

# **DESIGN AND CONSTRUCTION OF SMART ROOM HEATER**

**A Project submitted in partial fulfillment of the  
Requirements for the Award of Degree of  
Bachelor of Science in Electrical and Electronics Engineering**

**Submitted By  
Shreekanta Sarker  
ID: 151-33-2469**

**Majbah Uddin Ahmed  
ID: 151-33-2505**

**Supervised By  
Fahmida Hossain Tithi  
Assistant Professor, Department of EEE  
Faculty of Engineering**



**DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING  
FACULTY OF ENGINEERING**

**DAFFODIL INTERNATIONAL UNIVERSITY**

*Dedicated to*

*Our Parents*

*&*

*Teachers*

## Certification

This is to certify that this project entitled "Construction and design of smart room heater" is done by the following students under my direct supervision and this work has been carried out by them in the Department of Electrical and Electronics Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronics Engineering.

### Signature of the candidate

*ShreeKanta*

**Name: Shreekanta Sarker**  
ID: 151-33-2469

*Majbah Uddin*

**Name: Majbah Uddin Ahmed**  
ID: 151-33-2505

### Signature of the supervisor

*Fahmida*  
*14-01-2019*

**Fahmida Hossain Tithi**  
Assistant Professor  
Department of EEE  
Daffodil International University

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## **ABSTRACT**

This project will present the design, construction, development, control and evaluation of an automatic switching and control room temperature automatically. The microcontroller base automatic room temperature control and auto switching system presented in this project is required to fulfill the requirement of technologies “tomorrow will be more advanced than today. This project also presents the expected performance of the automatic temperature control and switching system, construction of hardware and software development to gather the performance data. The components should have the input, controller and the output. In this system, the input is a temperature sensor, the controller is a microcontroller and the output is DC motor and LCD for status monitoring. The system temperature knowledge can use to control battery charging and impede damage to costly microprocessor. The temperature measurement is critical in modern electronics devices, especially expensive laptop computers and other portable devices with deeply packed circuits which waste energy in form of heat.

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# LIST OF ABBREVIATIONS

PCB	Printed Circuit Board
LED	Light emitting Diode
LCD	Liquid Crystal Display
LDR	Light-Dependent Resistor
VCC	Voltage Common Collector
AC	Alternating Current
DC	Direct Current

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

With development of technologies, automation has become important part of our every daily life. It made our life very easy and comfortable. A home is normally the most preferable place in every culture of society. The home areas that are usually assumed by the peoples, such as our living room or bedrooms should be maintained within normal temperature ranges that is very comfortable for humans. Grown-ups could discover their way around "warm distresses", yet newborn children may not. This makes it important the requirement for a Temperature Control System inside the home. Programmed room warmer control system returns in the eighteenth century and this musing was first anchored in Norman School, Oklahoma by a teacher named Warren S. Johnson. Prior to that time, Janitors were constrained to go in each classroom to check the temperature of the classes, and from that point onward, control the dampers in the S-storm cellar in like way. A lot of programmed room radiator framework business things is instantly available in the market and this incorporates gadgets, for example, Air con.

The Automatic Temperature Control System was to meet this very need which prompts ceasing teaching. Electric organization association started by this which was away to diagram customized control frameworks. At first developed the pneumatic temperature control system which considered temperature control on a room by room start in structures and homes. By the mid twentieth century the Automatic Temperature Control System creation wound up observably well known in undertakings and homes. Starting late, a significant proportion of work is being done by associations in this field.

## **1.2 Problem Statements**

Most of the people feels worried about changing the heater speed level automatically when the room temperature changes. With the help of humidity sensor the manual fan system that automatically changes the speed level according to the temperature changes is take up to constitute for solving this problem.

## **1.3 Objective**

Sometimes electric heater causes waste of power for the human activities. Human also wants that can easily use without wasting Energy. For minimizing the power usage, this project developed an automatic heater system where speed is controlled by the temperature of the room.

The main objectives of this project are written below:

- Enable the electric heater to manually change the speed level according to temperature changes of room.
- Enable an exhaust fan process which can preview the status of the temperature and velocity level with Liquid Crystal Display (LCD).
- Improve an automatic heater system that can change the speed level due to the temperature changes in environment.

## **1.4 Aim of the project**

Temperature measurement is tough in modern electronics device, especially costly laptop and computers and also other portable device. These systems misuse a huge amount of power in the form of heat and by this the system loss is getting more and more of system temperature knowledge can also be used to check battery charge. It also enable to the prevent damage for costly microprocessors. In this project, there is input device, another is a controller and the last one is an output device. For this project, we used a temperature sensor as the input is, we have also used a controller, name is microcontroller and finally

the output is a DC cooler and a LCD. LCD is used for status monitoring. At last we have to compare this working performance valued by performance data of this project with the theoretical data.

## **1.5 Scopes**

Room heater is essential for those whose are living in cold country. In Bangladesh, The north bangle is the coldest place. But they cannot use room heater as the cost of is very high and also cause of electricity. So we want to give them room heater at a low cost.

## **1.6 Methodology**

This undertaking will exhibit the structure, development, improvement, control and assessment of a programmed exchanging speed of electric fan, light, and control room temperature automatically. This further step of an intelligent electric room heater and automatic control ac load (fans, light) and humidity and by circuit relay of analog system. The microcontroller base automatic room temperature control and auto switching process are shown in that project is needed to fulfill the requirement of technologies “tomorrow will be more advanced than today”. The exhaust fan manually controls the speed according to the environment in temperature changes. This fan include with sensor, controller, driver and motor with integration of joined and control programming using Arduino Uno as main the controller. This project ruling the expected performance of the auto temperature control and switching system, develop of hardware as well as software to collect the performance of data.

## **1.7 Organization of the Report**

This project report has six chapters in total. The first chapter describes an idea about our project “Construction and design smart control room heater” it can switching light fan tv etc. ac voltage”, Brief description of the project, problem statement, scopes and methodology.

The second chapter describes about history, block diagram, circuit diagram and list of components.

The chapter third reviews about component description, cost analysis of our system.

The fourth chapter is about software analysis & program explanation.

Then chapter five describes result & discussion properly, limitation of our system and suggestion for the future works

Finally, chapter six gives the concluding remarks.

## **CHAPTER 2**

# SYSTEM REVIEWS

## 2.1 Introduction

The first mechanical tachometer was similar in operation to an eccentric ruler. German engineer Dietrich Bullhorn was the inventor of the first mechanical tachometer. For measuring the speed of machines in 1817 he used it. Since after then, tachometer used to measure the speed of locomotives in automobiles, trucks, tractors and aircrafts. Early tachometer designs were based on the principle of constable multi vibrator, which has one stable state and one quasarstable state. The circuit remained in a stable state, producing no output. However, when it receives triggering current pulse from the ignition system, the circuit transitions to the quasarstable state for a given time before returning again to the stable state. Automation has become part of our daily life with the progress of technologies. The room heater control systems idea of programmed goes back in the 18th century and in Norman School, Oklahoma named Warren S. Johnson this idea was first confirmed. Home is usually the most important place in the culture. Home areas are normally assumed by people, for example the living room and bedrooms need to be controlled within livable temperature ranges. Other places in house that are used as storage areas for perishable food items also need to be thermally regulated in order to prevent accelerated decay of such items. These issues become more appropriate in areas of the home that are assumed by minor. Also adults can find their way around “thermal discomforts”, but babies may not. This makes it necessary the need for a Temperature Control System within the home.

## 2.2 General Block Diagram

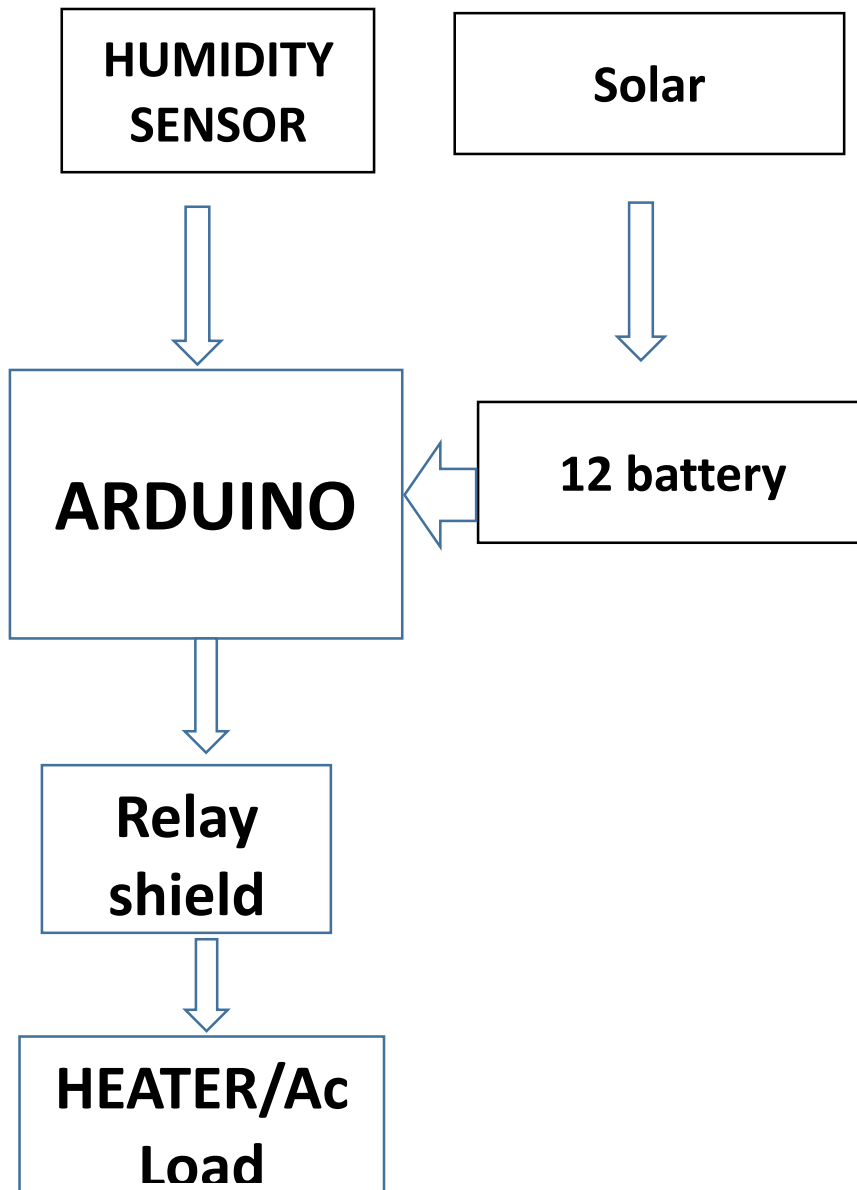


Fig 1: General Block Diagram

### 2.2.1 Block Diagram Description:

In this project that mainly we control our temperature by humidity sensor. Humidity Sensor can sense humidity level in air .then humidity through the voltage ratio in microcontroller Arduino Uno. Other hand motion sensor detect motion of human that can sense by motion and given through Arduino microcontroller .and microcontroller convert the analog signal to digital signal and really shied switching the ac load ( light, fan, ac) from getting signal from Arduino Uno microcontroller . Hear solar is the charging element of battery that can charge .and battery can supply voltage to Arduino microcontroller. Heater can auto control depended with humidity sensor.

### 2.3 Circuit Diagram:

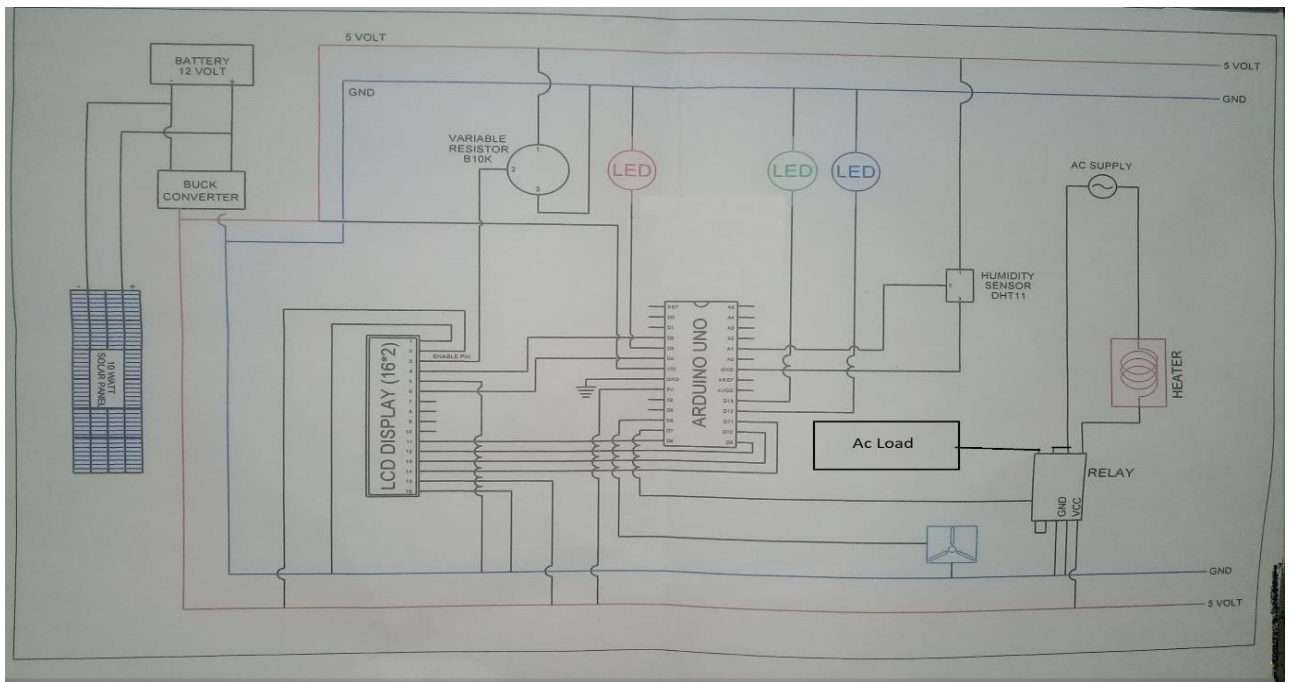


Fig 2.1: Circuit Diagram.

#### 2.3.1 Working Processor of circuit:



In our project the circuit diagram is given figure 2.1. In this circuit we use both AC and DC voltage. A solar panel can provide DC charge for a battery and the battery will provide DC voltage for a microcontroller and other sensors and displays. We use an Arduino Uno ATmega-328P R3 microcontroller. We use a motion sensor and that was connected with Arduino Analog pin A0, we also use an LCD display for displaying some humidity level and temperature, and an AC heater connected to the relay shield.

And a relay connected to the microcontroller digital pin. We also use a buck converter to step down voltage level for the circuit. Some LEDs we use for detecting level that was also connected to the microcontroller. A humidity sensor connected to the digital pin and the voltage is 5V that was given by Arduino Uno. Arduino connected to the buck converter that was 9V given by battery. Battery connected to the solar panel and solar panel is open for getting voltage from sun. Some AC load connected to relay module.

### **Type of inverter:**

We usually classify inverters by their signals. It is not a straightforward process to convert a DC voltage to a sine waveform. The output quality for inverters is classified among some categories:

- Square Wave Inverter
- Modified Sine Wave Inverter
- Pure Sine Wave Inverter

A square waveform is very simple. DC supply switched between positive and negative. The waveform can be purified until it closely matches with pure sine wave by utilizing Pulse Width Modulation (PWM) and filtering techniques. There is no exact cut off which can define a pure sine wave. It is normally accepted that when total harmonic distortion of the voltage waveform is less than 3%, for all practical purposes this can be considered as a true sine wave. Some types of loads they can be problematic and do require a pure sine wave converter. It has been proved that pure sine wave inverter is more complex than other inverter. It is also costlier than others. [1]

## **2.4 Components list:**

<b>No</b>	<b>Component Name</b>	<b>Quantity</b>	<b>Used</b>
<b>01</b>	Arduino Uno	<b>02</b>	Used as a power generating method from sunlight.
<b>02</b>	Display (16x2).	<b>02</b>	.Used to save energy.
<b>03</b>	Humidity Sensor (DHT11)	<b>02</b>	current to flow in the opposite direction through the panels
<b>04</b>	Solar Panel (10 Watt)	<b>04</b>	To regulate voltage
<b>05</b>	Battery 12 Volt	<b>02</b>	Circuit Board
<b>06</b>	Heater	<b>01</b>	To controlled AC Power Load
<b>07</b>	Buck Converter	<b>02</b>	To detect temperature
<b>08</b>	Led (16*2)	<b>02</b>	To connection
<b>09</b>	DC cooler	<b>02</b>	To controlled amounts of resistance into electrical circuits
<b>10</b>	Arduino compiler	<b>01</b>	current to flow in the opposite direction through the panels
<b>11</b>	Relay shield	<b>02</b>	To controlled amounts of resistance into electrical circuits
<b>12</b>	Bulb/fan (Ac load)	<b>01</b>	To displayed
<b>13</b>	Jumper wire	<b>---</b>	To communication

Table 2.1: List of components used in circuit

## **2.5 Conclusion**

Our main aim of this project is to design and construct automatic room heater module with a sensor. We installed a solar panel with a reflector to solar tracking system. It in an efficient and feasible means that obtain optimal solar energy from the sun light. We have

seen that the productivity of sunlight based tracker with reflector and light the effectiveness of sun powered tracker are superior to 7% and 4% separately from the proficiency of settled sun oriented board. Both in normal & abnormal weather this process can work perfectly. Especially for residential area we have designed this project.

# **CHAPTER 3**

## **HARDWARE DEVELOPMENT**

### **3.1 Introduction**

Hardware means to electrical and electronics devices and also these devices are often joined with software. They have some functional and non-functional requirements. For both digital and analog electronics there have some key developments. The hardware developers works very hard to increase the speed of the devices. Electricity Generation has employed with rotating machine for producing sinusoidal current and voltage. Semi-conductors are used now-a-days to convert direct current (DC) into alternating current. Those which devices are used to convert DC to AC are called inverters.

### **3.2 Arduino UNO:**

The Arduino UNO is a microcontroller board which is an open source. It based on Microchip ATmega328P microcontroller. "Uno" means one in Italian. It is developed by Arduino.cc. Arduino can be programmed by Arduino IDE. IDE means Integrated Development Environment. The Arduino Nano and Leonardo also similar as arduino uno. The board is normally contain with digital and analog input/output (I/O) pin. It might be interfaced to different circuits. [1] The board have 14 digital pin and also 6 analog pin. Arduino is powered by a USB cable. It also can power with an external battery with nine voltage. It receives voltage between 7voltage to 20 voltage. The equipment reference configuration is appropriated under a Creative Commons Attribution Share-Alike 2.5 permit. It is accessible on the Arduino site. For some versions of the hardware are available for Layout and production. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino. The Uno board is the first in a series of USB Arduino boards. It also the reference model for the Arduino platform. The arduino is different from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. The ATmega328 on the Arduino Uno comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates by using the original STK500 protocol.

#### **3.2.1 General Pin functions:**

**LED:** Digital pin 13 refers to built-in LED driven. For HIGH value the LED is on and it gets off when pin is LOW.

**VIN:** By this pin we can supply voltage. The voltage to the Arduino board when it's utilizing an outer power source.

**5V:** Providing voltage through the 5V or 3.3V pins sidesteps the controller. It tends to be annihilated the board. This yields managed by 5V from the controller on the board.

**3V3:** On-board regulator in arduino generates 3.3volts. The highest current is often 50 mA on the board.

**GND:** It refers to Ground pins. There are a few GND pins on the Arduino. We can use any of these pins to ground circuit.

**IOREF:** This pin gives the voltage reference and by this the microcontroller properly works. It can recognize the suitable power source for outputs to work with the 3.3V or 5V. An appropriately arranged shield can read the IOREF pin voltage.

**Reset:** It reset the system in arduino. Reset can plug or unplug the board. And also it can start the arduino. [2]



fig3.1: Arduino UNO.

### 3.3Display (16x2):

LCD means Liquid Crystal Display. It is an electronics presentation module. It has a wide range of applications. It is generally used in many circuits and devices. Liquid crystals do not emit light directly. A 16x2 LCD implies it can show 16 characters for each line and there are 2 such lines. In this LCD each character is shown in 5x7 pixel grid. There are normally two registers, such as Command and Data.

The command register stores the command instructions. It also clears LCDs screen, cursor position setting, to control display etc. The information enlist stores the information to be shown on the LCD. The information is the ASCII estimation of the character to be shown on the LCD. Snap to take in more about inner structure of a LCD.

The LCD screen is more energy-efficient. LCD screens are using in many such as watches, digital cameras calculators, and mobile telephones and smartphones. LCDs are utilizing in a wide range, for example, PC screens, LCD TVs, air ship cockpit shows, instrument boards, and furthermore indoor and open air signage. LCD screens are accessible in a more extensive scope of screen sizes than CRT and plasma shows. Since LCD screens don't utilize phosphors, they don't endure picture copy in when a static picture is shown on a screen for quite a while.



Fig 3.2: LCD Display.

### **3.4 Humidity Sensor (DHT11):**

This DHT11 Temperature and Humidity Sensor includes an adjusted computerized flag yield with the temperature and humidity sensor capacity. It is incorporated with a superior 8-bit microcontroller. Its innovation guarantees the high reliability and excellent long-term stability. This sensor contains a resistive component and a sensor for wet NTC temperature estimating gadgets. It has fantastic quality, quick reaction, hostile to obstruction capacity and elite. Each DHT11 sensors includes to a great degree exact adjustment of stickiness alignment chamber. The adjustment coefficients put away in the

OTP program memory, interior sensors identify motions all the while. We should call these alignment coefficients. The single-wire sequential interface framework is coordinated to end up snappy and simple. Little size, low power, flag transmission separate up to 20 meters, empowering an assortment of uses and even the most requesting ones. The item is 4 pin single column stick bundle. Advantageous association, uncommon bundles can be given by clients require. [4]

### **Specification:**

1. It can Supply Voltage about +5 V
2. It can recognize Temperature range often 0-50 °C and it has error of  $\pm 2$  °C
3. Humidity level : 20-90% ,Relative humidity is  $\pm 5\%$  RH error
4. DHT11 Interface configuration is Digital.

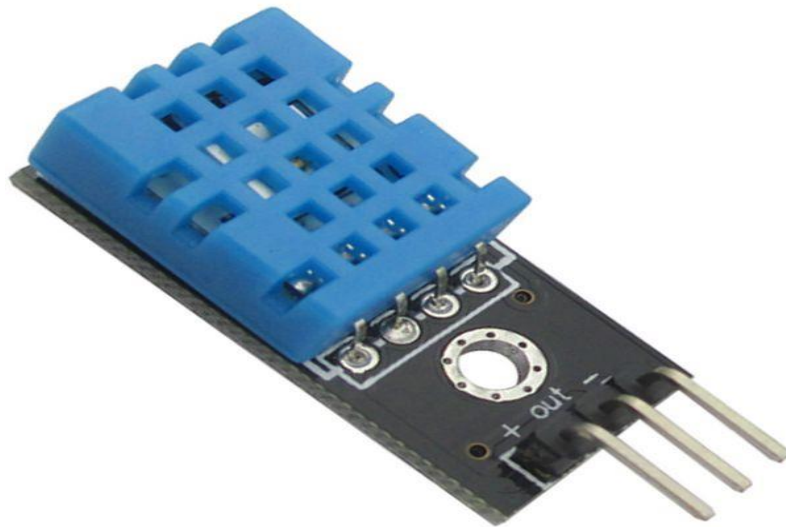


Fig 3.3: Humidity Sensor (DHT11).

### 3.5 Solar Panel (10 Watt):

Solar panels are those devices which are used to absorb the sun's beams. Converting them into power. A sunlight based board is really a gathering of sun based (or photovoltaic) cells, which can be utilized to produce power through photovoltaic impact. These cells are orchestrated in a lattice like example on the surface of sun based boards. Hence, it might likewise be portrayed as an arrangement of photovoltaic modules, mounted on a structure supporting it. A photovoltaic (PV) module is a bundled and associated gathering of  $6 \times 10$  sun based cells. With regards to wear-and-tear, these boards are exceptionally solid. Sun powered boards destroy to a great degree moderate. In a year, their adequacy diminishes just around one to two percent (now and again, considerably lesser). Most sun based boards are made up utilizing crystalline silicon sunlight based cells. Sun based panel in house helps in fighting the unsafe discharges of ozone harming substances and therefore lessens a dangerous atmospheric deviation. They additionally decrease our reliance on non-renewable energy sources (which are constrained) and conventional power sources. Nowadays, sun oriented boards are utilized in far reaching electronic supplies like adding machines. Sun controlled boards don't fast any sort of pollution Regardless, the primary genuine drawback of sun arranged sheets is that they are exceptionally over the top. Sun based boards normally set outside because they need day light to get charge. [5]

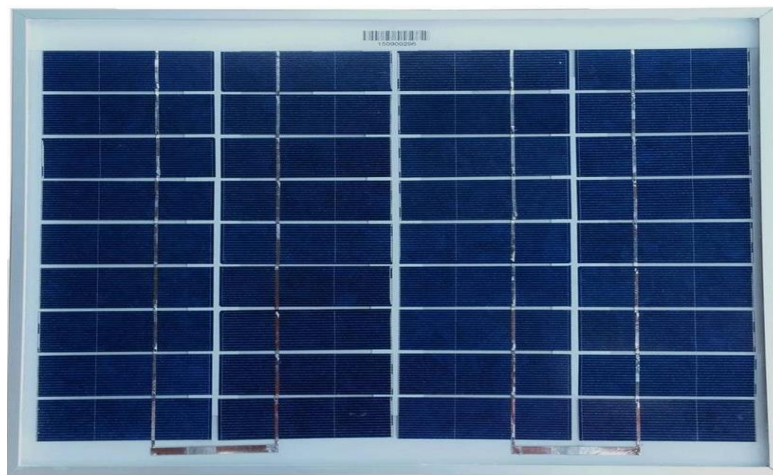


Fig 3.4: Solar Panel (10 Watt).



### 3.6 Battery 12 Volt:

Storage battery is a type of electric battery which is able to reserve charge and discharge for many times. The term "accumulator" is used as it accumulates and stores energy through a reversible electrochemical response. It is composed of one or more electrochemical cells. The rechargeable batteries has many different shapes and sizes. Different types of electrode materials and electrolytes are used, including lead–acid, nickel–cadmium (NiCd), lithium-ion (Li-ion), and lithium-ion polymer (Li-ion polymer). Rechargeable batteries have a much lower total cost of ownership and environmental impact, as they can be recharged without any cost many times before they need replacing. A battery's "hold limit" is a proportion of to how long in minutes a battery can convey 25 amperes of electrical flow. Charge rechargeable batteries usually gets from a battery charger using AC mains supply. The voltage of source must be greater than that of the battery. But if the source is too much higher, battery may be damaged for over voltage.



Fig 3.5: Vero Board.

### 3.7 Electrical Heater:

Electric heating means electrical energy is converted into heat energy. It is an electric device which converts an electrical current to heat. Heat element inside in every electrical heater is an electrical resistor. It works on the principle of Joule heating. Nichrome wires using as the active element in many electrical heating devices. Heater keeps the interior space cooled and discharged the warm air to the outside. For convection heater the heater heats the air by thermal conduction. This material is normally packaged into a glass envelope and with a reflector to direct the energy output away from the body of the heater. Electric heater does not warm the air, it warms humans and objects which remains in the room. This can be used for garages or basements in the building where spot heating is required. The Radiant heaters works silently and it have the greatest potential danger of ignition. Generally cool air has high dense than hot air, so it rises for due to floating so that it allows more and more cool air to flow in and to replace its place. Electric heaters are sometimes loaded with oil. They are ideally suited for heating a closed space. They operate silently and have a lower risk of ignition hazard if they make unintended contact with furnishings compared to radiant electric heaters. Some common applications of heater is space heating, water heating, cooking etc.



Fig 3.6: Electric Heater.

### 3.8 Buck Converter:

A buck converter is DC-to-DC power converter. It steps down the voltage and stepping up current from its input supply to its output load. In buck converter the inductor always “bucks” or acts against the input voltage that’s why it’s called buck converter. While there are different theories, traditional standard advance down converters were diode-rectified device. It contains at least two semiconductors. One is diode and the other is transistor. The buck converters give a lot greater power efficiency. The buck converter can be understood by the relation between current and voltage of the inductor. It begins with the switch open in which the current is zero and when the switch is closed (on-state), the current will start to increase. This voltage drop decreases the net voltage of the load. If switch is opened when the current is changing, there always be a voltage drop across the inductor. When the switch is opened again (off-state), the voltage source will remove from the circuit so that the current start to decrease. During the off-state, the inductor discharges its stored energy to the circuit. The voltage at the load will always be greater than zero if the switch is closed again before the inductor fully discharges (on-state). The decreasing current produce a voltage drop across the inductor (opposite to the drop at on-state), and now the inductor becomes a Current Source. Stored energy in the magnetic field inductor helps the current flow by the load. When the input voltage source is disconnected this current will flow. The "increase" in average current makes up for the reduction in voltage and preserves the power provided to the load. [3]



Fig 3.7: buck converter.

### **3.9 DC cooler:**

A DC cooler works same as the principle of the DC motor. Direct current cooler have variable and uneven flow in the system. DC technology has become more sophisticated in recent times. It is applying in residential and industrial fans. DC coolers have motors that rely on permanent, built-in magnets in order to attracting and repel a rotor around an axis joined with inverters. The DC technology is much popular and newer than AC technology. DC fans prevent electromagnetic interference. For example, various kinds of computers or laptops have DC fans in their internal designs. This prevent equipment from overheating. Electromagnetic interference affect sensitive applications.

Due to fluctuations in the circuit all voltage sources cannot able to give fixed output. To get constant output the voltage regulators are implemented. The integrated circuits are used to regulation of voltage. These are called voltage regulator ICs. Here we have discussed about IC 7805. The voltage regulator IC 7805 is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The 'xx' present in 78xx describes the value of the fixed output voltage. And this is provide by particular IC. For 7805 IC, it is +5V DC regulated power supply. This controller IC likewise includes an arrangement for a warmth sink. Input voltage of the voltage regulator rises upto 35V and this IC give a constant 5V for any value of input less than or equal to 35V. It is the threshold limit. [7]



Fig 3.8: DC Cooler.

### **3.10 Jumper wire:**

A jump wire is an electric wire or group of them in a cable, with a connector at each end. Jumper is commonly used to interconnect the materials of a breadboard or other prototype without soldering. Singular jump wires are fitted by embedding their "end connectors" into the spaces gave in a breadboard, a bit of test hardware or the header connector of a circuit board.

Jumper wires have classified in many types. Some of them have same kind of electrical connector at both ends, while others have different connectors at both ends. Some general connectors name given below

- Registered jack are commonly used in computer networking and telephone.
- To connect with a breadboard Solid tips are used usually.
- Crocodile cuts are utilized incidentally to connect sensors.
- To test for DC and low-frequency of AC signals, Banana connectors are used highly.
- RCA connectors are commonly used in low frequency and low resolution video applications. It also used in audio.

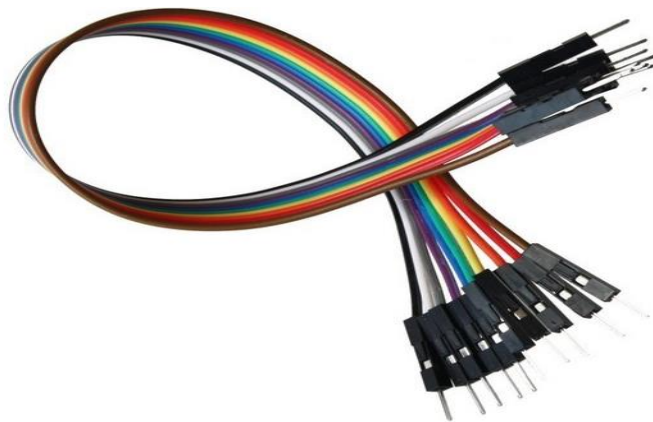


Fig 3.9: Jumper Wires.

### 3.11 Relay Shield:

Relay Shield is also an Arduino based coherent module with four relays which provides an easy path for controlling high voltage. It tends to be specifically controlled by Arduino/Seeeduno through advanced IOA. It is an electrically operated switch. Maximum power is 35VDC and 70W for every channel. Many relay utilize an electromagnet to mechanically work a switch, yet other working standards are additionally utilized, for example, strong state relay. Relays are utilized to control a circuit by a different low-power signal. Relay Shield have 4 high relays and gives normally open/normally close interfaces,

each relay have 4 LED signs to show on/off state. When polarized voltage is applied on a dual coil device to reset coil the contacts will transition. When power is applied with one polarity the relay will operate in one direction. In single coil device and it will reset when the polarity is reversed. For example, AC control magnetic latch relays have single coils. [8]

### 3.11.1 Feature:

- Arudino Uno is very perfect
- Relay shield shape and design is very standard
- High quality relays.
- Relay screw terminals.
- Update pin SCL, IOREF, SDA, NC.
- Each relay have LED signs or indicators.
- Each relay have COM, and NC (Normally Closed), NO (Normally Open) pins.

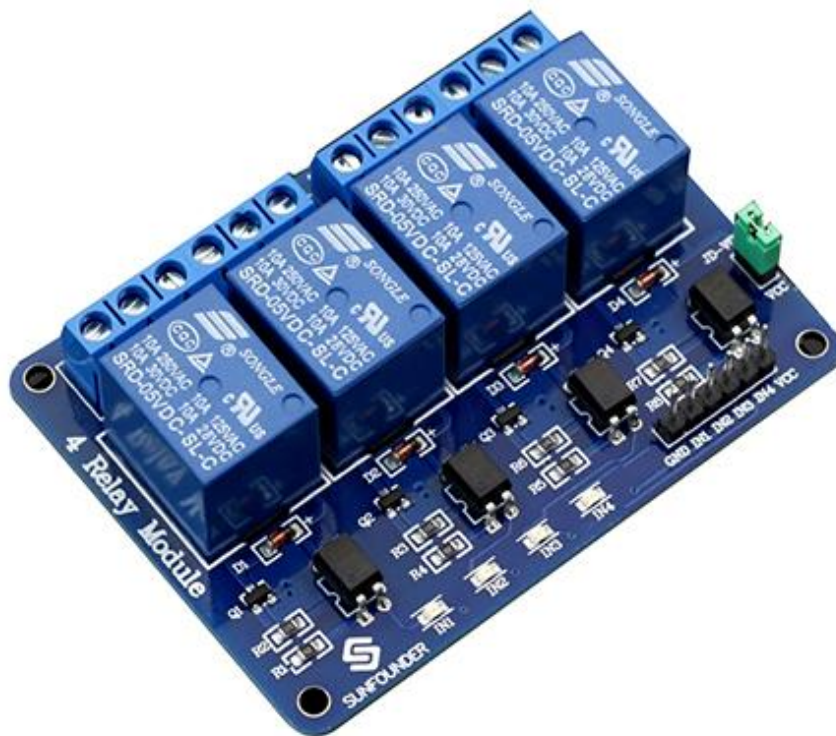


Fig 3.10: Relay Shield.



### 3.12 Cost Analysis

In this section we will show cost of our project that means cost sheet representation of our project.

#### 3.12.1 Cost Sheet:

No	Component Name	Quantity	Purchase Price (TK)
01	Microcontroller ATMEGA328p	02	800/-
02	Push Button	02	5/-
03	Crystal Oscillator 16 MHz	02	16/-
04	Ac wire	04	20/-
05	Bred board	01	120/-
06	Ac heater	01	100/-
07	Battery(12V)	01	700/-
08	Battery connector	02	15/-
09	Voltage regulator 103	02	10/-
10	Glue stick	01	40/-
11	Buck converter	01	120/-
12	Relay shield	01	280/-
13	LCD display	01	155/-
14	Potentiometer 10k	01	10/-
15	Motion sensor	01	305/-
16	Solar panel	01	700/-
17	Ac bulb	01	25/-
18	Others	400	400/-



	<b>Total</b>		<b>=3721/-</b>
--	--------------	--	----------------

# CHAPTER 4

## ANALYSIS AND SIMULATION

### 4.1 Introduction

In this chapter we discussed about the software that we have used in this project for developing the task. Also program code dumping devices are clarified in this chapter.

### 4.2 Description of our Software

The environment is written in Java and dependent on Processing, avr-gcc, and other open source programming. The open-source Arduino environment makes it easy to write code. Upload it to the I/O board. It runs on Windows, Mac OS X, and Linux. Screen-shot of Arduino 1.6.8 is shown in figure 4.1

Arduino IDE is a lightweight software. It has both an online editorial manager and an on-start application, for clients to have the alternative whether they need to spare their representations on the cloud or locally all alone PCs.

Arduino IDE is exceptionally appraised by the clients. It is additionally equipped for doing complex procedures without burdening figuring assets.

With Arduino IDE, clients can without much of a stretch access contributed libraries and get cutting-edge bolster for the most recent Arduino sheets. So they can make portrays that are supported by the freshest adaptation of the IDE.

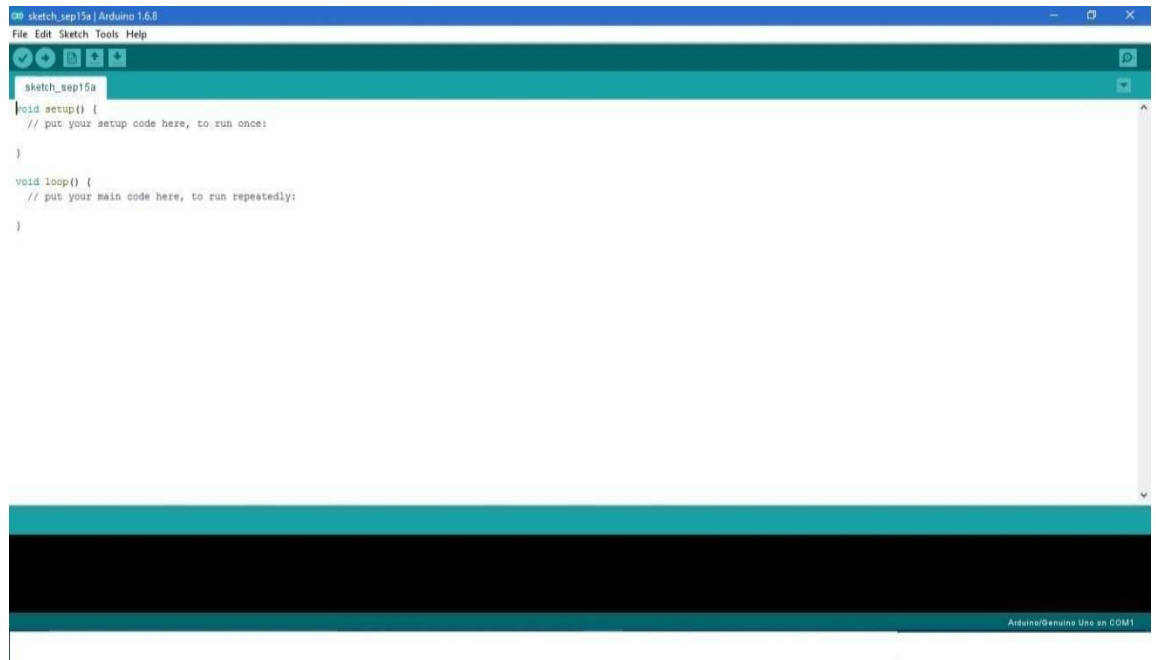
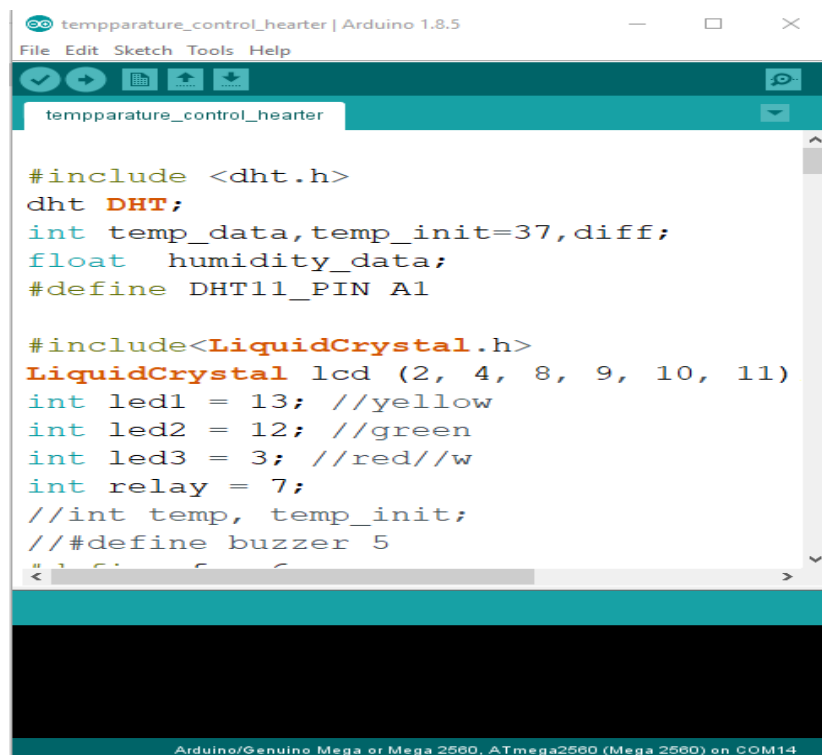


Fig. 4.1: Software Platform

It is likewise equipped for gathering and transferring projects to the board with a single click. There is commonly no need reason to edit make documents or run programs on a direction line interface. Despite that expanding on order line is conceivable whenever required with some outsider devices, for example- Ion. Programs of arduino are written in C/C++. Despite to run program client just need two capacities. Arduino IDE accompanies C/C++ called "Wiring" and that creates numerous normal information. The activities of that software is a lot of simpler.

### 4.3 The compiled window:



The image shows a screenshot of the Arduino IDE interface. The window title is "tempparature\_control\_hearter | Arduino 1.8.5". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". The toolbar contains icons for opening, saving, and running. The sketch name "tempparature\_control\_hearter" is displayed in the top bar. The main area shows the following code:

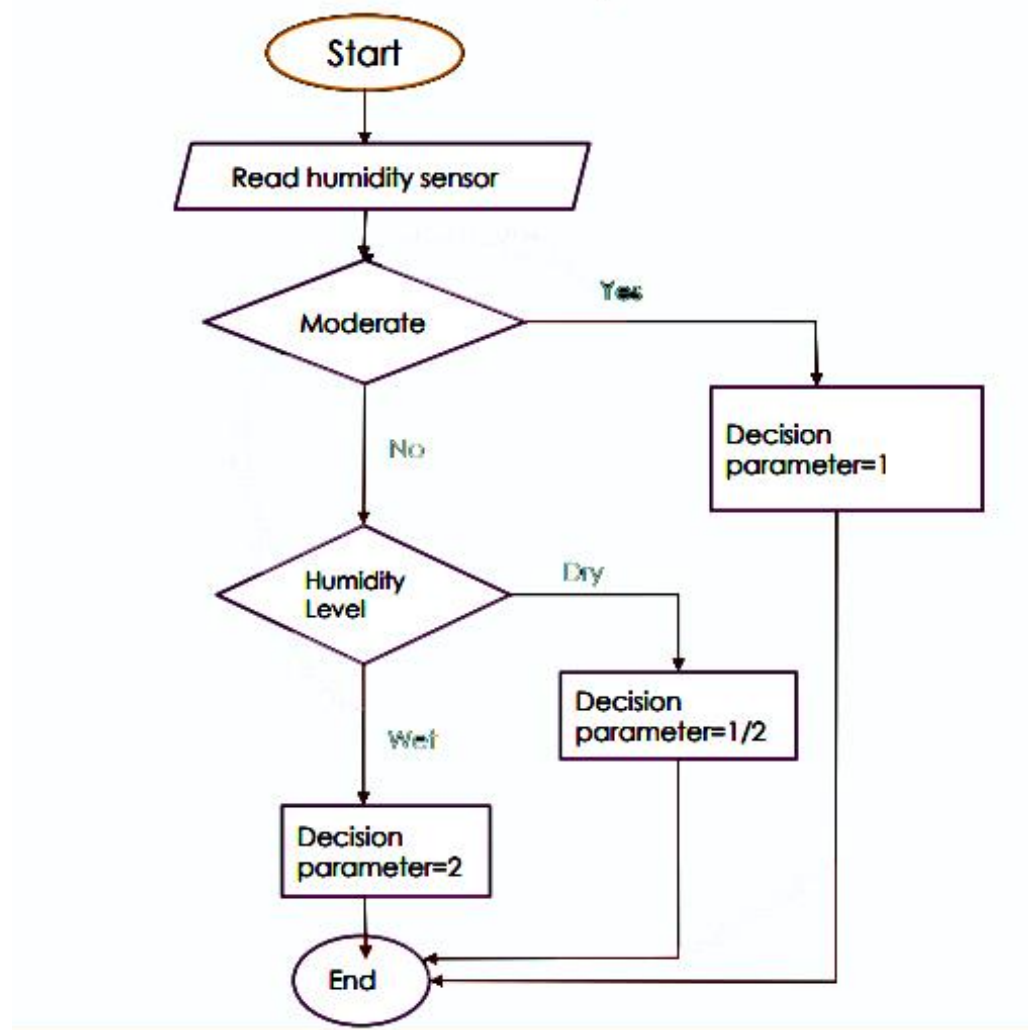
```
#include <dht.h>
dht DHT;
int temp_data,temp_init=37,diff;
float humidity_data;
#define DHT11_PIN A1

#include<LiquidCrystal.h>
LiquidCrystal lcd (2, 4, 8, 9, 10, 11)
int led1 = 13; //yellow
int led2 = 12; //green
int led3 = 3; //red//w
int relay = 7;
//int temp, temp_init;
//#define buzzer 5
< 1 5 6 6 >
```

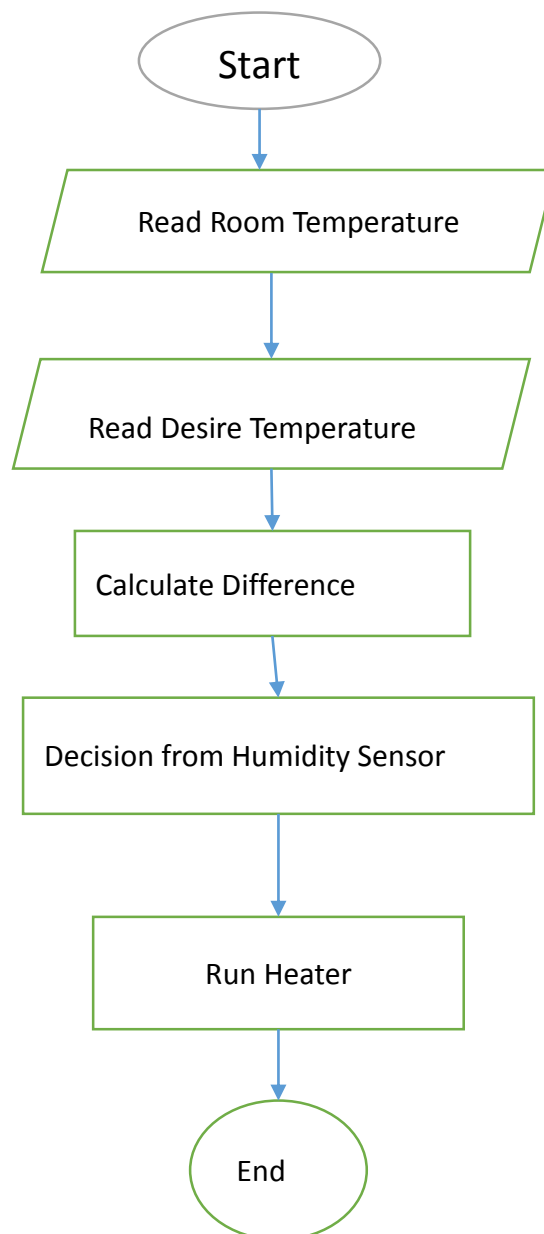
The bottom status bar indicates the board and port: "Arduino/Genuino Mega or Mega 2560, ATmega2560 (Mega 2560) on COM14".

#### 4.4 Flow Chart for Humidity sensor:

### Flow Chart for Humidity Sensor



#### 4.5 Flow chart for temperature:



# CHAPTER 5

## RESULT AND DISCUSSIONS

This chapter explains the overview of this project which includes the information of the list below:

- 5.1. Calculate output
- 5.2. Solar to battery charging data
- 5.3. Designed instruments output
- 5.4. Comparison of two output
- 5.5. Result
- 5.6. Future Scope

### **5.1 Calculated output humidity and temperature:**

The amount of water vapor in the air at any given time is usually less than that required to saturate the air. The relative moistness is the percent of immersion dampness, typically determined in connection to soaked vapor thickness.

The most widely recognized units for vapor thickness are gm/m<sup>3</sup>

For example, actual vapor density is 11 g / m<sup>3</sup> at 20 ° C compared to the saturated vapor density at that temperature of 17.2g/m<sup>3</sup>, then the relative humidity will be, [9]

$$R.H = 11/17.2= 63.9\%$$

## Dew-point:

In the event that the air is steadily cooled when keeping up dampness consistent, R.H will ascend until the point that achieves 100%. At which temperature the dampness content noticeable all around will soak the air known as the dew point. In the event that the air is cooled further, a portion of the moisture will gather. [10]

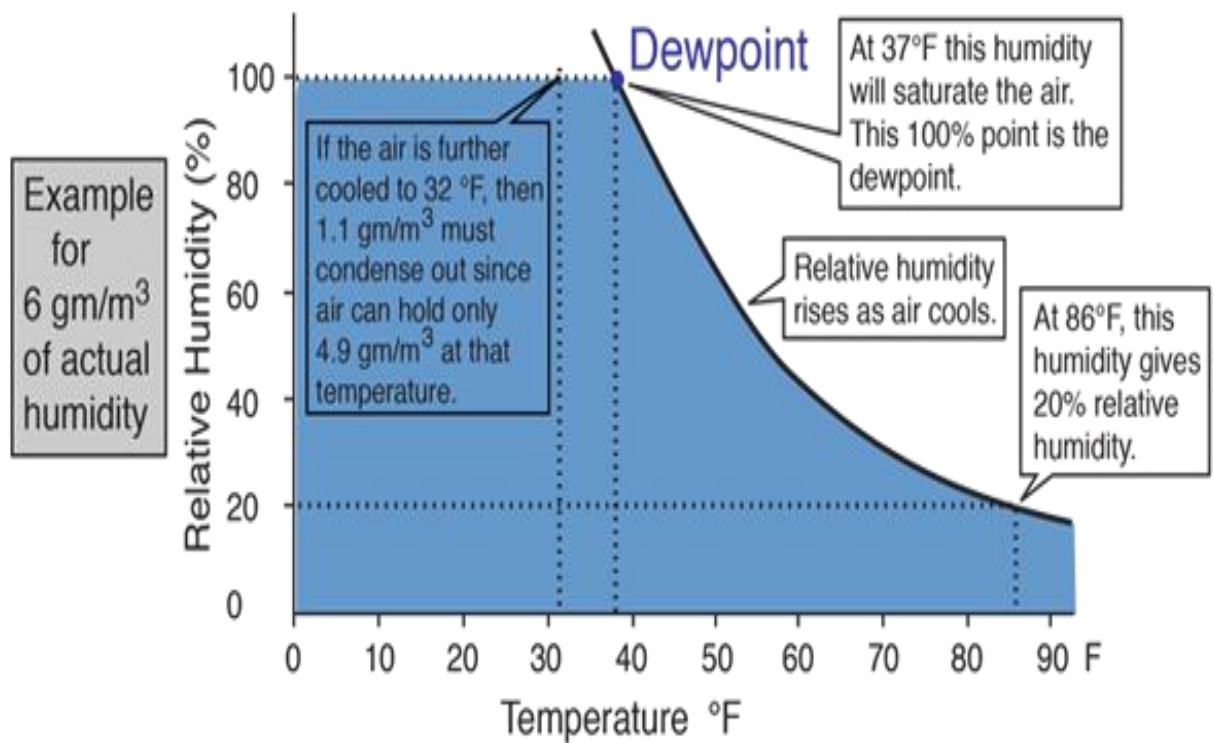


Figure 5.1: Dew point of temperature and humidity.

## 5.2 celsius temperature vs Empirical fit of saturated vapor density

An approximate calculation of saturated vapor density can be made from an empirical fit of the vapor density curve. It is almost easy to produce what appears to be a good fit of the saturated vapor density of water. The value close to the boiling are not much important to calculate relative humidity. Water vapor density behaves as a non-linear function.

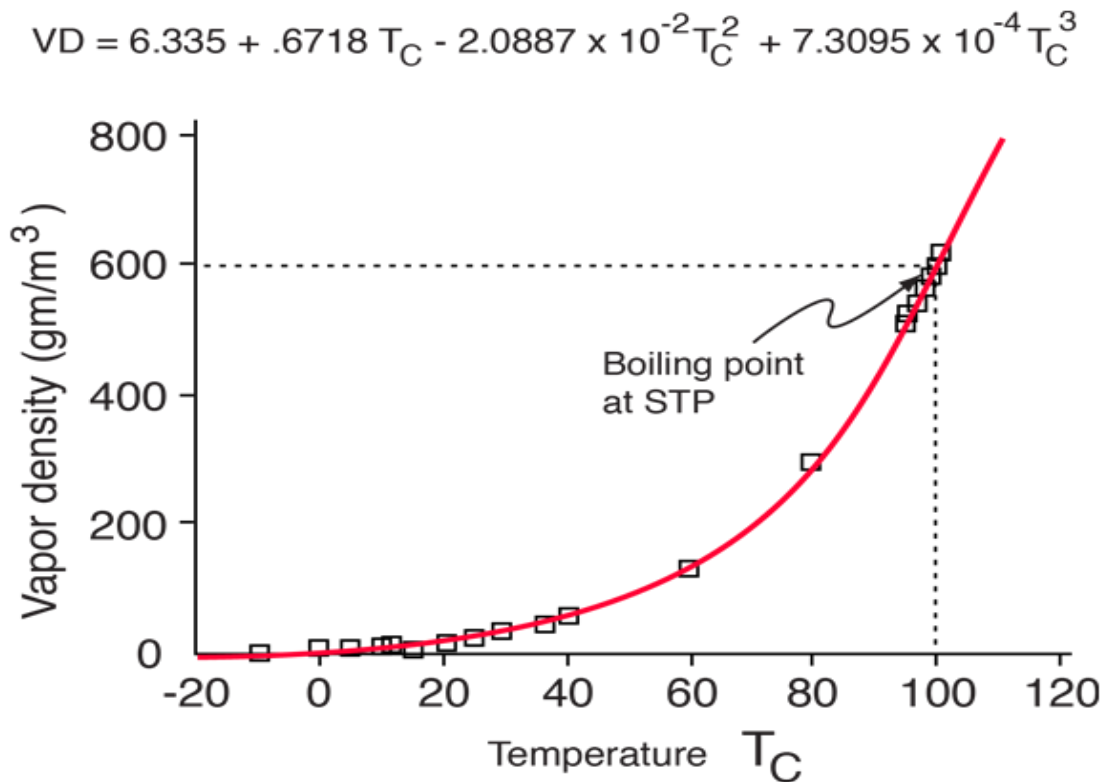


Figure 5.2: vapor density versus Celsius Temperature



This is the fit in the calculation of relative humidity, but it significantly underestimates the vapor density near the boiling point. At 100°C, the saturated vapor pressure comes to 760 mmHg. The immersed vapor weight generally parallels the soaked vapor thickness; numerical qualities are incorporated into the vapor thickness table.

### 5.3 CALCULATION DATA IN OUR PROJECT:

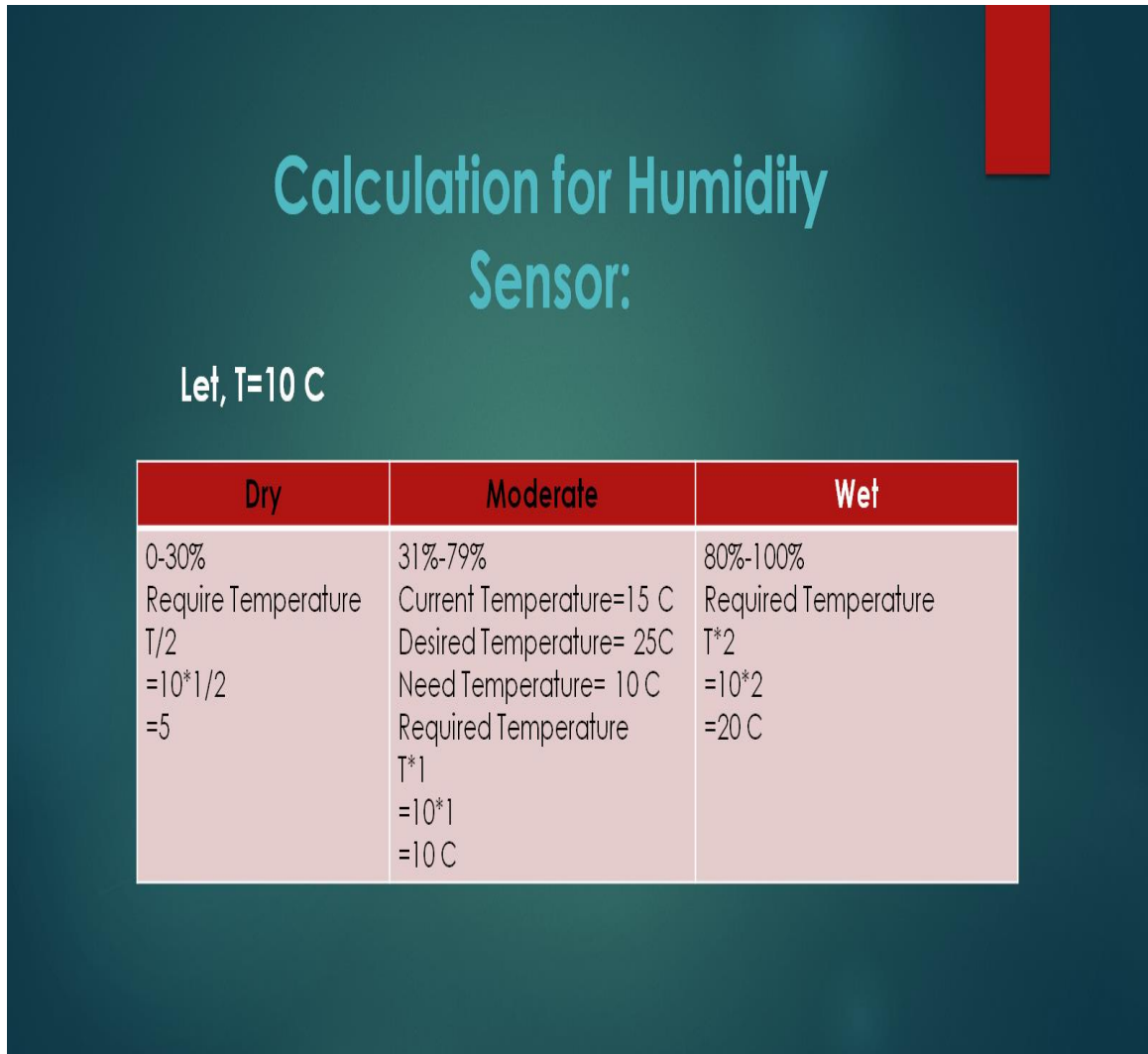


Figure 5.3: calculation System of our system

### 5. 4 proposed assembly for the smart heater:



Fig 5.4: Proposed assembly for the wireless tachometer system

## 5.5 proposed assembly for whole project:

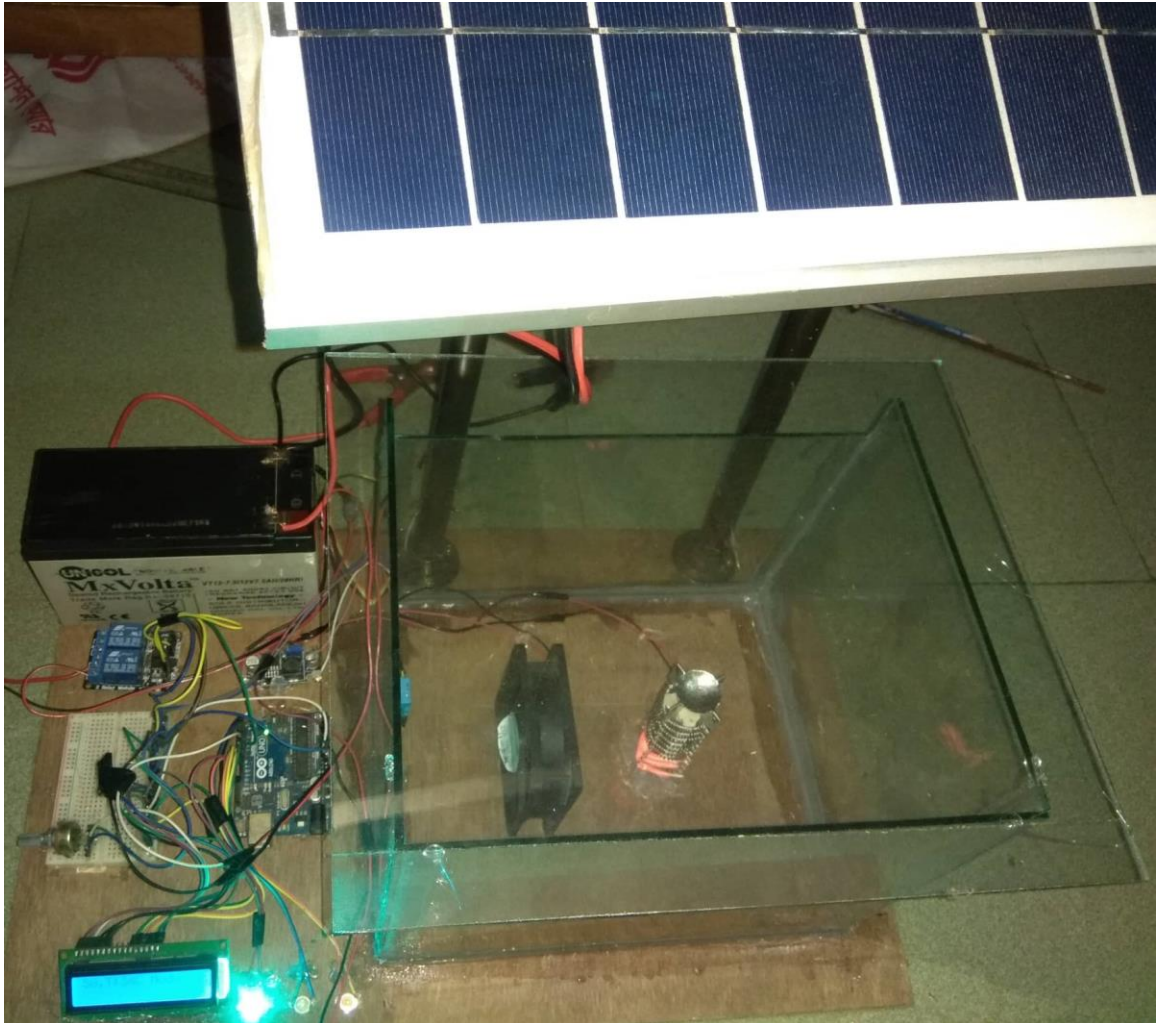


Fig5.5: Running heater system.

## 5.6 Result:

Each and every project is never complete as new things are learned further modifications can be done. Thus we have tried to make an automated humidity and temperature control heater and automated ac load controller and charge the battery and the whole circuit given 9v converted from 12 volt dc from buck converter and heater also connected ac load for heating. Despite the fact that there is higher starting cost included we have endeavored to make the cost effective .This is only the starting, we can add diverse upgrades to make the system more proficient so it will work round the year. The sun based boards utilizing this framework contrasted and the framework predominant at present has numerous points of interest. And we can use it for controlling temperature by depend humidity and it can automated light fan off and on system .Most of the hazard climate we can use is for comfortable climate. Each project will show signs of improvement than past one as training can make us perfect.

## 5.7 Advantages

- **Cost:** Electric heaters are quite affordable when compared to other sources of heat. They help in reducing your utility bills and up-front cost of electric heaters is low.
- **Safety/ easy to use:** Electric heaters are quite simple to use. You just need to simply it in and power. Electric heaters are extremely safe to use. Most of the electric heaters are built-in with these two safety precautions. Firstly, electric heaters automatically shuts off when anything or person comes much closer to it. Secondly, they never get much heated to cause combustion.
- **Small size:** Due to their small size, electric heaters can be fitted in any space. You can put house the heaters even in the tiniest space of your house either it is a small room, bathroom or kitchen. Electric heaters can be put on the floor, on a table or can even be hung on a wall.
- **Heats up quickly:** Electric heaters heats up the space in no time. If you keep the door of the room closed, the room will be heated quickly.
- **Portable:** Electric heaters are highly portable. Being lightweight, it is easy to carry the heaters around. Moreover, they are provided with handles which makes it easy

to carry the heater around. You can even travel with them or carry them around to your office.

- **Adjustable thermostat:** Electric heaters are provided with adjustable thermostats that allow you to adjust the temperature of the room according to your requirement.

### **5.9 Disadvantages:**

- **Shorter cords:** The cords attached to electric heaters are too short. You need to plug in and power the heaters and that is why long cords are a must. Electric heaters are meant to be inconspicuous.
- **Limited to small spaces:** Electric heaters can only warm a little space of your home and not the entire home. If you need to heat up the larger structure, electric heaters are not an accurate choice for you. Electric heaters perfectly suit your interiors but cannot pertain exterior or larger spaces.
- **No ducts:** No ducts means that a room will take more time to heat up and the warm air will stay around the room. It will not let the allergens spread.

### **5.10 Future Scope:**

We can provide more facilities in our smart system example:

1. We will be able to provide automatic room control by a smart phone
2. We will also provide smart switching from web side
3. Every season we can collect data from nature and help to our government.
4. We will also be able to provide a power and distribute power grid.

# **CHAPTER 6**

## **CONCLUSION**



## 6.1 Conclusion

Room heater is essential for those whose are living in cold country. In Bangladesh, The north bangle is the coldest place. But they cannot use room heater as the cost of is very high and also cause of electricity. So we want to give them room heater at a low cost. As the outside temperature varies, it may affect our room temperature. Room heaters are great to save our self from the harsh winters. Depends on our country from the north side last winter season lowest temperature was 3 degree Centigrade. It was very harmful to us mainly children & aged person. For making something difference we prepare a Microcontroller base smart room heater. Which is smartly control room temperature with Moisture. These small heaters with blowers fit into the hollow space under kitchen cabinets, stair treads and vanities. This can be a great solution. You can install a toe-kick heater (also called a 'kick space heater') under an existing cabinet by prying off the toe-kick. To power the heaters, you'll need to run from your main electric panel. You can control most units using a switch or a thermostat. It's worth getting a model with a temperature control (or a high / low switch). Powerful units can blow so hot on the high setting that they could overheat your feet or even soften vinyl flooring. Also, some models are noisy when the blower operates on high. Hydrolic toe-kick heaters that connect to hot water heating systems are also available.

## 6.2 REFERENCES:

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## APPENDIX A

```
#include <dht.h>
```

```
dht DHT;
```

```
int temp_data,temp_init=38,diff;
```

```
float humidity_data;
```

```

#define DHT11_PIN A1

#include<LiquidCrystal.h>

LiquidCrystal lcd (2, 4, 8, 9, 10, 11);

int led1 = 13; //yellow

int led2 = 12; //green

int led3 = 3; //red//w

int relay = 7;

int relayPin=A4;

int sensorPin = A3;    // Set up a PIR sensor pin

//int pirState = LOW;

//int val

//int relayPin = A4;    //Set up a Relay pin

//int temp, temp_init;

//define buzzer 5

#define fan 6

int chk, val;

void setup() {

// put your setup code here, to run once:

Serial.begin(9600);

```



```
lcd.setCursor(16, 2);
```

```
lcd.clear();
```

```
lcd.setCursor(0, 1);
```

```
lcd.print("diu");
```

```
delay(2000);
```

```
lcd.clear();
```

```
lcd.setCursor(0, 2);
```

```
lcd.print("Heater Running");
```

```
delay(1000);
```

```
pinMode(led1, OUTPUT);
```

```
pinMode(led2, OUTPUT);
```

```
pinMode(led3, OUTPUT);
```

```
pinMode(relay, OUTPUT);
```

```
pinMode(sensorPin, INPUT);
```

```
pinMode(relayPin, OUTPUT);
```

```
chk = DHT.read11(DHT11_PIN);
```

```
int temp= constrain(DHT.temperature, 0, 100);
```

```
delay(500);
```

```
Serial.println(temp_init);
```

```
diff=temp_init-temp;
```

```
pinMode(fan, OUTPUT);

//pinMode(buzzer, OUTPUT);

}

void loop() {

    dht_sensor();

    rt();

}

void dht_sensor() {

    chk = DHT.read11(DHT11_PIN);

    temp_data = constrain(DHT.temperature, 0, 100);

    humidity_data = constrain(DHT.humidity, 0, 100);

    Serial.print(temp_data);

    Serial.print(" ");

    Serial.println(humidity_data);

    delay(2000);

```

```
if (humidity_data >= 0 && humidity_data <= 30) {  
  
    if (temp_data < temp_init + (diff/2)) {  
  
        digitalWrite(fan, HIGH); //fan high  
  
        digitalWrite(relay, HIGH); //relay high  
  
        digitalWrite(led3, HIGH);  
  
        digitalWrite(led2, LOW);  
  
        digitalWrite(led1, LOW);  
  
        lcd.clear();  
  
        lcd.setCursor(0, 1);  
  
        lcd.print(constrain(DHT.humidity, 0, 100));  
  
        lcd.setCursor(3, 1);  
  
        lcd.print("%");  
  
        lcd.setCursor(3, 0);  
  
        lcd.print("T:");  
  
        lcd.setCursor(5, 0);  
  
        lcd.print(constrain(DHT.temperature,0, 100));  
  
        lcd.setCursor(7, 0);  
  
        lcd.print("C");  
  
        lcd.setCursor(8, 0);  
  
        lcd.print(" ");  
  
        lcd.setCursor(9, 0);  
  
        lcd.print("Dry");  
  
        delay(500);  
  
        Serial.print("Temp_data:");
```

```
//Serial.println(temp_data);

Serial.print("Fan on");

}

else if (temp_data >= temp_init+(diff/2)) {

digitalWrite(fan, LOW); //fan off

digitalWrite(relay, LOW); //relay off

digitalWrite(led2, HIGH);

digitalWrite(led1, LOW);

digitalWrite(led3, LOW);

lcd.clear();


lcd.setCursor(0, 1);

lcd.print(constrain(DHT.humidity, 0, 100));


lcd.setCursor(3, 1);


lcd.print("%");


lcd.setCursor(3, 0);


lcd.print("T:");


lcd.setCursor(5, 0);


lcd.print(constrain(DHT.temperature,0, 100));


lcd.setCursor(7, 0);


lcd.print("C");


lcd.setCursor(8, 0);


lcd.print(" ");


lcd.setCursor(9, 0);
```

```

    lcd.print("Dry");

    delay(500);

}

}

else if (humidity_data >= 31 && humidity_data <= 79) {

    if (temp_data < temp_init + diff) {

        digitalWrite(fan, HIGH); //fan high

        digitalWrite(relay, HIGH); //relay high

        digitalWrite(led2, HIGH);

        digitalWrite(led1, LOW);

        digitalWrite(led3, LOW);

        lcd.clear();

        lcd.setCursor(0, 1);

        lcd.print("Temp_data:");

        lcd.setCursor(0,0);

        lcd.print(constrain(DHT.humidity, 0, 100));

        lcd.setCursor(3, 1);

        lcd.print("%");

        lcd.setCursor(3, 0);

        lcd.print("T:");

        lcd.setCursor(5, 0);

        lcd.print(constrain(DHT.temperature, 0, 100));

        lcd.setCursor(7, 0);

        lcd.print("C");

```

```

    lcd.setCursor(8, 0);

    lcd.print(" ");

    lcd.setCursor(9, 0);

    lcd.print("Moderate");

    delay(1000);

    Serial.print("Temp_data:");

    Serial.println(temp_data);

    Serial.print("Fan on");

}

else if (temp_data >= temp_init + diff) {

    digitalWrite(fan, LOW); //fan off

    digitalWrite(relay, LOW); //relay off

    digitalWrite(led1, HIGH);

    digitalWrite(led2, LOW);

    digitalWrite(led3, LOW);

    lcd.clear();

    lcd.clear();

    lcd.setCursor(0, 1);

    lcd.print("Temp_data:");

    lcd.setCursor(0,0);

    lcd.print(constrain(DHT.humidity, 0, 100));

    lcd.setCursor(3, 1);

    lcd.print("%");

    lcd.setCursor(3, 0);

```

```

    lcd.print("T:");

    lcd.setCursor(5, 0);

    lcd.print(constrain(DHT.temperature, 0, 100));

    lcd.setCursor(7, 0);

    lcd.print("C");

    lcd.setCursor(8, 0);

    lcd.print(" ");

    lcd.setCursor(9, 0);

    lcd.print("Moderate");

    delay(500);

}

}

else if (humidity_data >= 80 && humidity_data <= 100) {

    if (temp_data < temp_init + (diff*2-1)) {

        digitalWrite(fan, HIGH); //fan high

        digitalWrite(relay, HIGH); //relay high

        digitalWrite(led1, HIGH);

        digitalWrite(led2, LOW);

        digitalWrite(led3, LOW);

        lcd.clear();

        lcd.setCursor(0, 0);

        lcd.print(constrain(DHT.humidity, 0, 100));

        lcd.setCursor(2, 0);

        lcd.print("%");

```

```

    lcd.setCursor(3, 0);

    lcd.print("T:");

    lcd.setCursor(5, 0);

    lcd.print(constrain(DHT.temperature, 0, 100));

    lcd.setCursor(7, 0);

    lcd.print("C");

    lcd.setCursor(8, 0);

    lcd.print(" ");

    lcd.setCursor(9, 0);

    lcd.print("Wet");

    delay(500);

    Serial.print("Temp_data:");

    Serial.println(temp_data);

    Serial.print("Fan on");

}

else if (temp_data >= temp_init+(diff*2)) {

    digitalWrite(fan, LOW); //fan off

    digitalWrite(relay, LOW); //relay off

    digitalWrite(led1, LOW);

    digitalWrite(led2, LOW);

    digitalWrite(led3, LOW);

    lcd.clear();

```



```
    lcd.clear();

    lcd.setCursor(0, 0);

    lcd.print(constrain(DHT.humidity, 0, 100));

    lcd.setCursor(2, 0);

    lcd.print("%");

    lcd.setCursor(3, 0);

    lcd.print("T:");

    lcd.setCursor(5, 0);

    lcd.print(constrain(DHT.temperature, 0, 100));

    lcd.setCursor(7, 0);

    lcd.print("C");

    lcd.setCursor(8, 0);

    lcd.print(" ");

    lcd.setCursor(9, 0);

    lcd.print("Wet");

    delay(500);

}

}

}

void rt() {

val = analogRead(sensorPin);

Serial.print(val);

// read input value
```

```
if (val >= 700) {           // check if the input is HIGH
    digitalWrite(relayPin, LOW); // turn Relay OFF
    delay(100);

}

else if (val <= 699)
{
    digitalWrite(relayPin, HIGH); // turn Relay ON
    delay(300);

}
}
```