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Under sec. 3 of UGC Act 1956.
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SCHOOL OF ELECTRONICS, ELECTRICAL AND BIOMEDICAL TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Level Project Report

IOT-SENSORS AND DEVICES
(211ECE1400)

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Project Title	**AUTOMATIC FAN SPEED CONTROLLER FOR DOMESTIC PURPOSE**
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BONAFIDECERTIFICATE

Bonafide record of work done by Y. Pavan Kumar Reddy, Y. Jeevan Reddy, V. Lokesh, T. Venkatesh, K. Srinivas Reddy of CSE Department during Odd semester in Academic Year 2022-23, as part of 211ECE1400 - IOT-Sensors and Devices Course level project.

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Submitted for the evaluation of course level project of 211ECE1400 - IOT-Sensors and Devices course held on _____

Internal Examiner **External Examiner**

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AUTOMATIC FAN SPEED CONTROLLER FOR DOMESTIC PURPOSE

ABSTRACT:

This project is about automatic fan speed controller that controls the speed of an electric fan according to our requirement. Use of Arduino that is embedded system makes the project simple and more efficiency. The sensed temperature and fan speed level values are simultaneously displayed on the LCD panel. It can be implemented for several applications including air-conditioners, Water heaters, snow- melters, ovens, heat-exchangers, mixers, furnaces, incubators, thermal baths and veterinary operating tables.

ARDUINO micro controller is the heart of the circuit as it controls all the functions. The temperature and humidity sensor DTH11 senses the temperature and converts it into an electrical (analog) signal, which is applied to the microcontroller. This project uses regulated 5v power supply. This project is useful in process industries for maintenance and controlling of Boilers temperature.

The project presented here is based on automatic fan speed controller that automatically adjusts the fan's speed according to ambient temperature of the surroundings. The temperature flow controlled fan is an automated fan, controlled by a temperature sensor, using fully hardware design. The heart of this project consists of the temperature sensor circuit which senses the change in the ambient temperature of the surroundings. As the signal sensed by the temperature sensor is very weak in amplitude and strength. Therefore we use amplifier to increase the strength of the signal so that the signal is able to drive the output section, in this case a fan. Here pulse width modulation is use in this case. When heat is applied to the temperature sensor, this will determine the fan automatically increasing or decreasing in speed according to the four speed levels of a normal fan that are set to different temperature ranges of a room. It can be used in cooling electronics devices, where the fan speed needs to increase if here dissipation increases.

INTRODUCTION:

The Technology is increasing rapidly which need to be followed by us With the advancement in technology, intelligent systems are introduced every day. Microcontrollers play a very important role in the development of the smart systems as brain is given to the system. Microcontrollers have become the heart of the new technologies that are being introduced daily. The increase in technology leads to many automatic innovations that are taking place. In many ways the power is getting wasted as of our laziness or carelessness as we switched on ac and forgets to switch off in the afternoon times, So this project is Automatic fan speed controller which decreases the speed and even power offs if the condition satisfies. A temperature sensor has been used to measure the temperature of the room and the speed of the fan is varied according to the room temperature using PWM technique. The duty cycle is varied from 0 to 255 to control the fan speed depending upon the room temperature, which is displayed on Liquid Crystal Display.

Nowadays, the humankind is moving towards the new technologies by replacing the manual operations to automatically controlled devices. One of the basic requirements of the people during hot weather is a cooling fan. But, the speed of the fan can be controlled by manual operation using a manual switch namely fan regulator or dimmer. By turning the dimmer, the fan speed can be altered. It can be watched in some places like where the temperature is high during the morning though the temperature falls radically at night time. The users do not understand the difference in temperature. So to overcome the speed of the fan here is a solution to vary according to temperature. This concept is particularly applicable for areas like where temperature changes radically during day and night time. This project will convert the manual fan into automatic fans. The automatic fans will change their speed according to the temperature in the room. This article discusses a temperature-controlled fan block diagram, working on each block and properties.

MOTIVATION:

Now-a-days the technology is increasing rapidly and this new era brought automation in every thing as there is less need of humans and less burden on humans. The world is so busy in updating and learning new things. In this busy schedule working on simple things can be distracting way as one of these things includes regulating the fan using regulator. The users need to regulates based on whether conditions as they need to increase the fan speed if temperature increases and decrease the fan speed if the temperature decreases and if it happens at the time of sleep it would be uncomfortable in regulating the fan speed. And in some places temperature rapidly gets increased and deceased and in these places normal manual regulating fans would be unusual and causes disturbances. So we thought of this project(AUTOMATIC FAN SPEED CONTROLLER) and implemented through a demo. This projects auto regulates the fan without the help of any humans and it autoregulates based on the whether conditions, as the FAN speed increases when the temperature increases and the FAN speed decreases when the temperature decreases .

In many domestic areas like factories and industries the machinery leads to the rise in temperature and to bring back to normal temperature ventilator fans are used and these work through manually and these work with regulators which are operated by humans. But the time for regulating that number of fans may leads to waste of time. Once if the fans are in ON conditions they rotate with the high speed even if the temperature decreases but the fans will rotate with same speed. This leads to wastage of electricity and the parts of the fans will wearout fastly and this high speed for long time will cause heat in fans. This project can be replaced by those fans as they are autoregulating and lessneeded of humans. So the fans will get ON condition if the temperature increases an the speed of the fan will depend on the temperature. In anycase the user forgot to switch off the fan at night the fan automatically gets switched off as the temperature at night will get decreased.

OBJECTIVE:

The main objective of this project is to control or to automate the fans based on the temperature conditions using microcontroller. Using of regulators to regulate the speed of fans is an old and uncomfortable method. This method is innovative and saves most of the time and energy. As the temperature decreases, but the fans are running with high speed the user feels uncomfortable. So this project justifies the working of fan based on temperature. The Temperature and Humidity sensor that is DHT11 is used to to describe the temperature and gives the input to the microcontroller.

The microcontroller controls the fan speed based on the input given by temperature sensor. The speed of the fan is increased when temperature is increased and decreased when temperature is decreased. This project can be used for domestic purposes like in industries, Factories and these can be used even in the houses. As we know that the normal fans are connected to the regulaters where the speed of the fan is regulated, but in the places where the temperature rises and falls continuously, the regulator must be monitered continuously and manually. This is usually uncomfortable and includes the work that runs through manually. But this project vanishes burden created by those techniques as it runs based on the temperature conditions. It auto regulates its own speed based on the input given by Arduino by analysing the the input given by temperature sensor that is DHT11. So this projects successfully runs the fan based on conditions given in the code by comparing with the temperature. So when the temperature increases the temperature sensor reads and sends to the Arduino, In Arduino the input from the DHT11 is analysed and compared to the conditions and gives the input is given to the fan based on the condition and the fan is regulated in this way.

This project can be used for domestic purposes like in industries, Factories and these can be used even in the houses. As we know that the normal fans are connected to the regulaters where the speed of the fan is regulated, but in the places where the temperature rises and falls continuously, the regulator must be monitered continuously and manually.

LITERATURE SURVEY:

K. N. Ramii (2014) at al, , they proposed research paper on Development of Home Energy Management System Using Arduino, the Arduino is developed as a controller to manage the lamp, fan and air conditioner It correspond the relay, lamp and fan via PIR sensor, and air conditioner via temperature sensor. The energy consumed by the electrical appliances can be saved by at least 1.5% with the implementation of arduino.

According to Kunla Singh (2015), Automatic Fan Speed Control system using Arduino as we all know that we are slowly moving toward automation and Automation is one of the trending topics. Basically in this project will be controlling the fan speed with respect to the temperature. The system will get the temperature from the temperature sensor and it will control the speed according to the temperature, set by the user.

In this project, microcontroller forms the processing parts, which firstly senses the temperature and the controller then compares the data with the set temperature. If the current temperature is greater than the set temperature, the controller turns ON the fan and the set speed will be proportional to the difference between the set temperature and the current temperature. If the current temperature is less than the set temperature, the fan will be turned OFF. The fan's speed will change according to the temperature.

Moreover, RipunjayChachan (2015), said designing an intelligent Temperature- Cum-Humidity monitoring device is depicted in this current project. The designing of the fully functional prototype is developed in-house. Once the humidity of the temperature gets out of the range mentioned by the user the device sends an SMS to the user's predefined number. This SMS contains information on the current temperature and the humidity. The developed device is also able to send the data to the monitoring station for recording and graph plotting for analyzing purposes at the later stage. The developed device has been tested under various simulated conditions.

PROPOSED APPROACH:

In the proposed systems, microcontroller plays a vital role in the smart systems development. Micro-controllers have become an essential part in the present technologies that are being presented daily. This project discusses temperature based fan speed control and monitoring system using an Arduino system. This system is used to control the cooling system automatically based on the room temperature. The system uses an Arduino board to implement a control system. Since this system is proposed to control the cooling system and it is very important to know Arduino controlled system well.

The Temperature and Humidity sensor is used that gives the input to the Arduino which is compared to the conditions mentioned in the code. If the condition is true the fan will run with the speed mentioned in that condition. Temperature is the base of working of this project as this project works on based on temperature condition. In this Automatic fan speed controller the LEDs also indicates the rise and fall in temperature, where one led glows at one condition and other led glows at some condition and vice-versa. The LCD display is used to display the temperature humidity and fan speed percentage. In this project analog input that is from the DHT11 sensor is converted to digital input and provided to the fan. The speed of the fan is autoregulated based on the input and conditions, so as there is no need of manual methods to be applied in here which will more efficient and more comfort than other. The all negative terminals are connected to the ground and the positive terminals of sensors are connected to the 5V and the data pin is connected to the analog pins of Arduino. The positive terminals of the fan are connected to the digital pins.

In this way the project determines the autoregulation as it controls its own output based on the input and conditions mentioned the code. In the code DHT11 and LCD display libraries are included and mentioned.

EXPERIMENTATION:

The components that are used in the project are:

- Arduino Uno
- Breadboard
- DHT11 sensor
- LEDs
- Jumper wires
- LCD display
- Motor with Fan

ARDUINO UNO:

Arduino is an open-source electronics platform based on easy to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

SPECIFICATIONS

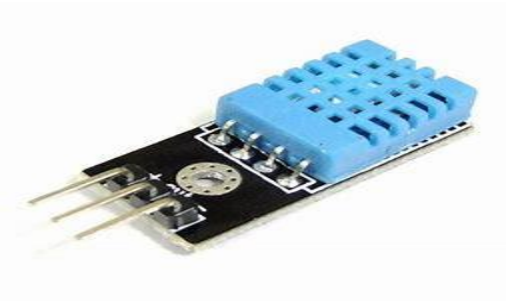
Microcontroller	:	ATmega328
Operating Voltage	:	5V Input
Voltage (recommended)	:	7-12V
Input Voltage (limits)	:	6-20V
Digital I/O Pins	:	14 (of which 6 provide PWM output)
Analog Input Pins	:	6
DC Current per I/O Pin	:	40 mA
DC Current for 3.3V Pin	:	50 mA
Flash Memory	:	32 KB
SRAM	:	2 KB
EEPROM	:	1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

LIQUID CRYSTAL DISPLAY:

The LCD is a dot matrix liquid crystal display that displays alphanumeric characters and symbols. 16X2 LCD digital display has been used in the system to show the room temperature. Liquid Crystal Display screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven-segments and other multi segment LEDs.

DHT11 SENSOR:

DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously. DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.



DESCRIPTION:

- We used Arduino Uno 3 as it has more efficient microcontroller that helps in working of this project.
- LCD display is used to display the temperature and the fan speed.
- DTH11 temperature sensor is taken and provided with Arduino voltage that is 5V.
- The pins of fan, sensor, display are connected to the Arduino to respective pins as mentioned in the code.
- The most important thing is to set the conditions by which the fan will rotate.
- LEDs are connected as it they indicates each condition.

CONNECTION:

- The positive and ground terminals are connected to the DHT11 sensor.
- The data pin of the sensor is connected to analog pin.
- The negative terminal of fan is connected to the ground and the positive terminal of the fan is connected to the pwm pin 9.
- The LCD display is connected as mentioned below:

  1 pin-ground

  2nd pin-5v

  3rd pin-ground

  4th pin-12th pin of arduino

  5th pin-ground

  6th pin-11th pin of arduino

  16th pin-ground

  15th pin-5v

  14th pin-2nd pin of arduino

  13th pin-3rd pin of arduino

  12th pin-4th pin of arduino

  11th pin-5th pin of arduino

- The LEDs neagtive pins are connected to the ground.
- The positive terminals of the LEDs are connected to the 6 and 7 pins of the arduino respectively.

BLOCK DIAGRAM:

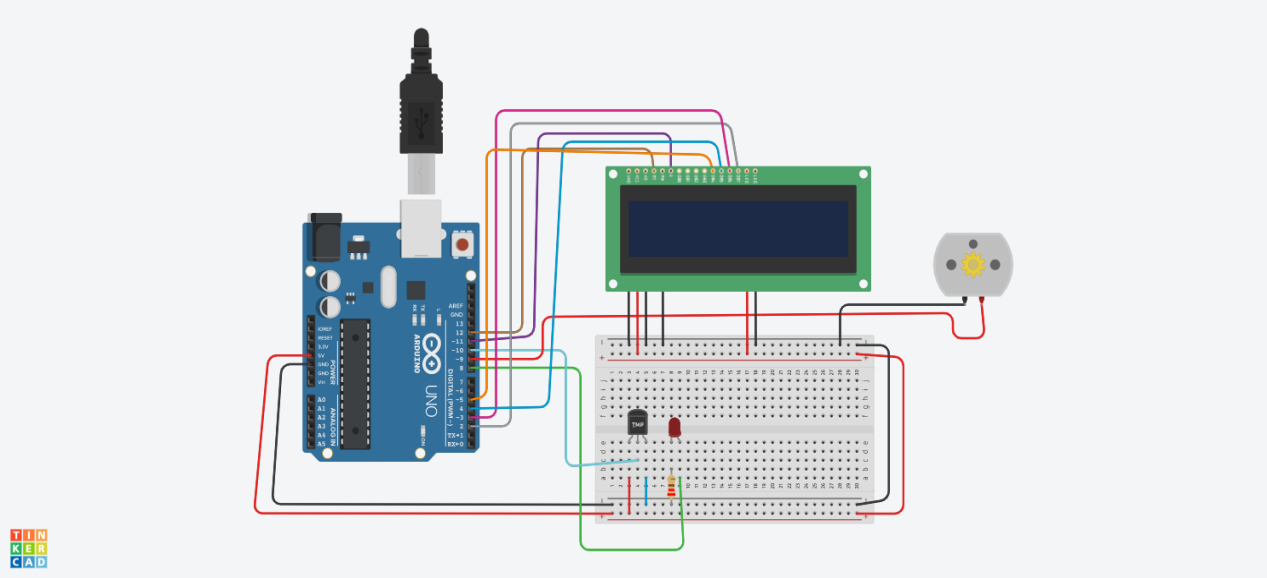
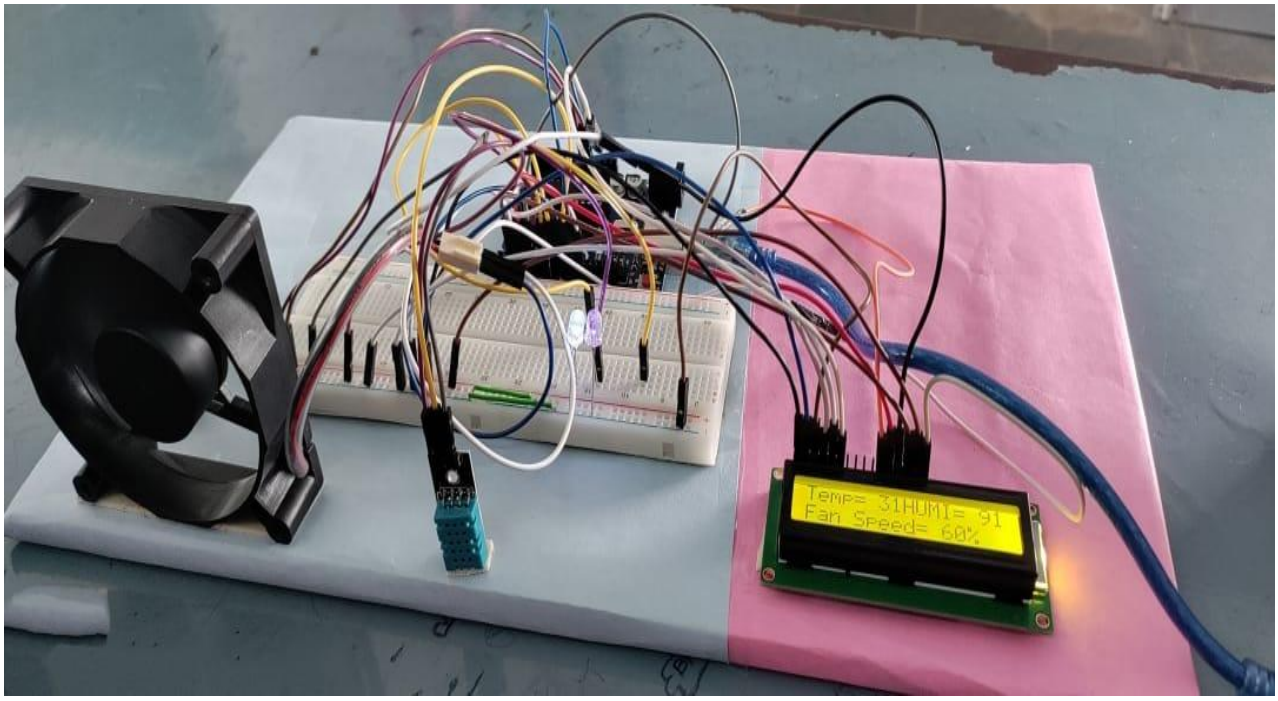


IMAGE OF THE PROJECT:



CODE:

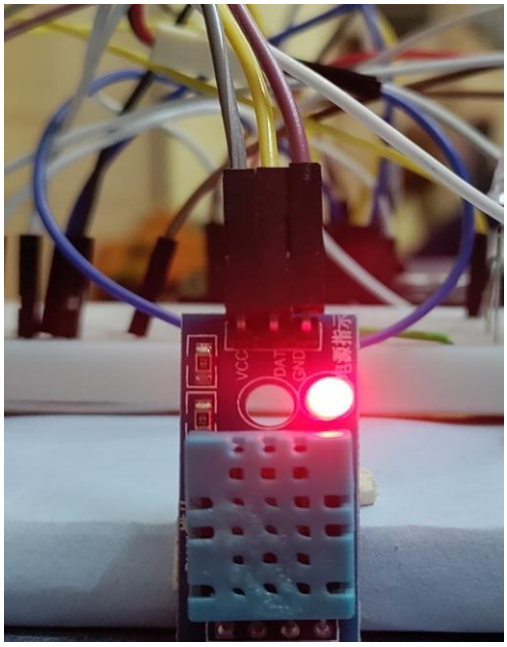
```
   #include <DFRobot_DHT11.h>
#include<LiquidCrystal.h>
LiquidCrystal lcd(12,11,5, 4, 3, 2);
DFRobot_DHT11 DHT;
#define DHT11_PIN 10
int LED1=8;
int LED2=7;
int buzzer=6;
#define pwm 9
byte degree[8] =
            {
              0b00011,
              0b00011,
              0b00000,
              0b00000,
              0b00000,
              0b00000,
              0b00000,
              0b00000
            };


void setup(){

  lcd.begin(16, 2);
 lcd.createChar(1, degree);
 lcd.clear();
 lcd.print("Temperature Controlled");
 lcd.setCursor(0,1);
 lcd.print("  DC Fan ");
 delay(2000);
 analogWrite(pwm, 255);
  Serial.begin(9600);
  pinMode(8,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(6,OUTPUT);


  analogWrite(pwm,255);


}


void loop(){
```

```
 delay(200);
  DHT.read(DHT11_PIN);
  Serial.print("temp:");
  Serial.print(DHT.temperature);
  Serial.print("  humi:");
  Serial.println(DHT.humidity);
   lcd.setCursor(0,0);
  lcd.print("Temp= ");
  lcd.print(DHT.temperature);
  lcd.print("HUMI= ");
  lcd.print(DHT.humidity);     //Showing temperature on LCD display
  lcd.setCursor(0,1);


  if(DHT.temperature<20){
    analogWrite(9,0);
    Serial.print("fan speed=0%");
     lcd.print("Fan Speed= 0%    ");
    delay(1000);
  }

  else if(DHT.temperature==29) {
    digitalWrite(8,HIGH);
    analogWrite(7,LOW);
    analogWrite(6,LOW);
    analogWrite(pwm,51);
    Serial.print("fan speed=20%");
     lcd.print("Fan Speed= 20%    ");
    delay(1000);
  }

  else if(DHT.temperature==30){
    digitalWrite(8,HIGH);
     analogWrite(7,LOW);

    analogWrite(6,HIGH);
    analogWrite(pwm,102);
    Serial.print("fan speed=40%");
     lcd.print("Fan Speed= 40%    ");
    delay(1000);
  }

else if(DHT.temperature==31){
    digitalWrite(8,HIGH);
     analogWrite(7,HIGH);
    analogWrite(6,HIGH);
    analogWrite(pwm,153);
    Serial.print("fan speed=60%");
     lcd.print("Fan Speed= 60%    ");
    delay(1000);
```

```
  }

else if(DHT.temperature==32){
    digitalWrite(8,HIGH);
     analogWrite(7,HIGH);
    analogWrite(6,HIGH);
    analogWrite(pwm,204);
    Serial.print("fan speed=80%");
     lcd.print("Fan Speed= 80%    ");
    delay(1000);
  }

else if(DHT.temperature>=33){


    analogWrite(pwm,255);
    Serial.print("fan speed=100%");
     lcd.print("Fan Speed= 100%    ");
    delay(1000);
  }delay(1000);
}
```

RESULTS:

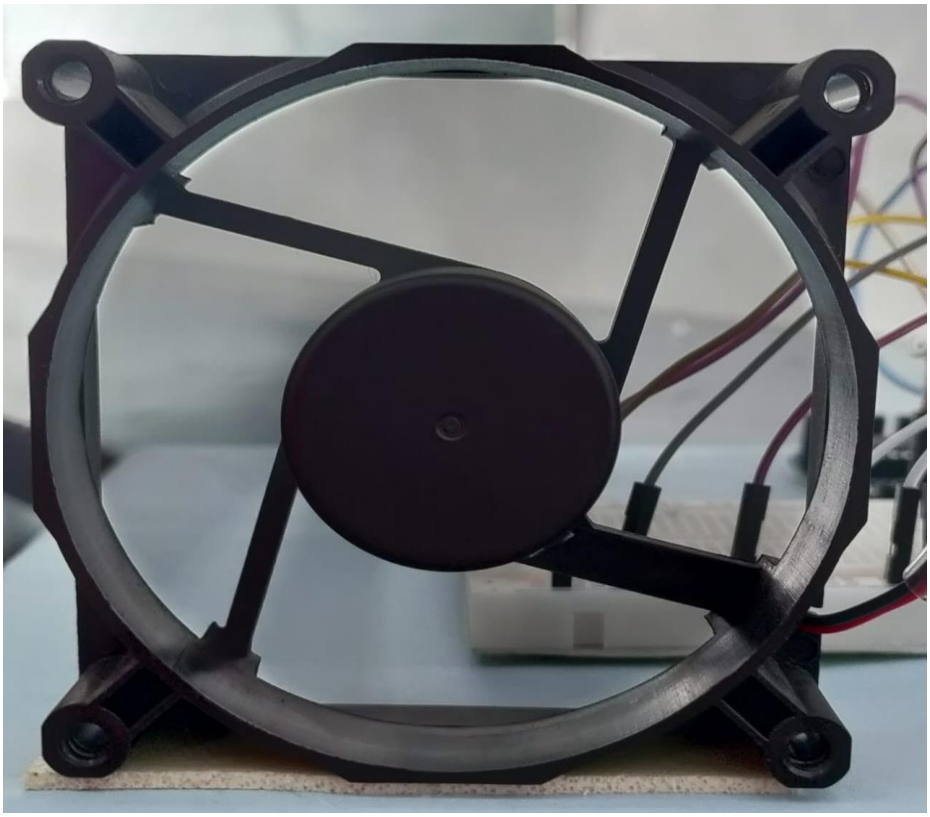
The temperature sensor analyses and gives the output to the Arduino where it is compared with conditions and gives the input to the fan.



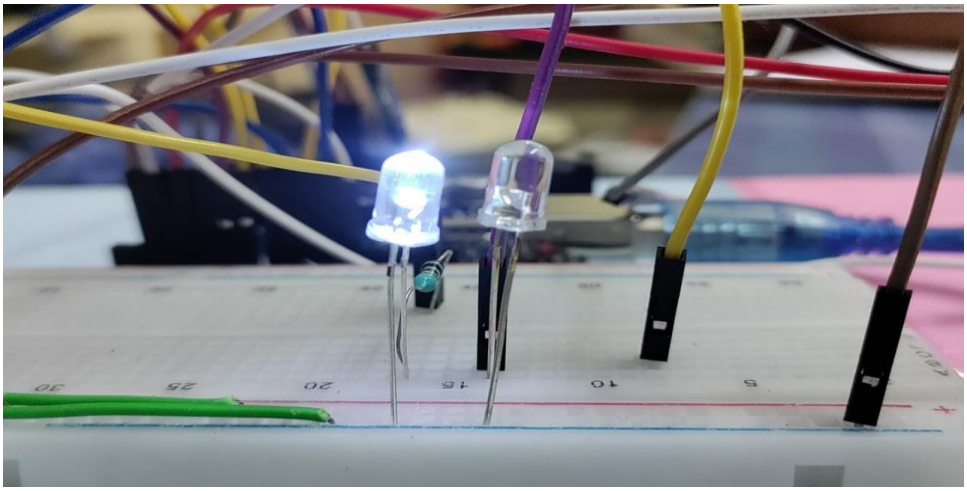
The temperature and the humidity percentage is showed on the LCD display along with FAN speed percentage.

RESULTS:

The input is taken from the temperature sensor and the input is analysed and compared to the conditions mentioned in the code and the speed of the fan is regulated according to the speed mentioned in that condition.



The LEDs glows as the condition changes, one LED glows at one condition and other LEDs glows at other conditions.



CONCLUSION:

The project statement is implemented. Hardware part is halfway implemented. Through simulations and after running the code in IDE abstract is verified. As the technology is going on developing day by day, we prefer things to be done automatically and in the same way our projects reduces the work to mankind. The temperature is high the fan set at high speed and at lower temperatures the fan is operated with lower speed. This is done automatically. This project can be enhanced by using higher power electronic devices to operate high capacity DC motors. Regenerative braking for optimizing the power consumption can also be incorporated. The automatic fan speed controller unit was put under a series of tests for ascertaining its performance as a controller device and very satisfactory results were obtained. This device was also found to be sufficiently quick, so that the safety of the equipment protection by the device under any undesired transient condition of the main supply is ensured. This device has a very high sensitivity. It is also simple in design, reliable in operation and cost competitive with any other product available in the market. From the above analysis, it is concluded that this device can easily control the fan automatically based on room temperature.

Many tests have been implemented on this project at various temperature conditions and at different places to get maximum efficiency yielding output. This project worked well through every condition. So finally we can conclude that when the power supply is given to the entire circuit then the DHT11 reads the surrounding temperature of the fan. The analog value of the temperature is given by the sensor and applied to the analog pin of the microcontroller. The value of analog is changed to the digital by the microcontroller internally. If the temperature is superior to the threshold value, then the value is compared to the the conditions mentioned in the code and if the condition is true the signal is sent to fan and the fan will start rotate according to the speed mentioned in that condition. Thus the fan starts rotating. The temperature, humidity and the speed of the fans are displayed on the LCD display.

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Upendra Surabhi1, Prasad2

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Vivek Kumar Jain3, volume 4

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