NANDHA ENGINEERING COLLEGE

ERODE–638052 (Autonomous)

(Affiliated to Anna University, Chennai)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

22AIC14 – INTERNET OF THINGS AND ITS APPLICATIONS

MINI PROJECT REPORT ON

TOPIC – IOT SMART GAS VENTILATION SYSTEM

Submitted by

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BONAFIDE CERTIFICATE

This is to certify that the project work entitled "IOT SMART GAS VENTILATION SYSTEM" is the Bonafide work of HARIHARAN A S (22AIL01), PRANESH G (22AIL02), THANVER K S (22AIL03) who carried out the work under my supervision.

Signature of the Supervisor	**Signature of the HOD**
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Submitted for End semester PBL review held on ______________

EARLY DETECTION OF FOOT ULCER

AIM:

The aim of the IoT-based Smart Gas Ventilation System project is to automate and optimize indoor air quality management by real-time monitoring of gas levels and ventilation and sustainability.

SCOPE:

This system is vast in the sense that it is just automated way of monitoring and controlling the quality of air inside. It detects the levels of harmful gases present in an area and controls the ventilation system accordingly, thus ensuring the efficiency of ventilation. The system also monitors air quality parameters carbon dioxide, carbon monoxide and volatile organic compounds (VOCs) and ensures they stay in acceptable limits. This system makes the air indoors safer, saves energy and creates a healthier environment both at home and workplace by minimizing human intervention.

BRIEF HISTORY:

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PROPOSED METHODOLOGY:

System Setup:

Select components such as gas sensors (e.g., MQ-series for detecting harmfulgases), ventilation fans, and a microcontroller for system control and data processing.

Gas Level Monitoring:

Use gas sensors to measure the concentration of harmful gases (e.g., CO, CO_2,VOCs) in real time and compare readings against predefined safety thresholds.

Ventilation Control:

- Automatically activate or adjust ventilation fans based on gas concentrationlevels to maintain safe indoor air quality.

User Interface:

Display real-time gas concentration levels, ventilation status, and alerts on anLCD or a mobile app for user awareness and control.

IoT Connectivity:

Enable IoT functionality for remote monitoring and control via a cloud-basedplatform, allowing users to track air quality and manage the system from anywhere.

COMPONENTS REQUIRED:

S.NO	COMPONENTS	NO'S
1	ESP32 microcontroller	1
2	Smoke Sensor(MQ-6)	1
3	DHT11 temperature and humidity sensor	1
4	Relay Module	1
5	Breadboard	1
6	Exhaust Fan	1
7	Jumper wires	As required
8	Power supply (Battery)	1
9	External Power Supply (adopter)	1

DESCRIPTION:

The IoT-based Smart Gas Ventilation System is an automated solution designed to efficiently manage indoor air quality and ensure safety by detecting and mitigating harmful gas levels. It integrates multiple gas sensors and a microcontroller to automate the process of monitoring air quality and controlling ventilation systems.The system uses gas sensors, such as MQ-series sensors, to measure the concentration of gases like carbon monoxide (CO), carbon dioxide (CO_2), and volatile organic compounds (VOCs) in the environment. Based on preset thresholds, the system automatically controls ventilation fans to either activate when gas levels exceed safe limits or deactivate when air quality is restored. This ensures efficient energy usage and maintains a safe and healthy indoor environment.

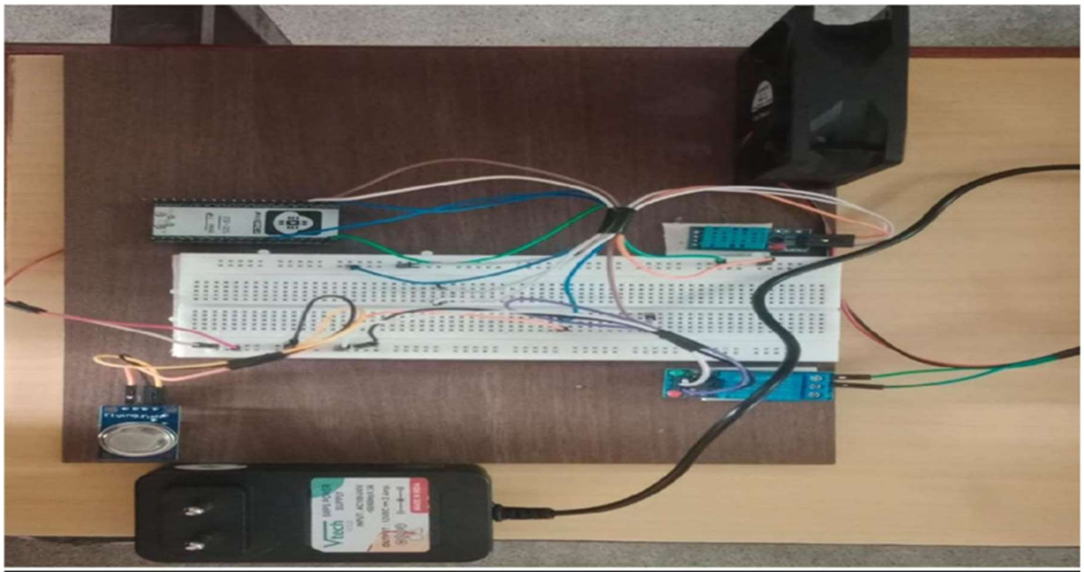
The real-time data from the gas sensors are displayed on a 16x2 LCD screen a connected mobile application, providing clear and immediate feedback to users. Alerts are triggered if harmful gas concentrations exceed safety thresholds, ensuring timely action. The entire system is controlled by a microcontroller, such as an Arduino or ESP8266, which processes sensor data, controls the ventilation system, and updates the display. Additionally, IoT functionality enables remote monitoring and control via a cloud platform, allowing users to track air quality and manage the system from anywhere. This system is suitable for various applications, including residential homes, industrial facilities, and public buildings, offering an efficient, low-maintenance solution for air quality management and safety enhancement.

CODING:

```
#define BLYNK_TEMPLATE_ID "TMPL3_ho0V7gO"

#define BLYNK_TEMPLATE_NAME "IOT Smart Exhaust Fan" #define BLYNK_PRINT
Serial

#include <WiFi.h>

#include <BlynkSimpleEsp32.h> #include "DHT.h"

const char auth[] = "VkaoGRBY2BVs1mvzy0IJlO8CO72_NGpm"; const char ssid[] = "vivo
Y33s";

const char pass[] = "9080691529";

#define DHTPIN 22 #define DHTTYPE DHT11 const int gasSensorPin = 32; const int
relayPin = 23;

const int gasThreshold = 20; DHT   dht(DHTPIN, DHTTYPE); bool manualMode = false;

void setup() {

Serial.begin(115200); dht.begin(); Blynk.begin(auth, ssid, pass); pinMode(relayPin,
OUTPUT); pinMode(gasSensorPin, INPUT);

digitalWrite(relayPin, LOW); delay(2000);

} BLYNK_WRITE(V4)

{

int relayControl = param.asInt(); manualMode = (relayControl == 1); if (manualMode)

{

digitalWrite(relayPin, HIGH);

}

else
```

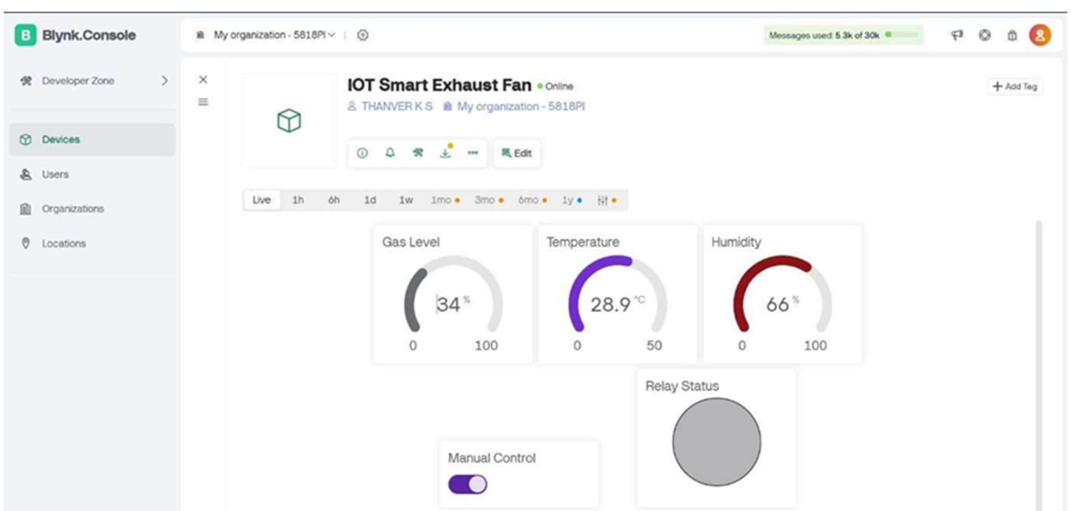
```
{
digitalWrite(relayPin, LOW);
}
Blynk.virtualWrite(V3, relayControl);
}
void loop()
{
Blynk.run();
int sensorValue = analogRead(gasSensorPin);
int gas_percentage = map(sensorValue, 0, 4095, 0, 100); float humidity = dht.readHumidity();
float temperature = dht.readTemperature(); if (isnan(humidity) || isnan(temperature))
{
Serial.println(F("Failed to read from DHT sensor!")); return;
}
Serial.print("Humidity: "); Serial.print(humidity); Serial.println("%");
Serial.print("Temperature: "); Serial.print(temperature); Serial.println("°C ");
Serial.print("Gas sensor value: "); Serial.println(sensorValue);
Serial.print("Gas Percentage: "); Serial.print(gas_percentage); Serial.println("%");
Serial.println();
if (!manualMode)
{
if (gas_percentage > gasThreshold)
{
digitalWrite(relayPin, HIGH); Blynk.virtualWrite(V3, HIGH);
}
else{
digitalWrite(relayPin, LOW); Blynk.virtualWrite(V3, LOW); } }
Blynk.virtualWrite(V0, gas_percentage); Blynk.virtualWrite(V1, temperature);
Blynk.virtualWrite(V2, humidity);
delay(1000); }
```

SCREENSHOTS:



OUTPUTS:

This Screenshot defines the dashboard that displays the temperature , humidity and gas values in the blynk dashboard:



PROTOCOLS:

MQTT (Message Queuing Telemetry Transport):

Lightweight and efficient, designed for IoT devices.

Used for real-time data exchange between the ESP32, sensors, and the Blynk server.

Ensures fast, reliable communication even in low-bandwidth networks.

WHY MQTT:

Blynk uses MQTT in the background to send sensor readings (like gas levels, temperature, andhumidity) from your ESP32 to the cloud and to receive commands from the Blynk app.

It's fast, reliable, and consumes very little power, making it perfect for IoT systems.

HTTP(S):

Used occasionally for one-off tasks like interacting with Blynk's REST API.

Less efficient than MQTT for continuous interactions.

WHY HTTP(S) USED HERE:

Blynk can also use HTTP, but only for specific tasks like connecting to its REST API. This mighthappen if you send a command from your app that doesn't require continuous interaction.

Unlike MQTT, HTTP isn't as efficient for constant communication, which is why it's not theprimary choice for your project.

LIMITATIONS:

Smartphone Needed: The system relies on a smartphone or connected device for monitoring and alerts, which might not be convenient or accessible for everyone.

Power Usage: Since the system runs continuously and transmits data, it may consume more power, requiring frequent recharging or a stable power source.

Limited Coverage: The setup might not cover all areas of a building or space, leaving some spots unmonitored for gas leaks or ventilation issues.

Environmental Impact: Factors like dust, high humidity, or sudden temperature changes could affect the accuracy of the sensors.

Not Fully Tested: The system may need more real-world testing to ensure it works reliably in different residential or industrial scenarios.

FUTURE ENHANCEMENTS:

Smarter Alerts with AI: Use cloud-based AI to analyze gas levels more accurately and send smarter, faster alerts when needed.

Integration with Building Systems: Connect the system to building automation setups, making it easier to control and monitor ventilation and safety measures.

Better User Experience: Add features like voice commands and a user-friendly mobile app to make the system more accessible and easy to use.

Full Building Coverage: Expand the system to monitor gas levels in all key areas, ensuring maximum safety throughout the entire space.

Stronger Data Security: Use advanced encryption and privacy measures to keep your data safe and protect it from unauthorized access.

CONCLUSION:

The implemented IoT based Smart Gas Ventilation System presents good automated output after processing indoor air quality monitoring. It uses high-precision gas sensors to constantly monitor harmful gas levels and autonomously regulates ventilation and other systems to keep air quality at a safe level. The system vents automatically by detecting gas threshold levels to not only maintain a safe atmosphere, but to also use as little energy as possible. Complete with a clear LCD display and IoT-enabled remote monitoring, it minimizes manual intervention and improves safety. Designed for residential, industrial, and public applications, the system provides robust environmental quality management, enhanced safety, and optimal operational efficiency.