

Acknowledgement

We would like to express our gratitude and appreciation to all those who gave us the possibility to complete this report

We take pleasure in expressing gratitude towards our institution for providing us the opportunity to work on this project as a part of our course. We would like to express our gratitude and sincere thanks to our management, **Bro. Antony Vayalil**, Director and **Bro. Peter**, Assistant Director for providing us with a congenial environment for studies. We would like to express our gratitude to Principal, **Dr. R N Subba Rao** for providing the right atmosphere at the institute. We express our heart full thanks to **Dr. Nazura Javed Kutty**, Head of the Department, for being helpful through the project. We express our deep sense of gratitude to our project guide **Dr. Chethana Sridhar**, Assistant Professor for her unfailing encouragement, valuable guidance and suggestions to us in the course of project work. We also express our heartfelt thanks to our parents for being supportive in all our activities without whom it wouldn't have been possible for us to complete our project.

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1. Abstract

This project is a standalone automatic fan controller that controls an electric fan according to our requirement. The sensed temperature and fan values are simultaneously displayed on the Blynk IoT application. It is very compact using few components and 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. NODEMCU ESP8266 12E is the heart of the circuit as it controls all the functions. The temperature sensor DHT11 temperature sensor the temperature and converts it into an electrical (analog) signal, we use the Blynk IoT application to monitor the process, this project uses regulated 12V, 2A power supply. This project is useful in process industries for maintenance and controlling of Boilers temperature, 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. When heat is applied to the temperature sensor, this will determine the fan speed automatically to the levels of a normal fan that are set to different temperature ranges. In a room, it can be used in cooling electronic devices.

2. Problem Definition

The problem addressed by the temperature control fan project is the need for an efficient and automated solution to regulate the temperature in a space based on user-defined preferences. Traditional manual control of fans may not provide optimal comfort or energy efficiency, especially when users are not present or unable to manually adjust the fan settings.

The problem can be summarized as follows:

- **Lack of Automated Temperature Control:** The absence of an automated system to monitor the temperature and adjust the fan speed accordingly results in suboptimal temperature regulation in the space.

- **Inefficient Energy Consumption:** Manual control of fans may lead to unnecessary energy consumption when the fan operates continuously, even when the temperature is within the desired range.
- **Limited Accessibility for Disabled Individuals:** Individuals with disabilities may face challenges in physically adjusting the fan speed or monitoring the temperature, making it difficult for them to maintain a comfortable environment.

The goal of the temperature control fan project is to address these problems by designing an IoT-based solution that enables automated temperature monitoring and improved energy efficiency

2.1 Objective

In the electronics world we want to make the human life comfortable. Therefore the home automation system is very essential. Fan controller is one of the parts of the home automation system. The main objective of this project is to develop an low cost, user friendly automated temperature-controlled fan regulator which reduces power consumption and also assist physically challenged or older peoples so, they can able to control the fan from their locations.

This project Temperature Based Fan Control s can be done by using NODEMCU ESP8266 12E board with some electronics materials. The NODEMCU ESP8266 12E board is very popular among all electronic circuits, thus we employed NODEMCU ESP8266 12E board for the operation of the fan control. In the proposed system itself said that it is designed to detect the temperature of the room and send that information to the NODEMCU ESP8266 12E board. Then the NODEMCU ESP8266 12E board carries out the contrast of current temperature and set temperature based on the inbuilt program of the feed through us.

2.2 Advantages of the Proposed System

- **Real-time Monitoring:** The code provides real-time monitoring of temperature and humidity readings from the DHT sensor. These values are sent to the Blynk app, allowing you to monitor the environmental conditions remotely.

- Remote Control and Adjustments: Through the Blynk app, you can remotely control and adjust the threshold temperature value. This flexibility allows you to change the temperature settings without directly accessing the hardware.
- It offers a convenient and accessible means for disabled individuals to control the fan settings, allowing them to customize their environment according to their comfort and specific needs.

2.3 Limitations: Scope and Boundary

- Sensor Placement: The placement of the temperature sensor can impact the accuracy and effectiveness of the temperature control system. Ensure that the sensor is positioned in a representative location to monitor the desired temperature accurately. Factors such as proximity to heat sources, airflow, and insulation can affect the sensor readings.
- Environmental Factors: Environmental conditions, such as extreme temperatures, humidity, dust, or corrosive substances, can affect the performance and longevity of the fan and other components. Ensure that the system is designed and protected adequately to withstand the environmental conditions in which it will be deployed.

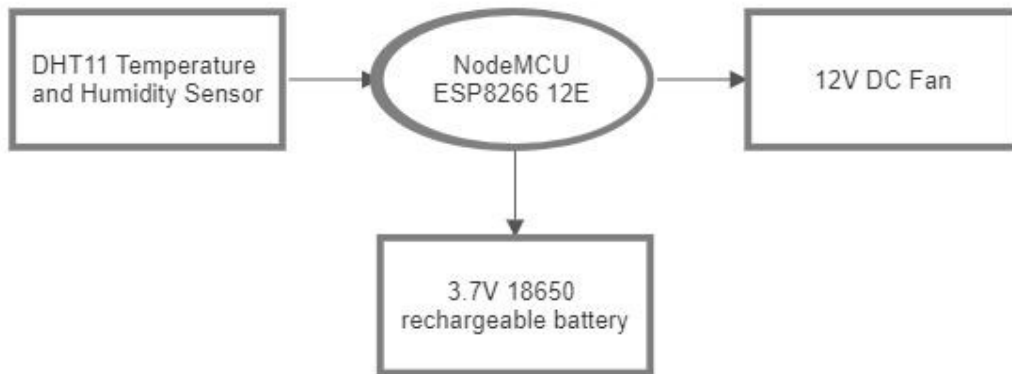
3 Requirement Analysis

- Functional Requirements:
 1. Temperature Control: The system should be able to control the fan based on a user-defined temperature threshold.
 2. Remote Control: The system should allow users to remotely adjust the temperature threshold and monitor temperature and humidity readings.
 3. Threshold Configuration: Users should be able to set and modify the temperature threshold through the Blynk app.
 4. Sensor Readings: The system should provide real-time temperature and humidity readings from the DHT sensor.
 5. Fan Control: The system should turn on the fan when the temperature exceeds the threshold and turn it off when the temperature falls below the threshold.

- Non-Functional Requirements:
 1. Usability: The Blynk app interface should be intuitive, user-friendly, and accessible to users, including those with disabilities.
 2. Reliability: The system should provide accurate and reliable temperature and humidity readings from the DHT sensor.
 3. Efficiency: The system should minimize power consumption by activating the fan only when necessary.
 4. Security: The Blynk integration should ensure secure communication between the app and the hardware.
 5. Scalability: The system should be designed to accommodate future expansions or integrations with additional sensors or actuators.
 6. Fault Tolerance: The system should handle errors gracefully and recover from any unexpected failures or sensor read failures.
- Hardware Requirements:
 1. ESP8266 Microcontroller: Used for connecting to Wi-Fi and interfacing with the sensors and motor driver.
 2. DHT Sensor: For measuring temperature and humidity.
 3. L298 2A Dual Motor Driver Module (optional): For fan speed control.
 4. Blynk App: Compatible smartphone or tablet with the Blynk app installed.
- Software Requirements:
 1. Arduino IDE: To compile and upload the code to the ESP8266 microcontroller.
 2. ESP8266WiFi Library: To enable Wi-Fi connectivity.
 3. Blynk Library: To integrate with the Blynk IoT platform.
 4. DHT Library: To interface with the DHT sensor.
- User Requirements:
 1. Remote Temperature Control: Users should be able to set and adjust the temperature threshold remotely through the Blynk app.
 2. Real-time Monitoring: Users should be able to monitor the temperature and humidity readings in real-time through the Blynk app.
 3. Accessibility: The Blynk app interface should be accessible and customizable to accommodate users with different disabilities.

4. Ease of Use: The system should provide a straightforward and user-friendly experience for controlling and monitoring the fan.

3.1 Data Flow Diagram



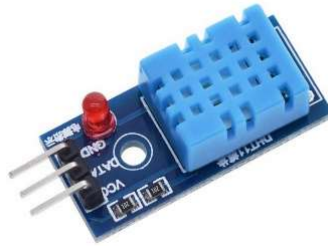
3.2 Requirement Specification

- **NodeMCU ESP8266 12E Development Board**



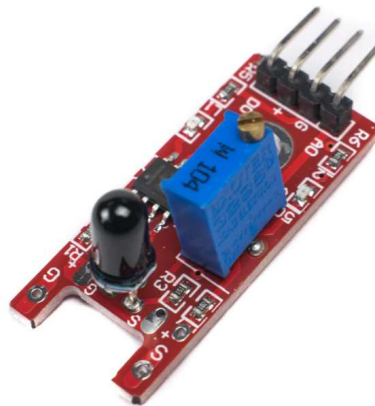
ESP8266 NodeMcu is a popular and widely used development board based on the ESP-12E Wi-Fi Module that combines elements of easy programming with Arduino IDE (C\C++) and Wi-Fi capability, it contains a built-in 32-bit low-power CPU, ROM and RAM. It is a complete and self-contained Wi-Fi network solution that can carry software applications as a stand-alone device or connected with a microcontroller (MCU). The module has built-in AT Command firmware to be used with any MCU via COM port. The ESP8266 can be flashed and programmed using the Arduino IDE. Due to its large open source developer community, a large number of libraries for this popular microcontroller is available.

- **DHT11 Temperature and Humidity Sensor**



The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use but requires careful timing to grab data.

- **KY-026 Flame Sensor**



The KY-026 flame sensor is a compact and versatile electronic module used for detecting the presence of flames. It utilizes an IR receiver to detect infrared light emitted by flames, enabling it to effectively sense fire and flames in its surroundings. The sensor features a sensitivity adjustment potentiometer that allows fine-tuning of its detection range. With its digital output interface, the KY-026 flame sensor provides a reliable signal to microcontrollers or other digital circuits when flames are detected, making it suitable for fire safety systems, flame monitoring applications, and fire alarm systems. Its small form factor and easy integration make it a popular choice among hobbyists and electronics enthusiasts for various fire detection projects.

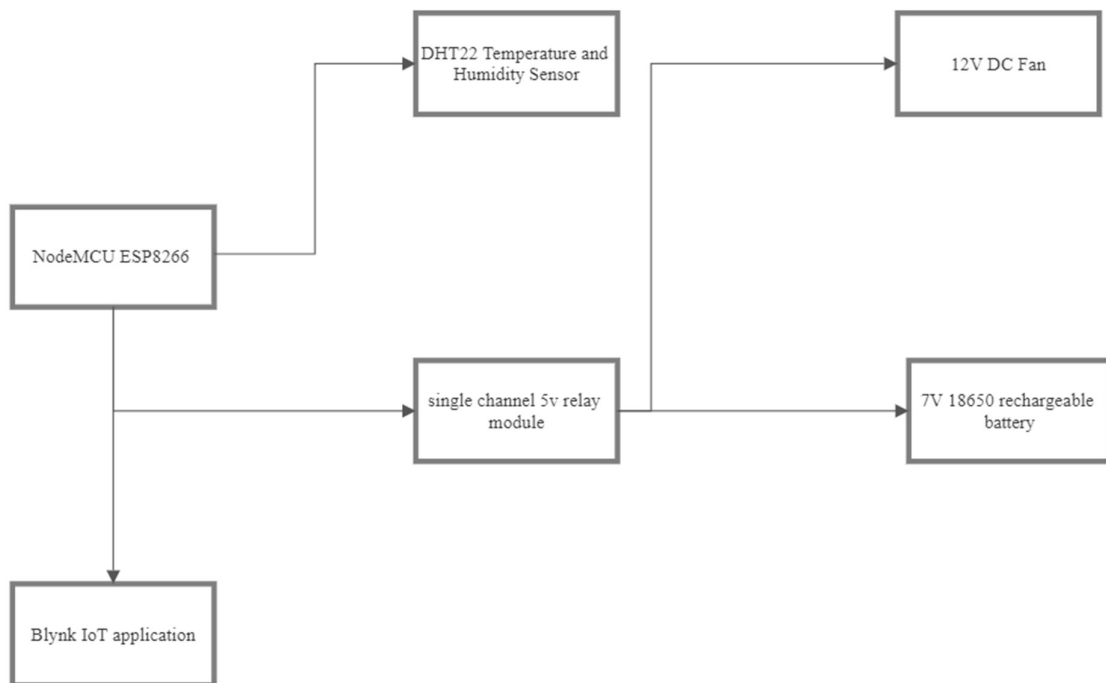
- Jumper wires
- Breadboard or prototyping board
- Power supply (12V DC) for Fan
- Fan or motor

SOFTWARE REQUIREMENTS

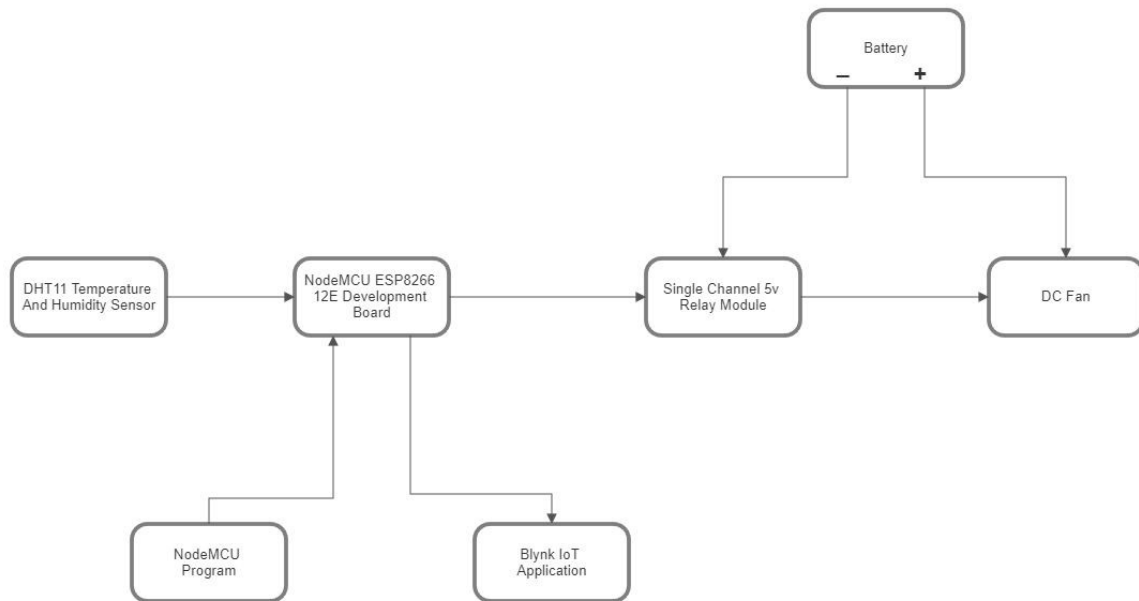
- Arduino IDE (Integrated Development Environment)
- ESP8266 board package for Arduino IDE
- Blynk mobile application (available for iOS and Android)
- Blynk library for Arduino IDE
- DHT library for Arduino IDE
- Windows 10

4 System Design

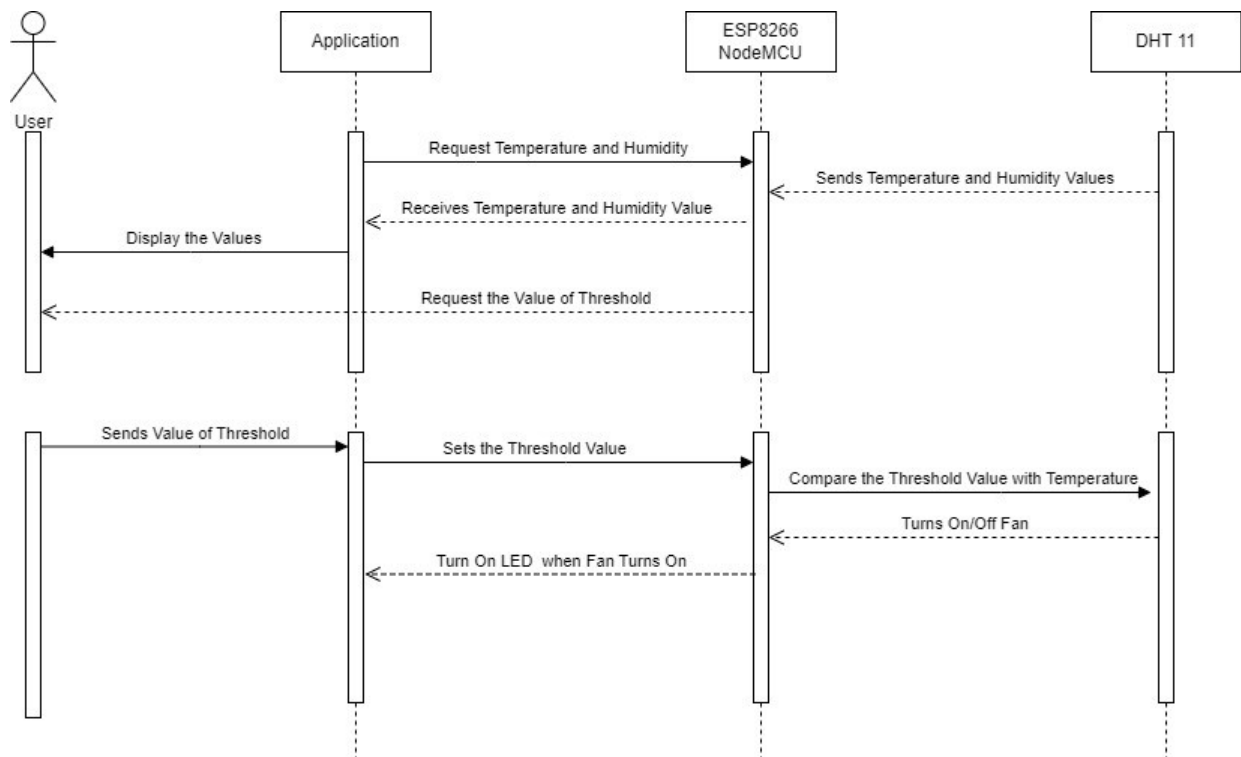
4.1 Architectural Design



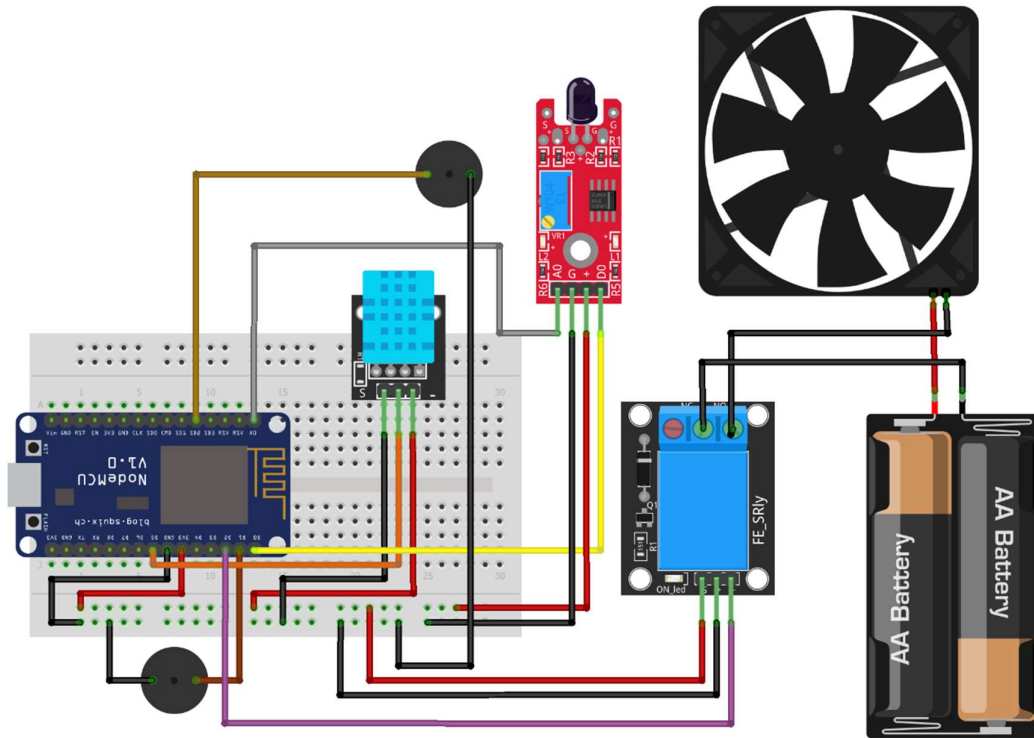
4.2 Block Diagrams



4.3 Sequence Diagram



4.4 Circuit diagram



5.1 Coding

```
#define BLYNK_TEMPLATE_ID "TMPLnLdAwkxT"
#define BLYNK_TEMPLATE_NAME "Temperature Control Fan"
#define BLYNK_AUTH_TOKEN "ssPeLh3IDYuoOylxG_4FLAjF4_R3-u8u"

#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include "DHT.h"

#define DHTPIN D5    // Digital pin connected to the DHT sensor
#define DHTTYPE DHT11 // DHT 11

#define FAN_PIN D2 // FAN RELAY
```

```
#define FAN_BUZZER D1 // Fan Buzzer pin
#define FIRE_BUZZER 9 // Fire Buzzer pin
#define Fire_analog A0
#define Fire_digital D0WidgetLED FAN(V0);
```

```
char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "Redmi Note 9 Pro Max";
char pass[] = "12345678";
```

```
float humDHT = 0;
float tempDHT = 0;
int Val = 0;
```

```
DHT dht(DHTPIN, DHTTYPE);
```

```
void setup() {
  Serial.begin(115200);
  pinMode(FAN_PIN, OUTPUT);
  digitalWrite(FAN_PIN, LOW);
  pinMode(FAN_BUZZER, OUTPUT);
  digitalWrite(FAN_BUZZER, LOW);
  pinMode(FIRE_BUZZER, OUTPUT);
  pinMode(Fire_digital, INPUT);
  Serial.println(F("DHT11 test!"));
  dht.begin();
  Blynk.begin(auth, ssid , pass );}
```

```
BLYNK_WRITE(V3) {
  Val = param.asInt();

  Serial.print("The Threshold value is: ");
  Serial.println(Val);
  Serial.println();
}
```

```

void loop() {
  Blynk.run();
  {
    int firesensorAnalog = analogRead(Fire_analog);
    int firesensorDigital = digitalRead(Fire_digital);

    Serial.print("Fire Sensor: ");
    Serial.print(firesensorAnalog);
    Serial.print("\t");
    Serial.print("Fire Class: ");
    Serial.print(firesensorDigital);
    Serial.print("\t");
    Serial.print("\t");

    if (firesensorAnalog < 100) {
      Serial.println("Fire");
      digitalWrite (FIRE_BUZZER, HIGH) ; //send tone
      delay(1000);
      digitalWrite (FIRE_BUZZER, LOW) ; //no tone
      Blynk.logEvent("fire_alert","Fire Detected Take Necessary Actions");
      digitalWrite(FAN_PIN, HIGH);
      FAN.off();
      Serial.println("Fan Turned Off!!");
    }
    else {
      Serial.println("No Fire");
    }
    delay(2000);

    humDHT = dht.readHumidity();
    tempDHT = dht.readTemperature();

    if (isnan(humDHT) || isnan(tempDHT)) {

```

```

    Serial.println("Failed to read from DHT sensor!");
    return;
}

```

```

Serial.print(F("Temperature: "));
Serial.print(tempDHT);
Serial.print(F("°C "));
Serial.println();
Serial.print(F("Humidity: "));
Serial.print(humDHT);
Serial.print(F("%"));
Serial.println();

```

```

Serial.println("*****");
Serial.println();

```

```

if (Val > tempDHT) {
    digitalWrite(FAN_PIN, HIGH);
    FAN.off();
    Serial.println("Fan Turned Off!!");
}
else {
    digitalWrite(FAN_PIN, LOW);
    FAN.on();
    digitalWrite(BUZZER_PIN, HIGH);
    delay(500);
    digitalWrite(BUZZER_PIN, LOW);
    Serial.println("Fan Turned On");
}

```

```

Blynk.virtualWrite(V1, tempDHT);
Blynk.virtualWrite(V2, humDHT);
}

```

5.2 Main modules

1. Sensor Module:

- Responsible for reading temperature and humidity values from the DHT sensor.
- Uses the DHT library to interface with the sensor and retrieve the sensor readings.
- Ensures accurate and reliable data acquisition from the sensor.

2. Control Module:

- Handles the logic for controlling the fan based on the temperature threshold.
- Compares the threshold value with the temperature reading to determine whether the fan should be turned on or off.
- Activates or deactivates the fan relay accordingly.
- Utilizes Blynk library and Blynk app integration for remote control and monitoring.

3. Communication Module:

- Establishes communication between the microcontroller (ESP8266) and the Blynk cloud server.
- Uses the ESP8266WiFi and BlynkSimpleEsp8266 libraries for connecting to the Wi-Fi network and the Blynk server.
- Enables data transmission between the microcontroller and the Blynk app for real-time monitoring and control.

4. User Interface Module:

- Provides a user-friendly interface for configuring the temperature threshold and monitoring the system status.
- Utilizes the Blynk app to display temperature and humidity readings, fan status, and allow user interaction.
- Allows users to set the temperature threshold value through the app.

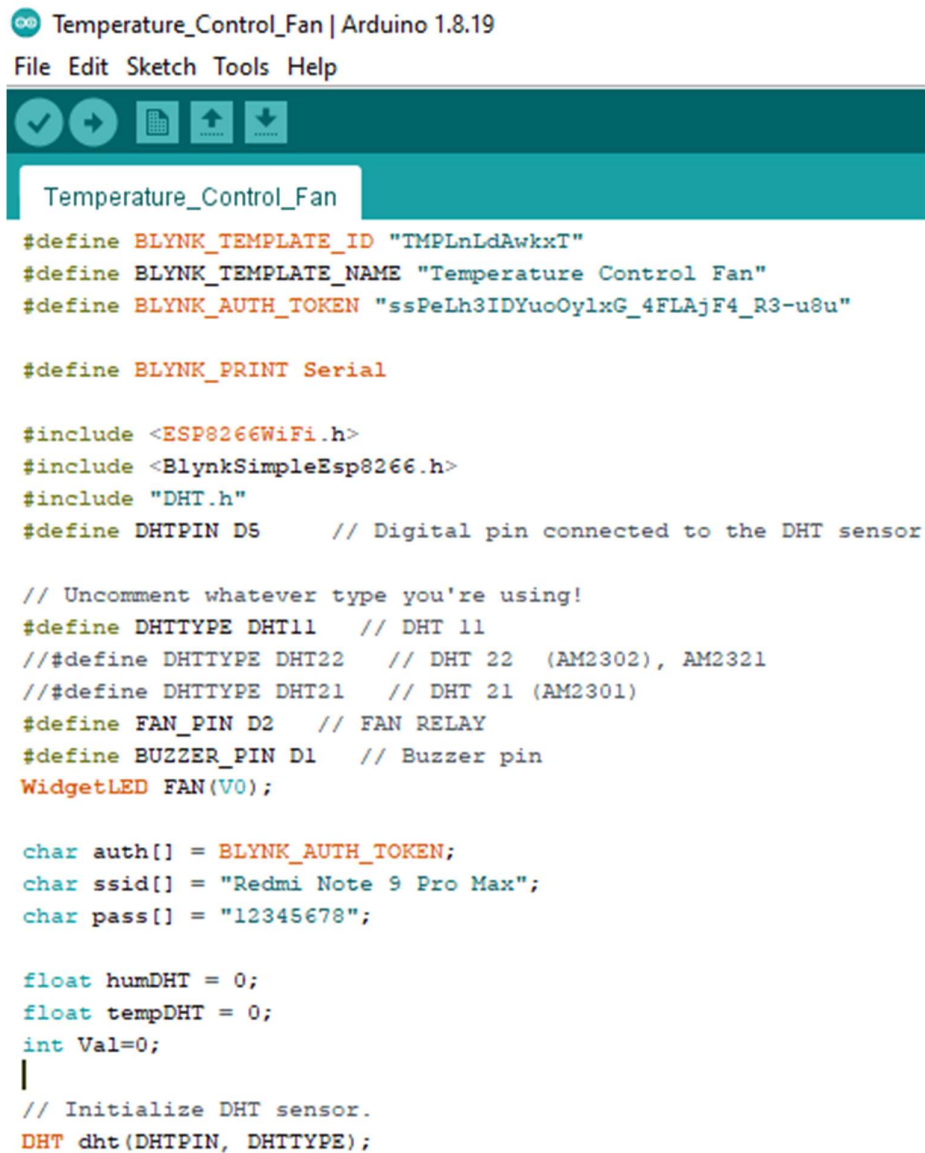
5. Alert Module:

- Includes a buzzer to generate audible alerts or notifications.
- Activates the buzzer in case if the fan is turned on.

These modules work together to create a functional temperature control fan system. The sensor module reads temperature and humidity, the control module decides fan activation, the communication module handles data transmission, the user interface module allows user interaction, and the alert module provides safety alerts.

5.3 Screen Shots

Code



```

Temperature_Control_Fan | Arduino 1.8.19
File Edit Sketch Tools Help

Temperature_Control_Fan

#define BLYNK_TEMPLATE_ID "TMPLnLdAwkxT"
#define BLYNK_TEMPLATE_NAME "Temperature Control Fan"
#define BLYNK_AUTH_TOKEN "ssPeLh3IDYuoOylxG_4FLAjF4_R3-u8u"

#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include "DHT.h"
#define DHTPIN D5      // Digital pin connected to the DHT sensor

// Uncomment whatever type you're using!
#define DHTTYPE DHT11   // DHT 11
// #define DHTTYPE DHT22   // DHT 22  (AM2302), AM2321
// #define DHTTYPE DHT21   // DHT 21 (AM2301)
#define FAN_PIN D2      // FAN RELAY
#define BUZZER_PIN D1   // Buzzer pin
WidgetLED FAN(V0);

char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "Redmi Note 9 Pro Max";
char pass[] = "12345678";

float humDHT = 0;
float tempDHT = 0;
int Val=0;
|
// Initialize DHT sensor.
DHT dht(DHTPIN, DHTTYPE);

```

```

void setup() {
  Serial.begin(115200);
  pinMode(FAN_PIN, OUTPUT);
  digitalWrite(FAN_PIN, LOW);
  pinMode(BUZZER_PIN, OUTPUT);
  digitalWrite(BUZZER_PIN, LOW);
  Serial.println(F("DHT11 test!"));
  dht.begin();
  Blynk.begin(auth, ssid, pass);
}

BLYNK_WRITE(V3)
{
  Val = param.asInt(); // assigning incoming value from pin V3 to a variable

  Serial.print("The Threshold value is: ");
  Serial.println(Val);
  Serial.println();
}

void loop() {

  Blynk.run();

  // Wait a few seconds between measurements.
  delay(2000);

  // Reading temperature or humidity takes about 250 milliseconds!
  // Sensor readings may also be up to 2 seconds 'old' (its a very slow sensor)
  humDHT = dht.readHumidity();

  // Read temperature as Celsius (the default)
  tempDHT = dht.readTemperature();

  // Check if any reads failed and exit early (to try again).
  if (isnan(humDHT) || isnan(tempDHT))
  {
    Serial.println("Failed to read from DHT sensor!");
    return;
  }

  Serial.print(F("Temperature: "));
  Serial.print(tempDHT);
  Serial.print(F("°C "));
  Serial.println();
  Serial.print(F("Humidity: "));
  Serial.print(humDHT);
  Serial.print(F("%"));
  Serial.println();

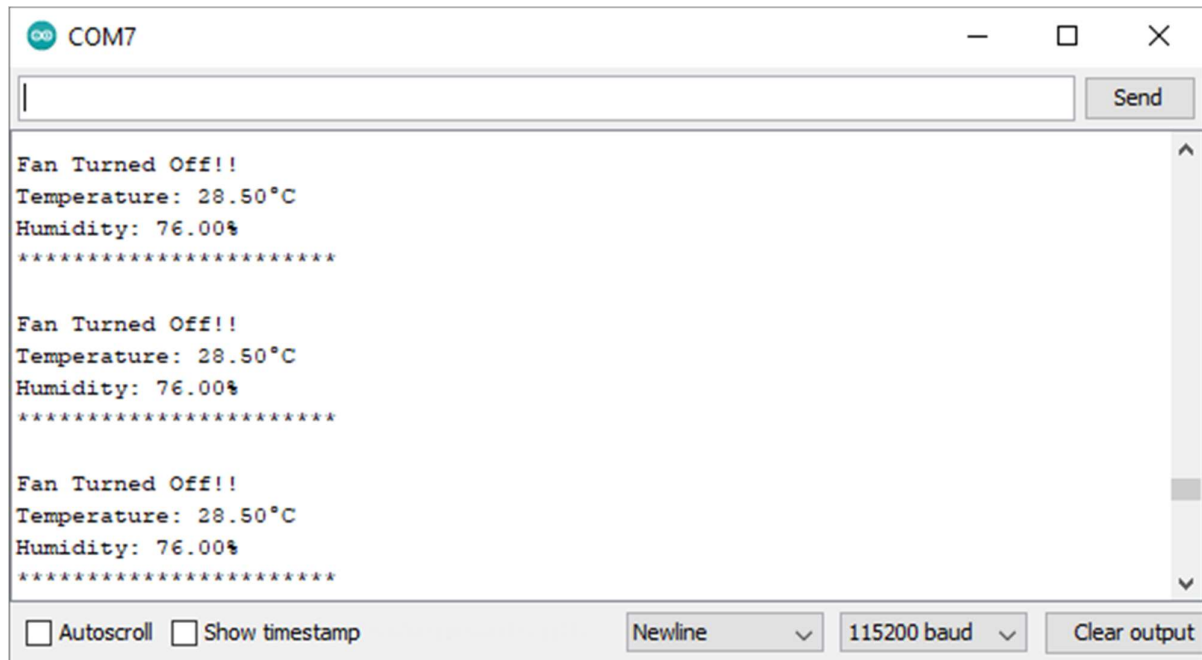
  Serial.println("*****");
  Serial.println();
}

```

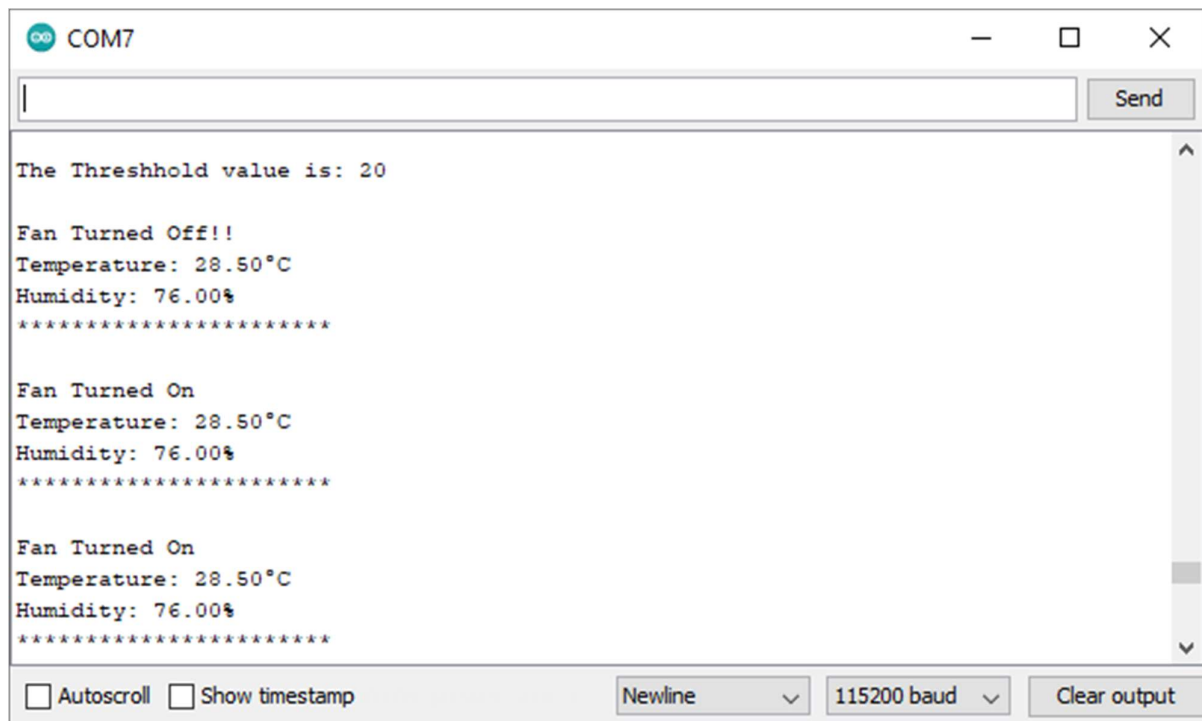
Connecting To Wi-Fi



Fan Turned Off



Fan Turned On



Fire Sensor Value(Without Fire)

Fire Sensor: 949

Fire Class: 0

No Fire

Fire Sensor Value(With Fire)

Fire Sensor: 38 Fire Class: 1

Fire

Fan Turned Off!!

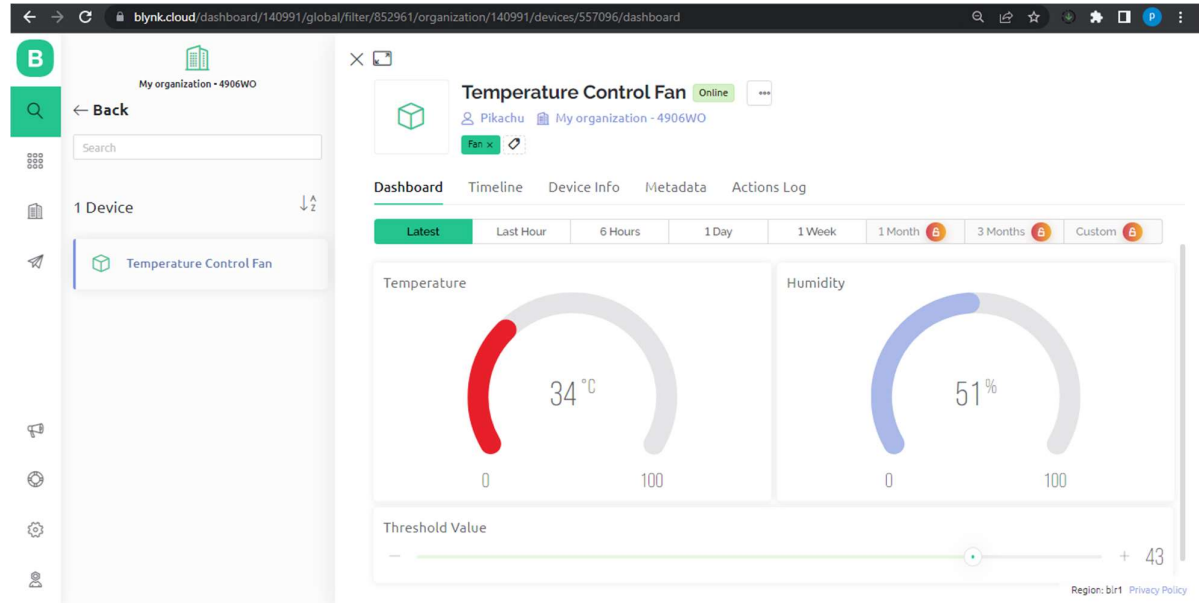
Blynk Datastreams

000

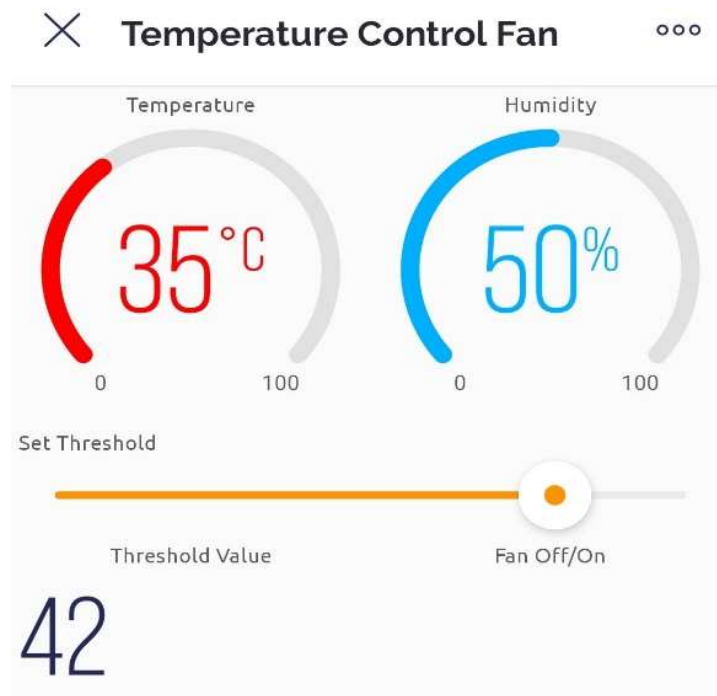
Blynk Events

Home	Datastreams	Web Dashboard	Automations	Metadata	Events	Mobile Dashboard
<input type="text" value="Search event"/>						+ Add New Event
Id	Name	Code	Color	Type	Description	Actions
1	Online	online		Online		
2	Offline	offline		Offline		
3	fire_alert	fire_alert		Warning	Fire in the house take necessary action	

Web Dashboard



Mobile Dashboard



Dashboard Fire Alert Warning

×

📱

Temperature Control Fan

Online

...

DashboardTimelineDevice InfoMetadataActions Log

LatestLast Hour6 Hours1 Day1 Week1 Month3 MonthsCustom

🔔 Notifications Settings

📶

Critical

Warning 17

Info 58

Content

Resolved 1

All 76

○ fire_alert 1:55:04 PM Today

Fire Detected Take Necessary Actions

○ fire_alert 1:54:56 PM Today

Fire Detected Take Necessary Actions

○ fire_alert 1:54:52 PM Today

Fire Detected Take Necessary Actions

○ fire_alert 1:54:37 PM Today

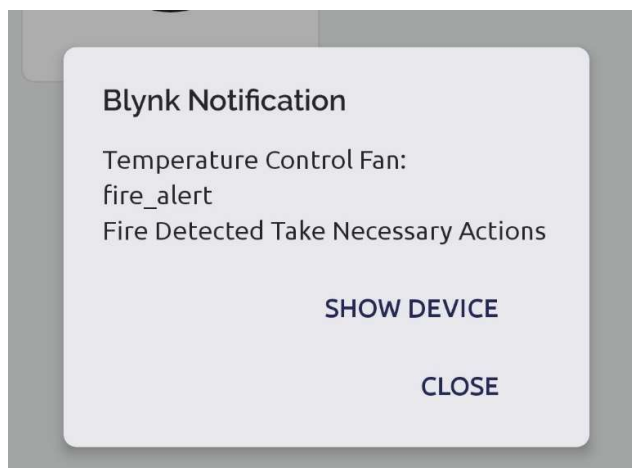
Fire Detected Take Necessary Actions

○ fire_alert 1:54:32 PM Today

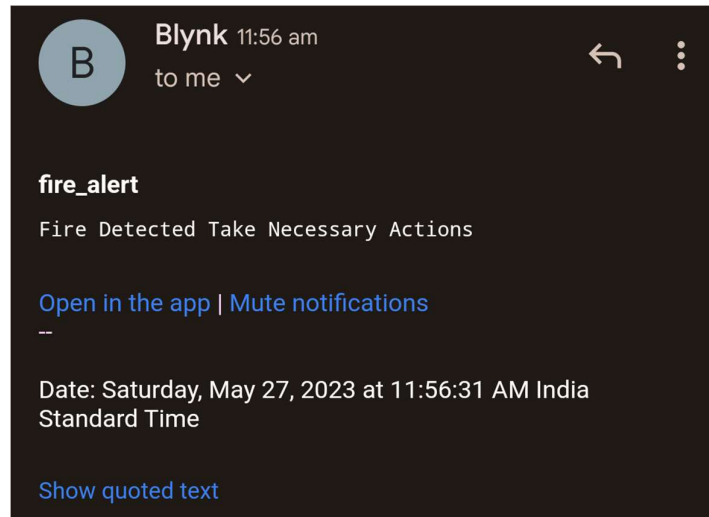
Fire Detected Take Necessary Actions

Region: blr1 [Privacy Policy](#)

Mobile Dashboard Fire Warning



E-mail Warning of Fire Alert



6. Testing

6.1 Test Case 1:

Description:

This test case verifies that the temperature control fan activates correctly based on the temperature threshold value.

Preparation:

- Ensure the temperature control fan system is properly set up and connected.
- Set the temperature threshold value to 30°C.

Execution:

- Start the temperature control fan system.
- Simulate a temperature reading of 28°C.
- Monitor the system behavior.

Check:

- Verify that the fan remains off.
- Ensure that the system logs the temperature reading correctly.
- Confirm that the fan status is reported as "Off."

6.2 Test Case 2:

Execution:

- Simulate a temperature reading of 34°C.
- Monitor the system behavior.

Check:

- Verify that the fan activates.
- Ensure that the system logs the temperature reading correctly.
- Confirm that the fan status is reported as "On."

7. Conclusion & Future Scope

Conclusion:

The provided code showcases a temperature control fan system using an ESP8266 module and the Blynk platform. It integrates a DHT sensor to measure temperature and humidity, allowing the fan to be automatically controlled based on a threshold value set in the Blynk app. Additionally, the code includes a fire sensor for detecting fire and activating an alarm.

By implementing this code, you can create a basic temperature control system that provides remote monitoring and control capabilities. However, it's important to note the limitations and considerations mentioned earlier, such as sensor accuracy, response time, and real-world factors.

Future Enhancements:

- User Interface Enhancements: Enhance the Blynk app interface to provide a more user-friendly and intuitive control panel. Add additional control elements such as a graphical representation of temperature, adjustable fan speed, and more detailed information about temperature and humidity readings.
- It does not support fan speed control. However, by incorporating an L298 2A Dual Motor Driver Module with PWM control, it is possible to overcome this limitation and enable precise control of the fan speed.

- **Multiple Temperature Zones:** Expand the system to support multiple temperature zones or areas. This can be achieved by integrating additional temperature sensors and controlling multiple fans independently based on the temperature of each zone.
- **Integration with Smart Home Systems:** Explore integrating the temperature control fan system with existing smart home systems or platforms, such as Google Home or Amazon Alexa. This enables voice control and seamless integration with other smart devices in the home.

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