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SMART CONTROLLER FOR CONTROLLED ENVIRONMENT AGRICULTURE

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Abstract
The present-day challenge for moving forward plant development and decreasing costs legitimizes the advancement of a robotized water system framework that will minimize the squander of water and diminish work and observing overhead. Feedback-based approaches empower more effective dealing with of assets than open-loop frameworks, at the cost of complexity and solidness issues. Soil moistures are troublesome to degree, and their target levels cannot be kept up exceptionally successfully.A nursery gives an environment to develop plants all year circular, indeed on cold and cloudy days. Be that as it may, extraordinary natural variables interior the nursery such as tall temperatures and a tall mugginess can contrarily affect the plants. Subsequently, controlling this environment is fundamental in arrange for the plants to develop solid and healthy.The point of this extend was to plan and construct a nursery controller that can keep up the environment, by acting upon live sensor readings and be able to show the status of the system.

Keywords - Smart Controller, Agriculture, Environment, Node MCU, Arduino Nano

1. INTRODUCTION

Water could be an asset that all living species need. It is in this manner exceptionally valuable and needs to be utilized with control to be protected for the eras to come. Farming is an industry that employments a parcel of water[1].Most of the time, this resource isn't utilized effectively and considerable sums of water are squandered. Within the close future, these squanders will speak to a huge whole of cash. The ones who manage this asset proficiently will be winning time and money. In this extend report, a computerized water system framework is proposed to play down the water input and human intercession, whereas fulfilling the plant's needs. To begin with, the subtle elements of the issue are summarized. The objective and the scope of the venture are portrayed. A few common approaches to the plan are checked on. The comes about and conclusions of a test to decide the specified sums of water are examined[1]. At that point, the recommended plan is clarified in detail with the reason, necessities and imperatives.

Agriculture is India's biggest client of water. Be that as it may, expanding competition for water between industry, residential utilize and agribusiness has highlighted the ought to arrange and oversee water on a waterway bowl and multi-sartorial premise[2]. As urban and other requests duplicate, less water is likely to be accessible for water system. Ways to drastically enhance the efficiency of water system ("trimmer per drop") to befound[1]. Channelled transport, superior on-farm administration of water, and use of more productive delivery mechanisms such as trickle water system are among the activities that can be taken. There's moreover an ought to oversee as restricted to abuse the utilize of groundwater[3].Motivations to pump less water such as requiring power charges or community observing of utilize have not however succeeded past scattered activities[5]. Other key needs incorporate: (i) modernizing Water system and Waste Offices to coordinated the interest of ranchers and other offices in overseeing water system[2].

An assortment of new natural products and vegetables ought to be open at all times. In any case, the normal climate avoids the development of certain natural products and vegetables, particularly amid winter. This comes about in moment from diverse zones, which in turn has a few drawbacks. Not as it were does the shipping of imported products influence the environment contrarily but imported nourishment or vegetables are too less flavourful and sold to the next cost. The crops must be harvested prematurely when bringing in nourishment. This can be to delay the maturing handle so that it is conceivable for the natural products or vegetables to reach their goal some time recently they are considered unpalatable. The maturing prepare is later continued by splashing the nourishment with ethylene gas, a gas that's regarded to advance aging in certain natural products and vegetables. Be that as it may, this postharvest aging can lead to destitute taste. In the past couple of a long time, an expanded intrigued in natural and locally created nourishment has ended up a developing slant. Locally developed nourishments are picked[3].Temperature control alludes to the forms that are pointed at keeping up the temperature in a given region at certain maximum/minimum level or inside a certain run. This handle is commonly utilized in most regions of the world. As of late, globalization and industrialization has assist required the require for Temperature Control applications in different day by day exercises, particularly with the approach of the green house impact. Numerous Homes and Businesses among other ranges keep up certain areas of

operation that must be kept up inside a certain temperature for handle to work effectively[4].In investigate research facilities, the need of utilize of Temperature Control Frameworks has leadto the buy of chambers of different sizes where temperature particular inquire about work would be kept. This has moreover lead to an increment in overhead taken a toll. In regions that have electronic exercises or apparatus working continually, such as in server rooms and generation plants[4].

2. SMART CONTROLLER FOR CONTROLLED ENVIRONMENT AGRICULTURE

2.1 BASIC BLOCK DIAGRAM

BLCOK DIAGRAM

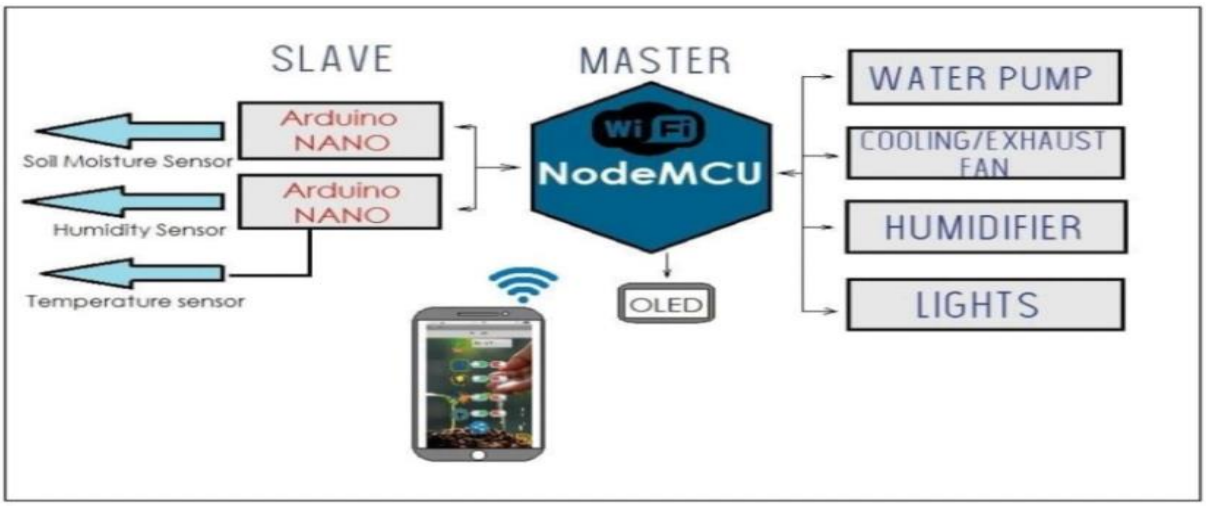

Fig. 1. Block Diagram

This project can majorly be divided into 3 sub-systems
1. Master and Slave controller (NodeMCU and Arduino NANO)
2. Input devices (Sensors, transducers)
3. Output devices (relays, OLED display)

3. SYSTEM REQUIRMENTS

CHOICE OF CONTROLLER

The microcontroller is the key component of the extend because it will control the sensors and transducers that monitor the environment. It'll moreover require a way to associate to the web and store sensor readings and plant settings. Beginning investigate into the conceivable gadgets required for this extend appeared that the microcontroller would need around 2 simple pins and 6 computerized pins. This required to be taken under consideration when selecting the board. However, these values were likely to alter as the venture advanced so the board required to be able to manage with that.

Selected controllers are
1.Aurduinonano
2.NodeMcu

3.1 ARDUINO NANO

The Arduino Nano could be a little, total, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same usefulness of the Arduino UNO, but in a distinctive bundle. It needs as it were a DC control jack, and works with a Mini-B USB cable rather than a standard one. Microcontroller ATmega328p, Design AVR, Working Voltage 5v, Streak Memory 32Kb, Clock Speed 16MHz, Simple I/P pins 8, Input Voltage 7-12V, Computerized I/O pins 22(6 PWM), PWM yield 6, Control Utilization 19mA, PCB Measure 18mm*45 mm, Weight 7g.

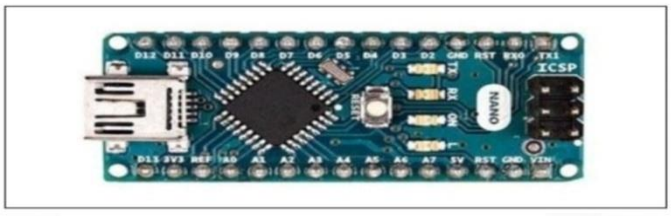

Fig. 2.Arduino NANO

3.2 NODEMCU (MASTERBOARD)

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the Lua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open-source projects, such as laicising, and spiff Developer ESP8266 Open-Source Community, Type Single Board Microcontroller, Operating System XTOS, Memory 128kB, Storage 4MB, CPU ESP8266, Power USB.

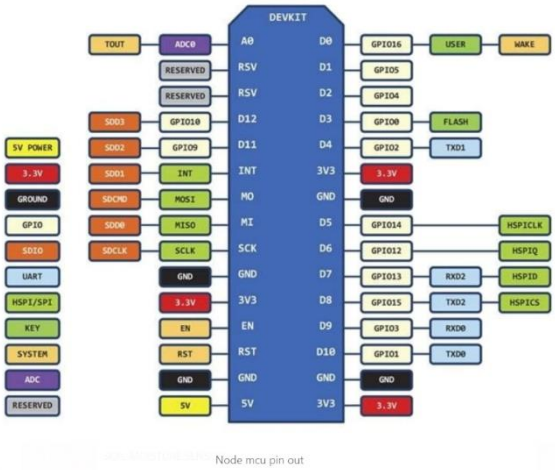

Fig. 3.Node MCU pin out

3.3 SOIL MOISTURE SENSOR

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free-soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for sensing in hydrology and agriculture. The measurement of soil moisture is based on the electrical resistivity of the medium, which decreases as the water content increases. This device is buried in intimate contact with soil and reaches equilibrium with the soil moisture. Stainless steel electrodes are fs. embedded in the granular matrix. When the soil wets up, the sensor moisture gets higher and the electrical resistance is reduced. When the soil dries, the resistance is increased since the sensor moisture gets lower. Module in the soil humidity less than a set threshold value when the AO port output high, when the when soil humidity exceeds the threshold value is set, the module D0 output low; Small plates digital outputs D0 can be directly connected with the microcontroller, microcontroller to detect high and low, and thus to detect soil moisture. Power supply :3.3v-5v Output voltage signal:0-4.2v current 35mA.

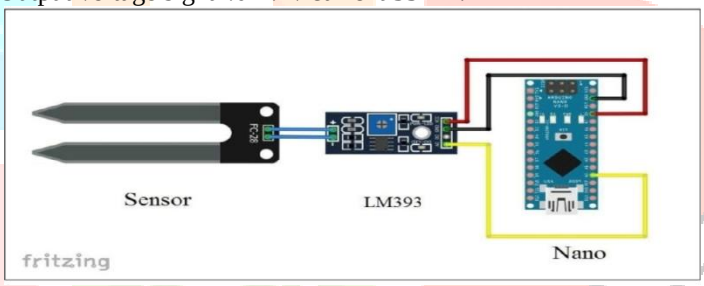

Fig. 4. basic connection for prototyping

3.4 DHT11 HUMIDITY SENSOR

DHT11 Temperature & Humidity Sensor highlights a temperature & stickiness sensor complex with a calibrated digital signal input. This sensor incorporates a resistive-sort moistness estimation segment and a NTC temperature estimation part, and associate with a high execution 8-bit microcontroller, offering fabulous quality, quick reaction, hostile to obstruction capacity and expense adequacy. Power supply :3.3-5v measurement range :20-90RH% 0- 50degree humidity accuracy +-5% RH Temperature Accuracy:+-2 degree

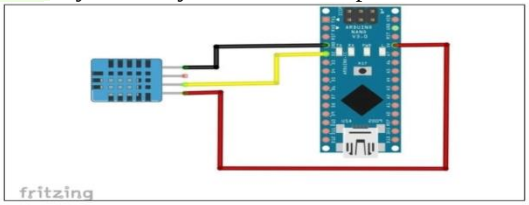

Fig. 5. basic connection for prototyping

3.5 OLED DISPLAY

The OLED Display is used to display the sensor values. The display also shows weather forecast for next 3 days. It displays time, day, date, Relative humidity, forecast, indoor
and outdoor temperatures. Type: graphic Display format: 128 x 64 dots Built-in controller: SSD1306BZDuty cycle:1/64 +3 V power supply Interface: 6800, 8080, serial, and I2C Module dimension: 26.7 x 19.26 x 1.65.

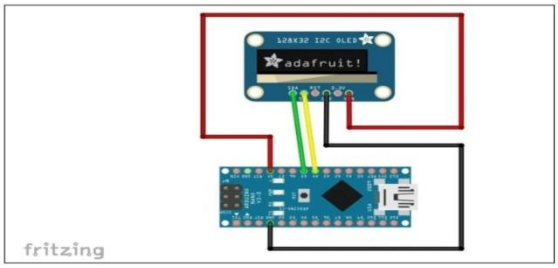

Fig. 6. basic connectionfor prototyping

3.6 HC-05BLUETOOTH CONNECTION MODULE

HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. By default, the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices.

Hardware Features

1. Typical -80dBm sensitivity.
2. Up to +4dBm RF transmits power. a. to 5 V I/O.
3. PIO(Programmable Input /Output) control.
4. UART interface with programmable baud rate.
5. With integrated antenna.

Software Features

1. Slave default Baud rate: 9600, Data bits: 8, Stop bit: Parity: No parity.
2. Auto-connect to the last device on power as default.
3. Permit pairing device to connect as default.
4. Auto-pairing PINCODE:"1234" as default.

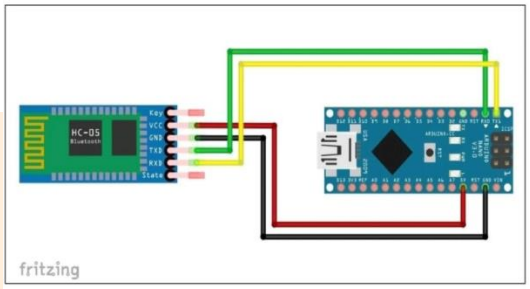

Fig. 7. HC-05 circuit connection for testing

3.7 RELAYS

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch. A 4channel relay module is used in this project, which acts as actuating mechanism to turn on/off mechanical devices such as pumps, blowers, air washers. The relay module receives signal from controller and it accordingly actuates mechanical devices. "NC" ports mean "Normally connected to COM" and "NO" ports mean "Normally open to COM". This module also equipped with 4 LEDS to show the status of relays. NC-Normally closed NO-Normally Open Drive current: 20mA Control signal: 5V/12V/24V TTL level Maximum switching voltage: 250VAC 30VDC.

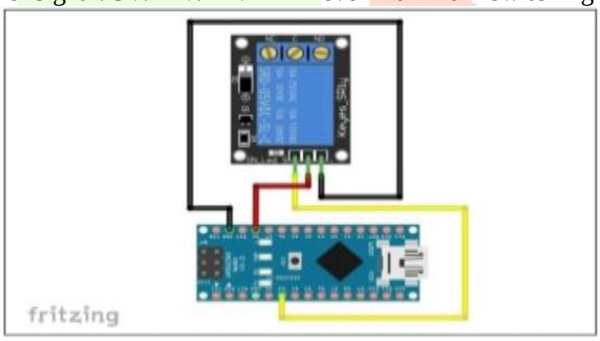

Fig. 8 .basic connection for prototyping

4. CIRCUIT DIAGRAM

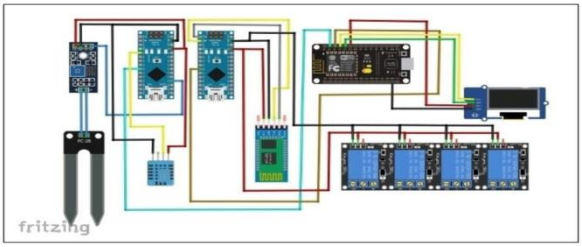

Fig. 9. Circuit Diagram

4.1 WORKING

1. As mentioned earlier, this system has a master controller. It also has 2 slave controllers. The slave controllers handle individual subsystems. One out of two deals with soil moisture sensing. The other however looks after humidity and temperature sensing.
2. The master controller has integrated Wi-Fi built in. the board connects to available network via Wi-Fi, thus allowing a connection with the user.
3. The detailed working of soil moisture sensing subsystem and humidity/temperature sensing will be explained in detail in later part.
4. Slave 1 and Slave 2 obtain sensor data and accordingly take decision of controlling concerned parameters. Their decisions are however cross checked by the master controller.

5. which also compares the acquired data with real time data obtained from local weather station. The master pulls weather data from local weather station and displays it on an OLED display. The weather data includes, present day humidity, temperature, forecast for next 3 days, day, date, time.
6. Since the master has integrated Wi-Fi, it can easily be controlled over the internet via mobile phone, laptop, tablets or any device that has internet access.
7. The android app also has features other than automatic and manual control of the device. The app also has options for locating nearest soil testing lab, to apply for soil health card, to apply for crop insurance. In addition, it also has troubleshot and maintenance guide for the device.

5.ALGORITHM

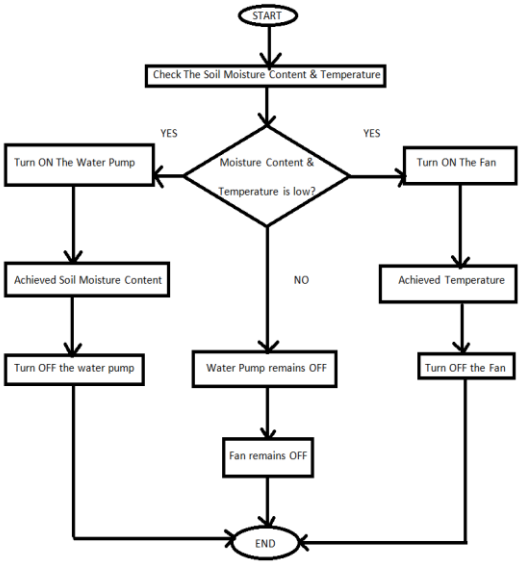

Fig. 10. Algorithm

5.1Algorithm Explanation

1.This is our project Algorithm.
2.Firstly, it checking whether the Humidity and Temperature of our Green house. And accordingly, it takes actions.
3.If the humidity level of the soil is less then it will turn on the water pump. Once the humidity level of soil reaching up to its desired set value then it will turn off the water pump.
4. Same with Temperature measurement if the temperature of our Green House is less than threshold voltage then it will adjust the temperature of our green house by turning on our fan.
5. As the temperature is equal to our desired temperature value then it will turn off the fan.
6. And if the humidity of our soil is already equal to our desired value, then the motor pump remains off.
7. And also, if our temperature of green house is also equal to desired set value then fan also remains off.

6. APP-CONTROLLED AGRICULTURE

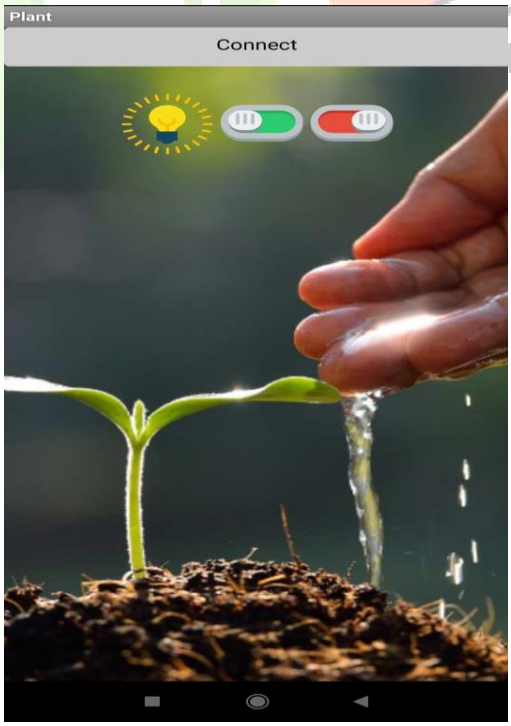

Fig.11.App View

6.1.App Use

1.This App is developed forcontrolling different-different device's which are connected to our model so that we can access the control of those from our remote location.

2.Here we are connecting A light bulb for purpose of demonstration but here we have some more options like fan, humidifier, motor etc, which we can connect to this port.
3.So that in this project we have two options of controlling device like fan, motor Automatically or through this app as remotely.

7.APPLICATION

7.1 Precision Farming

Moreover, known as exactness horticulture, exactness cultivating can be thought of as anything that creates cultivating hone more controlled and exact when it comes to raising animals and developing crops. In this approach of cultivate administration, a key component is the utilize of IT and different things like sensors, control frameworks, mechanical autonomy, independent vehicles, computerized equipment, variable rate innovation, and so on. The appropriation of get tohighspeed web, portable gadgets, and dependable, low-cost satellites (for symbolism and situating) by the producerare a number of key advances characterizing the accuracy agriculture trend? Accuracy farming is one of the foremost popular applications of IoT within the agricultural segment and various organizations are leveraging this procedure around the world. Crop Metrics could be an exactness horticulture organization centred on ultra-modern agronomic arrangements whereas specializing within the administration of exactness water system. The items and administrations of Crop Metrics incorporate VRI optimization, soil dampness tests, virtual optimizer Professional, and so on. VRI (Variable Rate Water system) optimization maximizes productivity on flooded trim areas with geography or soil changeability, progress yields, and increments water utilize productivity. The soil dampness test innovation gives total in season neighbourhood agronomy bolster, and suggestions to optimize water utilize effectiveness.

7.2 Livestock Monitoring

Expansive cultivate proprietors can utilize remote IoT applications to gather information with respect to the area, prosperity, and wellbeing of their cattle. This data makes a difference them in recognizing creatures that are debilitated so they can be isolated from the group, subsequently anticipating the spread of illness. It too brings down work costs as farmers can locate their cattle with the assistance of IoT based sensors. JMB North America is an organization that provides bovine checking arrangements to cattle makers. One of the arrangements makes a difference the cattle proprietors watch dairy animals that are pregnant and around to grant birth. From the calf, a sensor filled by a battery is ousted when its water breaks. This sends data to the crowd chief or the farmer. Within the time that's went through with yearlings that are giving birth, the sensor empowers ranchers to be more centred.

8. AUTHOR DETAILS

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9. RESULT AND CONCLUSION

9.1 CONCLUSIONFOR WATER SYSTEM

The try was uncertain in terms of the precision of estimations and calculations. In any case, the taking after conclusions can be drawn: Large day-to-day varieties make it about incomprehensible to preserve steady soil dampness with as it were human monitoring. This legitimizes the utilize of robotized input control, which may be performed at much higher test rates than with people, with inconsequential taken a toll increase. Pipe sizes will be directed by other determinations such as the estimate of the dribble water system pipe and the measure of the valve outlet. The temperature and mugginess readings were compared to moment gadget, an advanced hygrometer. The two gadgets gave exceptionally comparable comes about with the temperature by and large having a distinction of 0.2 degrees and the stickiness by and large having a contrast of 3%.

9.2 CONCLUSIONFOR TEMPERATURE SYSTEM

Controlling the temperature could be a major issue in our quickly advancing world and it needs cost-efficient arrangements. This Temperature Control Framework appears a way to induce the temperature esteem and showing the esteem on a display controller. In this Venture temperature values are measured in analog shape, and after that it is changed over to computerized by the Microcontroller. The client can arrange a set-point temperature esteem and control an outside warming and/or cooling gadget by utilizing the Temperature Control Framework. The framework can be utilized as the premise for creating custom arrangements for organized and stand-alone information collection and control hardware. It can be centrally fueled due to its moo current necessity and its little measure makes it more versatile, permitting it to be put nearly anyplace.

9.3 PROJECT PHOTO

Fig. 12. Model Photo
It shows the temperature value.

Fig. 13. Model Photo
This is our compact farming model. Or Compact Green House. For the purpose of demonstration.

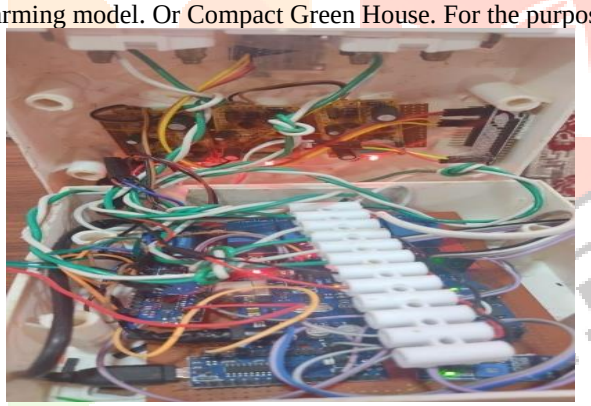

Fig. 14. Model Photo
This is our Actual working circuit Model. While power is on.

Fig. 15.Model Photo
It shows healthy growth of plants in our compact Green house by using this controlled agriculture model.

Fig. 16.Model Photo

Showing how Real time displays on our OLED display. It shows the real time and Day, and date also.

Fig. 17.Model Photo

It shows the temperature value.

11.REFERENCES

[1] C. M. Devika, K. Bose and S. Vijayalekshmy, "Automatic plant irrigation system using Arduino," 2017 IEEE International Conference on Circuits and Systems (ICCS), 2017, pp. 384-387

[2]S. Bhardwaj, S.Dhir and M. Hooda, "Automatic Plant Watering System using IoT," 2018 Second International Conference on Green Computing and Internet of Things (ICGCIoT), 2018, pp. 659-663

[3]Manisha Mayuree Priyanka Aishwarya "Automatic Plant Watering System", *2019 International Conference on VisionTowards Emerging Trends in Communication and Networking(ViTECoN) IEEE*.

[4] The Automatic Temperature Control for Agricultural Plant House Somyot Seesansui, Tharathip Phurahong and Jassada Sarasook Nakhon Phanom University, Thailand ID-10 page 37 2020 International Conference on Power, Energy and Innovations (ICPEI)

[5] K. N. Siva, R. Kumar G., A. Bagubali and K. V. Krishnan, "Smart watering of plants," 2019 International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN), 2019, pp. 1-4

[6] Bhatia, Vaibhav, and Gavish Bhatia. 2013. Room Temperature based Fan Speed ControlSystem using Pulse Width Modulation Technique. International Journal of ComputerApplications (0975–8887) 81 (5): 35–40.

[7] Tan, Christina. 2010. Integrated Temperature, Light and Humidity Monitoring System.15.

[8] Nandagiri, Kiranmai, and Jhansi Rani Mettu. 2018. Implementation of Weather MonitoringSystem. International Journal of Pure and Applied Mathematics 118 (16): 477–494.