SMART POLYHOUSE AUTOMATION SYSTEM USING IOT TECHNOLOGY

[1]Shraddha Pashine, [2]Roshni Baniya, [3]Sejal Waghmare, [4]Govind Khapekar, [5]Prof. Deepak Deshpande

[1] Student, Guru Nanak Institute Of Engineering And Technology, RTM Nagpur University, Nagpur (M.H),
[2] Student, Guru Nanak Institute Of Engineering And Technology, RTM Nagpur University, Nagpur (M.H),
[3] Student, Guru Nanak Institute Of Engineering And Technology, RTM Nagpur University, Nagpur (M.H),
[4] Student, Guru Nanak Institute Of Engineering And Technology, RTM Nagpur University, Nagpur (M.H),
[5] Assistant Professor, HOD Department Of ETC, GNIET, RTM Nagpur University, Nagpur (M.H)

Abstract – *The **"SMART POLYHOUSE AUTOMATION SYSTEM USING IOT TECHNOLOGY** " is an IoT-centered system created to replicate current weather conditions from any selected city. Utilizing an ESP8266 microcontroller, the AWS IoT platform, and a weather forecast API, the chamber simulates environmental conditions such as temperature, humidity, wind speed, and lighting within a controlled acrylic environment. The hardware configuration comprises a heating coil, Peltier device, DHT11 sensor, fan, and growth lights to replicate the collected weather data. This system offers a compact and economical solution for agricultural research, environmental investigations, and materials testing, delivering precise, real-time weather simulations that enhance decision-making in applicable areas. This covers advanced aspects such as data analytics and decision support systems while tackling challenges and future directions, including scalability and security, with a thorough examination of IoT, mobile applications, and cloud-based databases within the framework of polyhouse management. It also supports real-time data visualization and analysis methods for equipping farmers with insights for better decision-making. The incorporation of a real-time Firebase database is a primary emphasis of this review since it offers a strong cloud-based system for storing and synchronizing sensor information. The benefits of the real-time Firebase database, such as real-time value updates, effortless synchronization across multiple devices, and easy integration with Android applications, are examined thoroughly.*

Key Words: Polyhouse, Smart Farming, IoT technology, NodeMCU, Sensors, Android App

INTRODUCTION

In later decades the integration of web of things innovation portable app and cloud-based databases has brought almost noteworthy progressions in the field of farming one such application is the administration of polyhouse too known as nursery or controlled-environment agribusiness structures which give a perfect environment for developing crops by leveraging IOT and versatile innovations. Canny polyhouse organization system has created engaging agriculturists to remotely screen and control distinctive parameters interior their polyhouses. Distinctive sensors sent interior polyhouses such as temperature and stickiness, soil moistness is assessed highlighting their noteworthiness in watching and keeping up perfect normal parameters for alter advancement. Other than, the portion of the android application is for real-time control and visualizing of data is explored.

The android application grants agriculturists to remotely screen and change fundamental parameters such as temperature and stickiness and water framework systems ensuring perfect improvement conditions for crops.

It too encourages real-time information visualizing and analyzing procedures for engaging ranchers with experiences for educated decision-making the integration of real-time firebase database is a key center of this survey as it gives a vigorous cloud-based stage for putting away and synchronizing sensor information. The points of interest of real-time firebase database counting real-time values upgrades, consistent synchronization over more than one gadget and streamlined integration with the android application are examined in detail. The primary reason behind the usage of the Keen Polyhouse Computerization Framework Utilizing Hub MCU In IOT is utilized to develop particular sorts of blooms, natural products, vegetables to increment efficiency and quality of crops.

Poly house being broader term of green house is a put given beneath glass or polythene to give controlled conditions of temperature, mugginess, light etc., for developing different plants. Polyhouse is the strategy that quickens the development of crops and plants, assembly the essential necessities for development. Collecting a single trim requires negligible extra applications and inputs, coming about in most extreme yield and benefits. A polyhouse can give a perfect environment for developing high-quality plants. The development of plants is fundamentally impacted by variables such as temperature, stickiness, carbon dioxide levels, and soil dampness. If we are able to control all the over said parameters to which a plant certainly requires it, comes about in appropriate development of the plant which in turn comes about in tall abdicate of the edit by moving forward the development potential of the plant and by giving perfect condition for the plant development. The essential objective is to develop plants in a controlled environment, particularly a polyhouse, and closely screen and

direct all the fundamental components. Polyhouse is a structure developed utilizing bamboo or press channels, which are secured with a UV-resistant sheet of a particular thickness.

The thickness of ultra violet sheets shift depending on the particular trim assortment. Any change in one parameter can impact the other climatic parameters, requiring continuous observing and control measures to guarantee the prerequisites are met. By altering these parameters through control activities, it is conceivable to accomplish ideal plant development and higher edit yields. Be that as it may, in some cases generation capacity may diminish due to need of mindfulness of the conditions that require to be checked or due to human blunder. To fathom this issue, we have actualized a keen robotization arrangement that employments Web of Things technology.

Using different sensors, the conditions are checked and suitable activities are taken appropriately. The essential concept of the extend is to create an IoT-enabled climate recreation chamber that imitates real-time climate conditions from any city. The framework utilizes information gotten from a climate figure API, handled and transmitted by means of AWS IoT, and imitated inside the chamber utilizing temperature control, mugginess administration, wind recreation, and lighting control. In the field area, diverse sensors are introduced in the field, such as temperature sensors, dampness sensors, water engines, and stickiness sensors. The data accumulated from these sensors is connected to the Arduino uno. In the control segment, the gotten information is cross-checked against the foreordained limit values. If dampness level is moo at that point Arduino switches on a water pump to give water to the plant consequently. Water pump gets consequently off when framework finds sufficient dampness in the soil. Overhauling the status of water pump and soil dampness. A water system framework for productive water administration and crops proposal agreeing to temperature, stickiness and dampness level which is detected by executed sensors. Parameters like dampness, temperature, stickiness are measured by utilizing sensors. In show, is included which is a stage to control the Arduino that underpins equipment platform.

Monitoring the temperature, mugginess and dampness level by utilizing sensor and sending the status to the webpage by means of IOT module. Watering will be done naturally by predefined time delay. This venture incorporates different highlights like IoT based farther controlled soil observing, dampness & temperature, stickiness detecting, edit proposal and legitimate water system offices. It makes utilize of remote sensor systems for noticing the soil properties and natural components ceaselessly. Different sensor hubs are sent at distinctive areas in the cultivate. Controlling these parameters are through any farther gadget or web administrations and the operations are performed by meddle sensors. This concept is made as a item and given to the farmer's welfare.

So, making Programmed Plant Water System Framework utilizing Arduino, which naturally gives water to plants. In this Framework, the Soil Dampness Sensor checks the dampness level in the soil and if dampness level is moo at that point Arduino switches on a water pump to give water to the plant. Water pump gets consequently off when framework finds sufficient dampness in the soil.

System will to give include to degree the temperature and mugginess of soil and propose the edit proposal agreeing to the detected esteem by sensor appropriate for that area. If visitor client fair to know almost trim proposal, at that point client fair log in and enter the city title the framework will naturally bring the temperature and stickiness of that area and framework appear the edit.

1. PROJECT OBJECTIVE

The primary objective is to move forward cultivating hones by utilizing modern innovations to move forward yields. It was completely robotized, expending less control from the man.
Some more goals of shrewd polyhouse cultivating include:

- **Sustainable farming:** Smart polyhouse cultivating can offer assistance make cultivating more maintainable by lessening squander and natural affect.
- **Improved productivity:** Smart polyhouse cultivating can move forward efficiency by mechanizing forms and giving real-time information get to.
- **Better asset management:** Smart polyhouse cultivating can offer assistance agriculturists optimize asset utilize, such as water and vitality.
- **Increased yield:** Smart polyhouse cultivating can offer assistance increment edit abdicate and quality.
- **Data-driven choice making:** Smart polyhouse cultivating can offer assistance agriculturists make educated choices around trim determination, fertilization, water system, and bother control.
- **Climate resilience:** Smart polyhouse cultivating can offer assistance producers keep up steady yields in spite of changing climate conditions.
- **Biodiversity preservation:** Smart polyhouse cultivating can offer assistance protect biodiversity by lessening the require for chemical pesticides.

2. BLOCK DIAGRAM

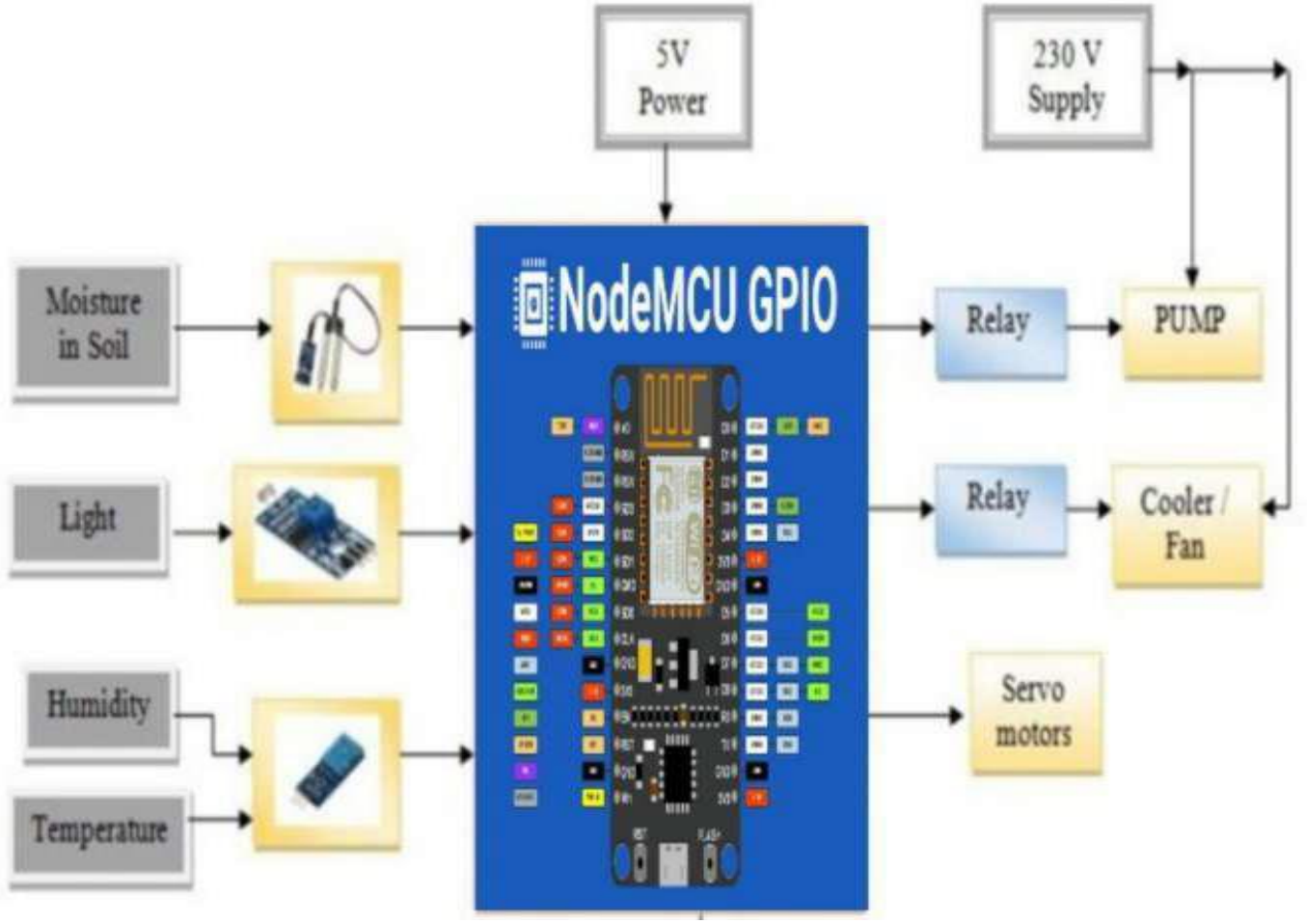


Fig: Block Diagram of Smart Polyhouse System

3. PROPOSED METHODOLOGY:

- **Monitoring**: Sensors monitor temperature, humidity, light intensity, soil moisture, and nutrient levels.
- **Controlling**: The data collected by sensors is used to automatically control the climate inside the polyhouse. For example, if the temperature rises too high, the IoT can activate ventilation or cooling systems.
- **Adjusting light**: The intensity of artificial light can be adjusted based on natural light conditions and the growth stage of the plants.
- **Detecting pests and diseases:** The system can detect early signs of pests or diseases.
- **Managing fish tanks:** In hydroponic farming setups, the IoT can manage fish tanks and optimize nutrient delivery to plants.
- **Remote access:** Polyhouse automation systems can be accessed from a smartphone, tablet, or computer.
- **Data Fetching**: The user selects a city from the web interface, and the system fetches real-time weather data (temperature, humidity, wind speed, and lighting) via a weather forecast API.
- **AWS IoT Integration**: The weather data is stored and transmitted to the ESP8266 microcontroller through AWS IoT services.
- **Environment Simulation**: The ESP8266 controls the chamber components based on the retrieved weather data:
  - **Temperature:** Managed by the heater coil and Peltier module.
  - **Humidity**: Monitored and regulated using the DHT11 sensor.
  - **Wind Simulation**: A fan adjusts its speed according to the wind speed data.

- **Lighting**: Grow lights simulate sunlight conditions based on the API data.
- **Monitoring**: Users can monitor the chamber environment remotely via the web interface.

4. COMPONENTS USED:

- **ESP 8266:**

The ESP8266 is a low-cost, small, and adaptable Wi-Fi microchip that's used in Internet of Things (IoT) devices. It's a system on a chip (SOC). The ESP8266 has been succeeded by the newer ESP32 microcontroller chip, but it's still a popular choice for IoT developers and manufacturers.

- **Heater coil:**

A heater coil's primary function is to provide heat and maintain the temperature of a space or object. It does this by converting electrical energy into heat through a process known as "joule heating".

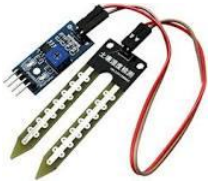
- **Peltier Module:**

Peltier modules, also known as thermoelectric modules, have many uses, including Cooling, Heating, Thermoelectric generators, Water purification. While Peltier modules are useful, they are not without limitations. They are less efficient than conventional coolant-based devices, and they will also decrease in efficiency over time.

- **DHT11 Sensor:**

The DHT11 is a commonly used humidity and temperature to measure temperature and humidity and an 8-bit microcontroller to output the values of humidity and temperature as serial data.

- **Soil Moisture Sensor:**



Soil moisture sensors gauge or approximate the quantity of water present in the soil. These sensors can be fixed in one place or portable devices like handheld probes. In the field, stationary sensors are installed at specific locations and depths, while portable soil moisture probes can measure soil moisture at multiple locations.

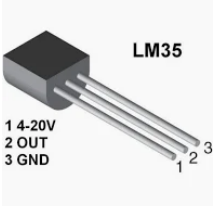
- **Relay Module:**

Relay modules serve as interface devices that permit the transfer of indicators and statistics between different gadgets or structures. They act as a bridge, allowing low-powered virtual electronics, together with microcontrollers like Arduino or Raspberry Pi, to govern high-powered gadgets like cars or lighting fixtures circuits.

- **L293D Module (Motor Driver) :**

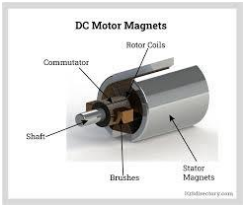
L293D is a fundamental motor driving force included chip (IC) that permits us to power a DC motor in both course and additionally manipulate the velocity of the motor. The L293D is a sixteen pin IC, with 8 pins on each aspect, permitting us to control the motor. It means that we can use a unmarried L293D to run up to 2 DC vehicles.

- **LM35 Temperature Sensor:**



LM35 is a temperature measuring device having an analog output voltage proportional to the temperature. It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry. The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases.

- **DC Motor:**



A DC motor is an electrical device that converts electric strength into mechanical energy. In a DC motor, the enter electric energy is the direct current which is converted into the mechanical rotation.

❖ **External Interface Requirements:-**

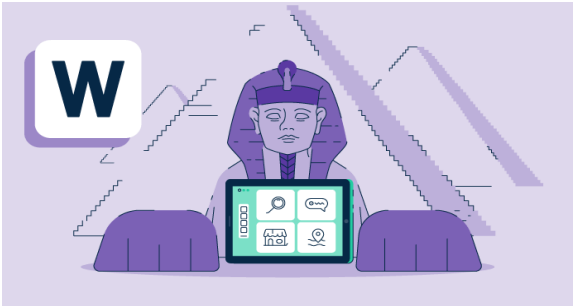
- **AWS IoT Services:**

Handles data storage, transmission, and remote monitoring.

- **Weather Forecast API:**

Fetches real-time weather conditions for the selected city.

- **Web Interface**:



Allows users to choose the city and view current chamber conditions

5. CONCLUSION:

Polyhouse robotization frameworks can offer assistance ranchers move forward edit quality and surrender by making an perfect environment for plants to develop in. They can moreover offer assistance agriculturists diminish labor costs and oversee assets more proficiently. With the utilize of Polyhouse robotization, a producer can increment the surrender and make strides the quality of crops and minimize climate for the trim by checking and controlling temperature, mugginess, light, and CO2 in the Polyhouse. The framework created produces ideal comes about for successful upkeep of controlled conditions in the polyhouse. Pump is turned on naturally when the dampness substance in the soil is less than the predefined esteem and at the same time the rancher gotten message related to it. With the created framework utilizing IoT, polyhouse is made more brilliant that takes care of controlled conditions consequently without any manual intercession. With this manual blunders can be diminished in observing polyhouse conditions and moreover ranchers can accomplish tall efficiency. IoT being the most recent developing innovation makes a difference to make strides quality and amount of polyhouse abdicate. This farming observing framework serves as a solid and productive framework and remedial activity can be taken. Remote observing of field diminishes the human control and it moreover permits client to see precise changes in trim abdicate. It is cheaper in fetched and expends less control. The savvy agribusiness framework has been planned and synthesized. The created framework is more effective and advantageous for agriculturists. It gives the data approximately the temperature, mugginess of the discuss in agrarian field to the rancher. The application of such framework in the field can unquestionably offer assistance to progress the gather of the crops and worldwide generation.
The ‘‘Smart Polyhouse Mechanization Framework Utilizing Arduino Uno In Iot” gives a versatile and reasonable way to recreate real-time climate conditions from any city utilizing IoT innovation. By coordination AWS IoT, it permits for exact checking and control, making it valuable for inquire about in agribusiness, natural science, and materials testing. The venture illustrates the potential of IoT in computerizing and imitating natural conditions, giving a adaptable device for analysts and teachers. In future this framework can be moved forward by including a few present-day strategies like water system strategy, sun-based control source utilization.

ADVANTAGES:

- Diminish the workload of agriculturists
- Natural cultivating is simpler beneath these structures.
- Generation of uniform quality crops.
- Administration of creepy crawly bugs, infections and weeds is simpler beneath these structures.
- You can develop low season crops. Such crops can abdicate higher benefits as they are in expanded request with small supply.
- We can appreciate a entirety year's abdicate of crops without having to hold up for the season’s revolutions.

6. DISADVANTAGES:

- Battery control ought to be required.
- Sensors may get fall flat some of the time.
- Restricted Recreation Parameters: Right now centers on temperature, mugginess, wind, and lighting, but needs other natural variables like discuss weight and precipitation.
- Subordinate on Web Association: Requires a solid association for getting climate information and communicating with AWS IoT.
- Fundamental Sensors: The utilize of straightforward sensors (like DHT11) may constrain the precision of natural control.

7. OUTPUT

–

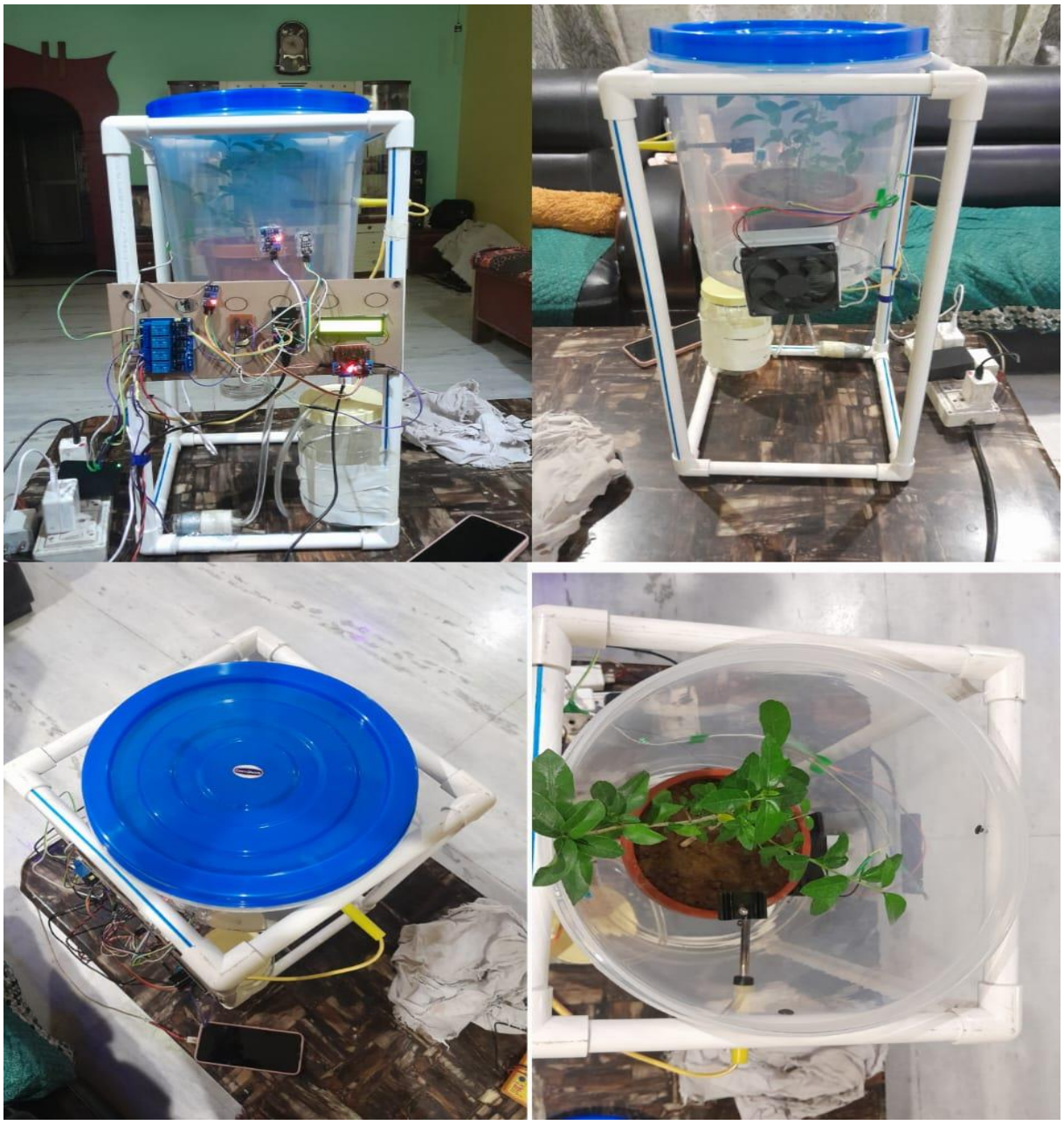


Fig: Final Look of Project

8. REFRENCES

1. Sahu K. & Mazumdar S.G., 2019, "Digitally Greenhouse Monitoring and Controlling of System based on Embedded System", International Journal of Scientific & Engineering Research (IJSER), ISSN: 2229-5518, Vol. 3, Issue 1, pp. 1-4.
2. Pawar S.D. & Rane U.A., 2019, "Environment Monitoring and Device Control using ARM based Embedded Controlled Sensor Network", SSRG International Journal of Electronics and Communication Engineering (SSRGIJECE), ISSN: 2348 – 8549, Vol. 2, issue 1, Jan 2019, pp. 34-37.
3. "IoT-based smart greenhouse for optimized crop cultivation" https://www.researchgate.net/publication/331862628_IoT-based_smart_greenhouse_for_optimized_crop_cultivation
4. "IoT-enabled Greenhouse Farming for Sustainable Agriculture" https://www.researchgate.net/publication/334125062_IoT-enabled_Greenhouse_Farming_for_Sustainable_Agriculture
5. "IoT-based Greenhouse Monitoring System" https://www.electronicsforu.com/electronicsprojects/hardware-diy/iot-based-greenhouse-monitoring-system]
6. "Smart Greenhouse Management System using IoT" https://ieeexplore.ieee.org/document/8274876
7. "IoT-based Intelligent Greenhouse for Smart Agriculture" https://www.sciencedirect.com/science/article/pii/S221201731630042X
8. Y. R. Sonawane, S. Khandekar, B. K. Mishra and K. K. S. Pandian, "Environment monitoring and control of a poly house farm through Internet," in Proceedings of 2nd Intelligent Computing and Information and Communication, IIT Kanpur, 2016.
9. Weather API documentation for real-time weather data.
10. AWS IoT Developer Guide for cloud-based data storage and transmission.
11. IoT-based environmental control systems research papers.
12. Technical specifications and guides for ESP8266, DHT11, and Peltier modules.