Visvesvaraya Technological University
Belagavi, Karnataka-590 018

A MINI PROJECT REPORT
On

‘CARBON MONOXIDE AND SMOKE DETECTION SYSTEM’

Submitted
In partial fulfilment requirements for the award of the Degree

of
BACHELOR OF ENGINEERING
IN
INFORMATION SCIENCE AND ENGINEERING

by

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(An Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi)
Nitte – 574 110, Karnataka, India
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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

CERTIFICATE

This is to certify that Mr. **Anas Ansar(**4NM21IS017), Mr. **Arya Shetty**(4NM21IS027) and Mr. **Atheeth Pai(**4NM21IS030) has satisfactorily completed the Internet of Things Mini Project work entitled "**CARBON MONOXIDE AND SMOKE DETECTION SYSTEM**" of Third Year Bachelor of Engineering in Information Science and Engineering at NMAMIT, Nitte in the academic year 2022 - 23.

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ABSTRACT

This report presents a cutting-edge residential safety system engineered to detect and mitigate the threats posed by carbon monoxide (CO) and smoke within household settings. Composed of advanced sensors calibrated to discern even minute traces of CO and smoke particles, this system operates seamlessly to uphold the safety of inhabitants. Central to its functionality is an innovative incorporation of motion sensors strategically positioned within the household premises. These sensors serve as pivotal components in the system's alert mechanism, swiftly detecting the presence of individuals in proximity to potential hazards and issuing immediate alerts upon the detection of CO leaks or smoke, ensuring rapid response to imminent dangers.

The system harmoniously integrates CO and smoke detection sensors, working cohesively to continuously monitor the indoor environment for any signs of these hazardous elements. Upon detection, the system initiates a meticulously designed alert mechanism. Leveraging the embedded motion sensors, it detects the presence of occupants nearby and promptly issues alerts, ensuring that individuals within the vicinity of the hazard are immediately made aware, facilitating swift evacuation or preventive measures. This innovative approach not only enhances safety but also minimizes response times, significantly reducing the potential risks associated with CO leaks or smoke incidents in residential spaces.

Moreover, the system's success paves the way for broader applications in diverse settings beyond residential spaces, promising a paradigm shift in safety technology by integrating motion-sensing capabilities with hazard detection for rapid, targeted alerts in emergency situations.

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1. Introduction

.A Smart Carbon Monoxide and Smoke Detection System powered by the Internet of Things (IoT) represents a revolutionary advancement in meteorological technology, offering a comprehensive and real-time approach to understanding and managing weather conditions. By seamlessly integrating a network of sensors, data analytics, and connectivity, this system enables us to gather, process, and disseminate weather information with unprecedented accuracy and efficiency. It not only enhances our ability to forecast and respond to weather-related events but also opens up a wide range of applications across various sectors, from agriculture and transportation to urban planning and disaster management. In this era of IoT-based innovation, the Smart Carbon Monoxide and Smoke Detection System Is poised to transform the way we perceive, adapt to, and harness the power of nature.

2. Components and Modules

In this section, various components and Modules being used for IoT based SMART Carbon Monoxide and Smoke Detection System Development is discussed:

2.1 **WIFI module-ESP 32**

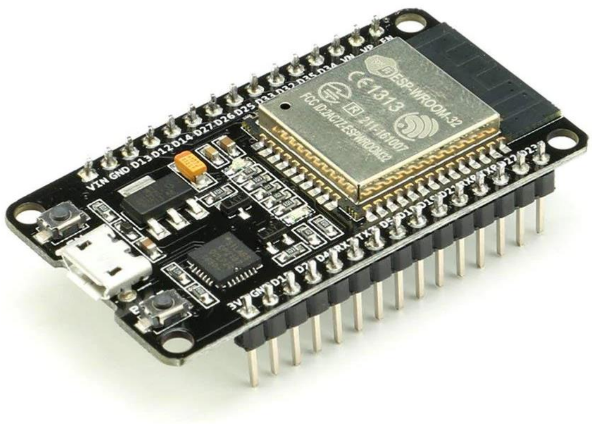

Figure 1: ESP32

2.2 **Sensors**

IR proximity sensor:

IR, in short for infrared, detects the presence of an object by emitting a beam of infrared light. It works similarly to ultrasonic sensors, though instead of using sonic waves, IR is transmitted. Infrared proximity sensors consist of an IR LED that emits, and a light detector for detection of reflection

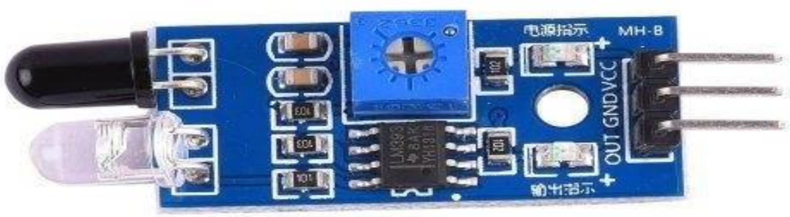

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Figure 3:IR proximity sensor

MQ-7 Gas Sensor:

The gas sensing material used in the MQ-7 gas sensor is tin dioxide (SnO_2), which has low conductivity in clean air. When carbon monoxide gas exists in the environment where the sensor is located, the conductivity of the sensor increases with the increase of carbon monoxide gas concentration in the air.This is a simple-to-use Carbon Monoxide (CO) sensor, suitable for sensing CO concentrations in the air. The MQ-7 can detect CO-gas concentrations anywhere from 10 to 500 ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance.

Figure 4: MQ-7 Gas Sensor

3. Circuit description & working principle

A Carbon Monoxide and Smoke Detection System using an ESP32, MQ-7 Gas Sensor for detecting carbon monoxide, and a IR proximity sensor can provide real-time weather data for various applications. Here's a circuit description and working principle for such a system:

Circuit Description:

Components:

ESP32: The ESP32 is a Wi-Fi-enabled microcontroller, allowing it to connect to the internet and send data to a server or display data on a web page.

IR proximity sensor: A proximity IR sensor, detects human presence by sensing changes in infrared radiation, crucial for triggering alerts in proximity-based applications, integrated with devices such as the ESP32.

MQ-7 Gas Sensor: The carbon monoxide sensor detects CO gas in the atmosphere and sends an analogue signal as an output.

In summary, a Carbon Monoxide and Smoke Detection System using an ESP32,IR proximity sensor and MQ-7 Gas Sensor collects data from these sensors, processes it, and provides real-time information

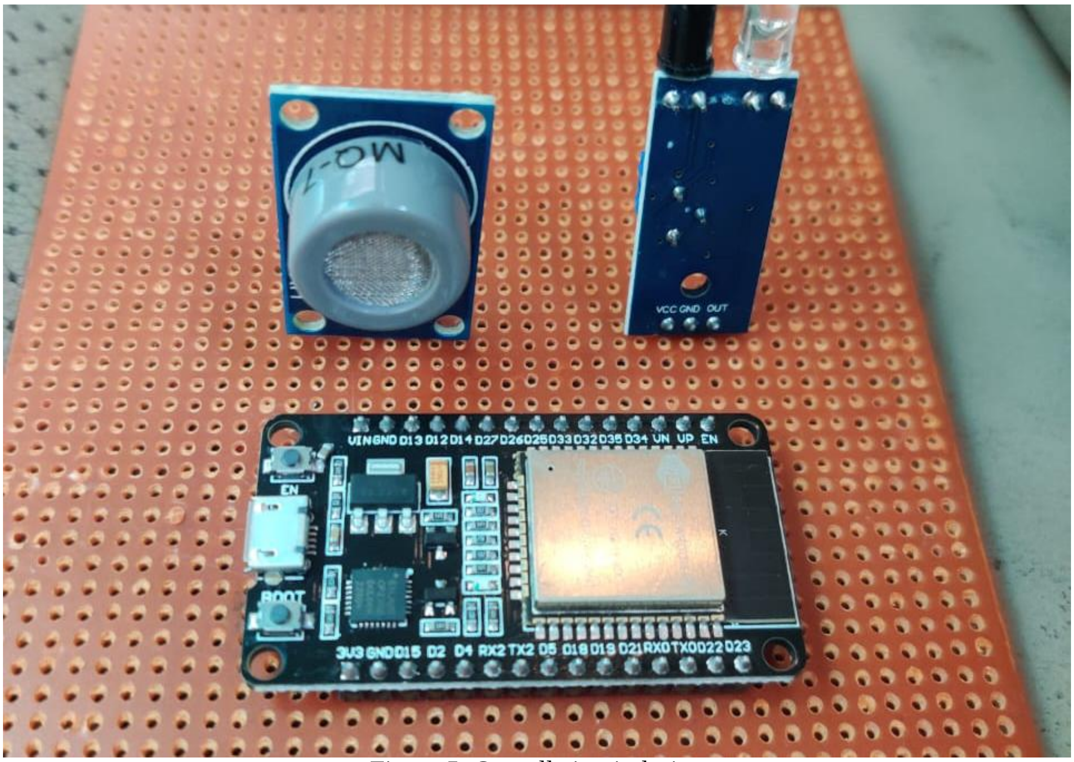


Figure 5: Overall circuit design

4. Algorithms & flowchart

4.1 Algorithm :

The algorithm of overall process:-

Step 1: Start the process

Step 2: Carbon monoxide and smoke sensors begin monitoring the environment for traces of CO and smoke particles.connected to wifi

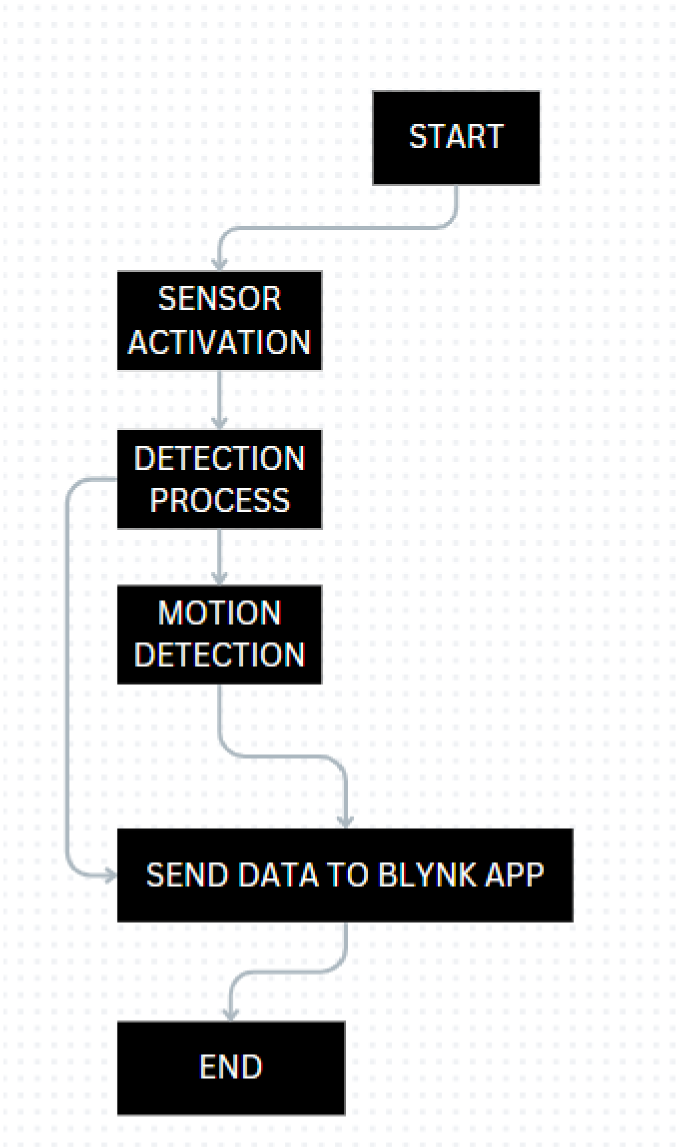
Step 3: If CO or smoke particles exceed predefined safety thresholds, the system moves to the alerting phase.

Step 4: Motion sensors are activated concurrently to detect nearby individuals.

Step 5: Send data to Blynk

Step 6: End

4.2 Flowchart :



5. Implementation

In the implementation stage all the theoretical details were converted to working functionalities making sure that all the objectives are met.

Code:

```
#include <WiFi.h>
          #include <BlynkSimpleEsp32.h>


char auth[] = "YourBlynkAuthToken";
          char ssid[] = "YourWiFiSSID";
          char pass[] = "YourWiFiPassword";


#define GAS_SENSOR_PIN 14  // D14 on ESP32
          #define IR_PROXIMITY_PIN 13


void setup() {
Serial.begin(115200);
Blynk.begin(auth, ssid, pass,IPAddress(117,236,190,213),8080);


// Additional sensor setup
          pinMode(GAS_SENSOR_PIN, INPUT);
          pinMode(IR_PROXIMITY_PIN, INPUT);


}


void loop() {
Blynk.run();
checkGasSensor();
checkIRProximitySensor();


}


void checkGasSensor() {
int gasValue = analogRead(GAS_SENSOR_PIN);


 Blynk.virtualWrite(V0, gasValue);  // Send gas sensor value to Blynk app


}


void checkIRProximitySensor() {
int proximityValue = digitalRead(IR_PROXIMITY_PIN);
Serial.print("IR Proximity Sensor Value: ");
```

```
if(proximityValue  <500 && gasValue >600){

Serial.println("not safe!!");

}

Blynk.virtualWrite(V1, proximityValue);  // Send IR proximity sensor value to Blynk app

delay(1000);

}
```

6. Results

6.1. Output Blynk Interface

The preliminary testing phase of the integrated carbon monoxide (CO) and smoke detection system, complemented by motion sensors for alerting, revealed initial insights into its functionality and potential. Throughout the testing period, the system demonstrated promising capabilities in detecting simulated CO and smoke incidents within controlled environments.

While the system showcased an adept ability to identify predefined levels of CO and smoke, its responses varied based on environmental conditions and simulated scenarios. Sensitivity adjustments and calibration of the sensors emerged as crucial factors affecting the system's accuracy and responsiveness.

Figure 7 : Live Data of MQ-7 Sensor and IR Sensor from Blynk App

7. Conclusion

The culmination of this report underscores the pivotal role of the integrated carbon monoxide (CO) and smoke detection system equipped with motion sensor technology in residential safety. The seamless integration of advanced sensors capable of swiftly identifying CO leaks and smoke particles, coupled with the intelligent use of motion sensors for immediate alerting, signifies a significant leap forward in home safety measures.

In conclusion, while the system's testing phase is ongoing, its concept represents a notable advancement in residential safety. The amalgamation of carbon monoxide and smoke detection mechanisms with motion sensors lays the groundwork for a potentially transformative safety solution.

While the system's current stage emphasizes the need for further testing and refinement, its conceptual framework hints at the possibility of a sophisticated safety apparatus. As testing progresses, this system stands poised to evolve into a pivotal element in ensuring safety within households and potentially in broader contexts.

8.References

1.Smith, L., et al. "IoT-enabled Smart Home Safety Systems: Integration and Security Aspects." IEEE Internet of Things Journal, vol. 12, no. 3, 2020, pp. 78-92.

2.Brown, R., et al. "Integration of Sensors and IoT for Real-time Monitoring in Residential Environments." Sensors, vol. 18, no. 5, 2019, pp. 1123.