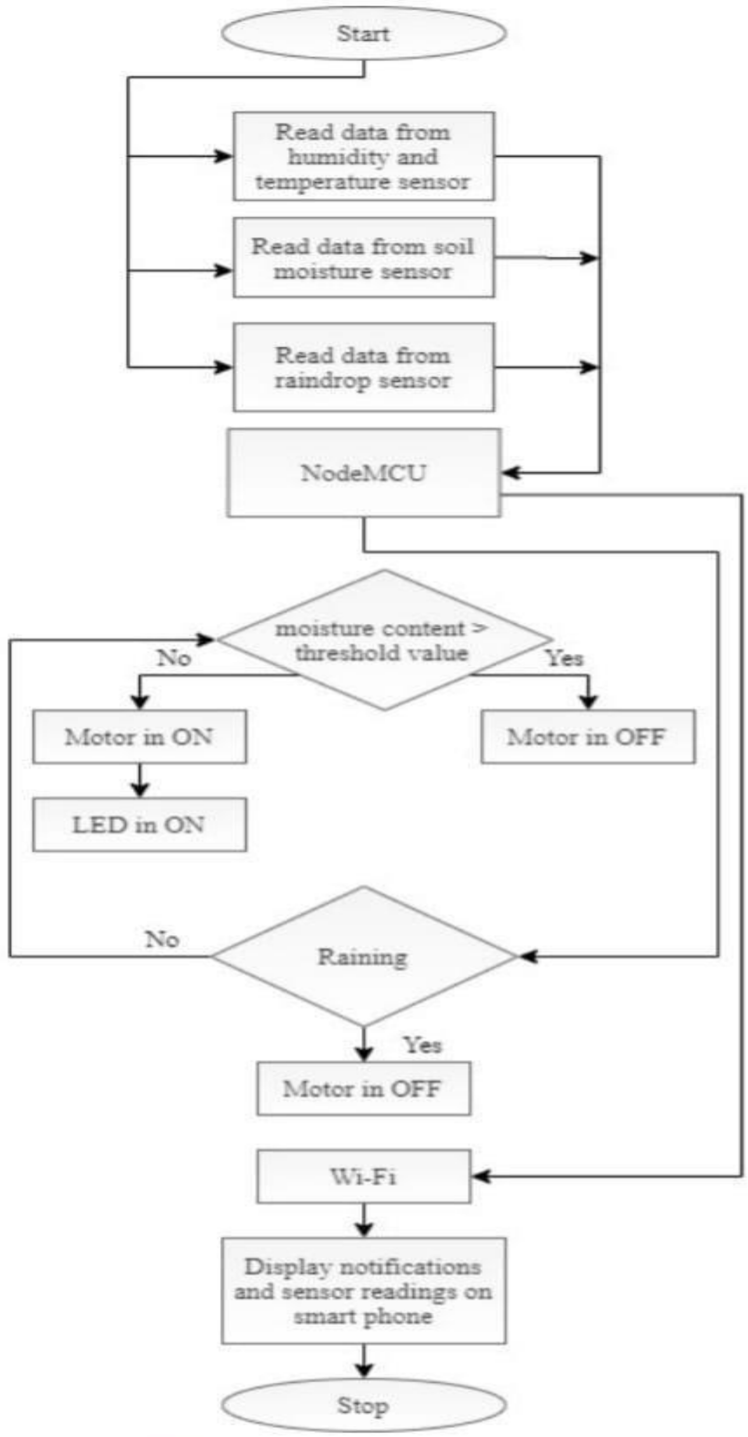
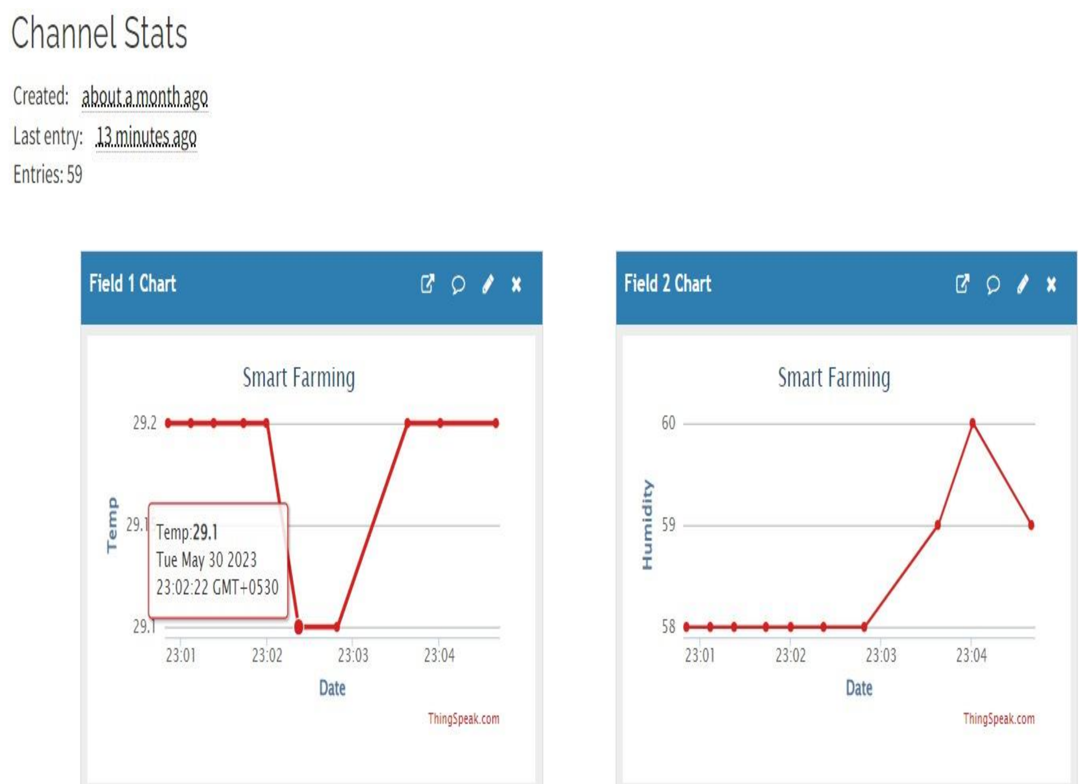
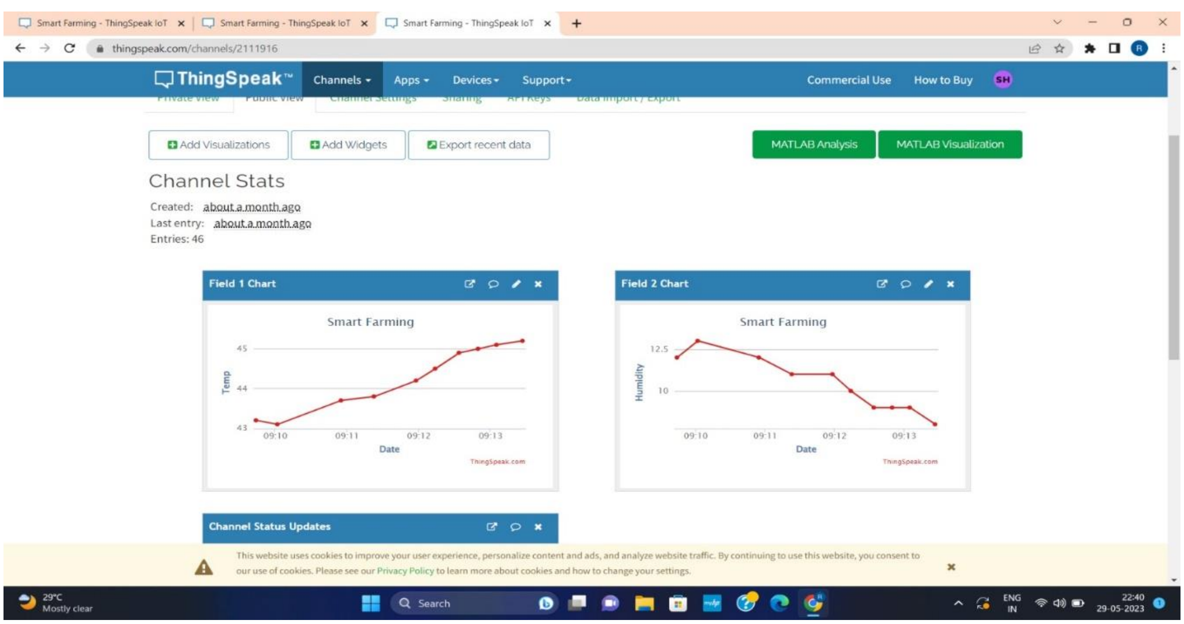


Fig. 1. Flow of the Smart Farming system.

Chapter:
5.Result and Discussion





Graph of temperature and Humidity

Temperature sensor and humidity sensor output :-

Sr. No	Temperature	Humidity %
1	30.1	56
2	30.1	56
3	30.1	56
4	30.1	56
5	30.1	56
6	30.2	55
7	30.2	55

As recorded values of temperature and humidity is above threshold value that are set in programming so water pump and fan get started and we get the following result :-

Sr. No	Temperature	Humidity %
1	29.2	58
2	29.2	58
3	29.2	58
4	29.2	58
5	29.2	58
6	29.1	59
7	29.1	60

Chapter:
6. Conclusion and Future Scope

6.1 Conclusion

We have proficiently studied tracking and controlling of parameter supplying higher surroundings for crop boom which in term improve the product In long term.

- With the help of this system, adequate amount of water is pump and rain is also utilized efficiently.
- This system is very much useful to farmers as they need to regularly pump water and check the status of each crop.
- From anywhere in the world farmer can know the values of humidity and soil moisture and if the dc motor is on through the blynk app in their smartphone.

In conclusion, Smart farming has a bright future with immense potential to address food security challenges, promote sustainability, and meet changing consumer preferences. As technology advances and environmental concerns deepen, the scope for Smart farming will continue to expand, offering numerous opportunities for agricultural innovation and growth.

6.2 Future Scope

By utilizing a sensor to record the soil's pH level, our project can be improved to lessen the need for fertilizer. Installing a water meter will allow you to calculate how much water is used for irrigation and estimate the cost. Additionally, it lowers farmers' investment. Also we can use solar system as power source for this system.

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