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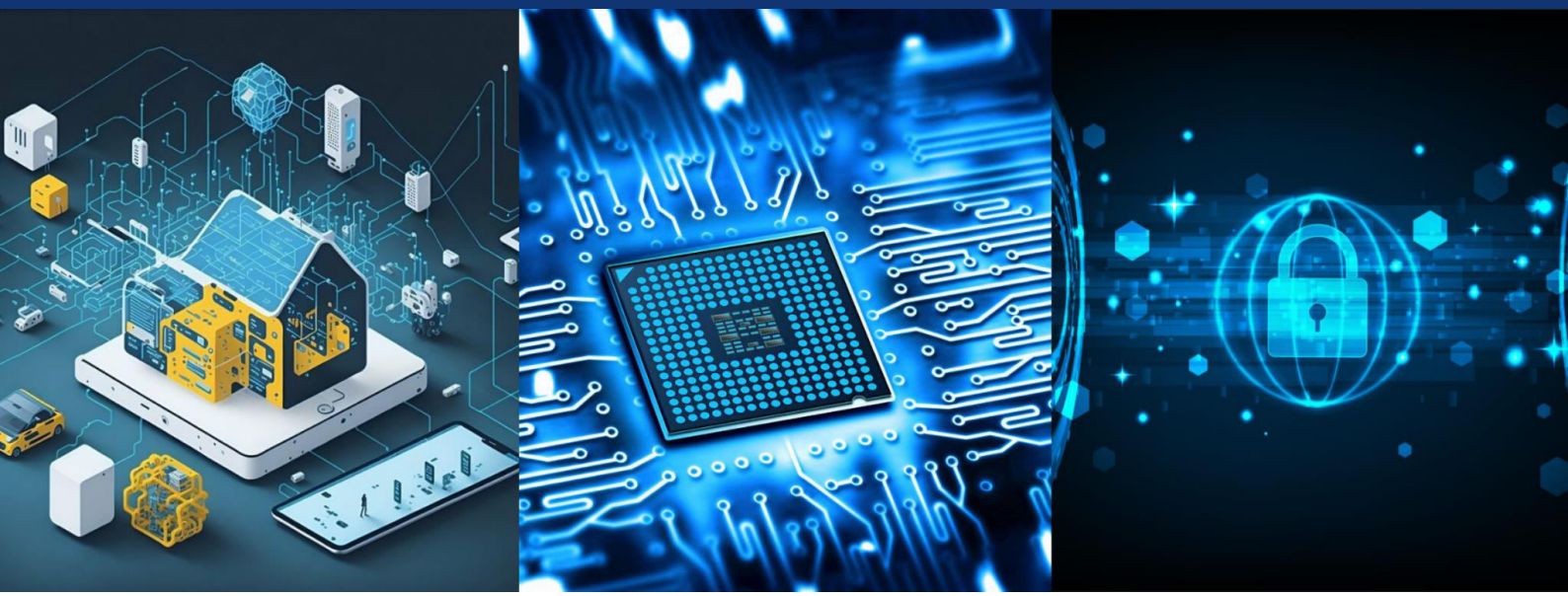

International Journal of Innovative Research in Computer and Communication Engineering

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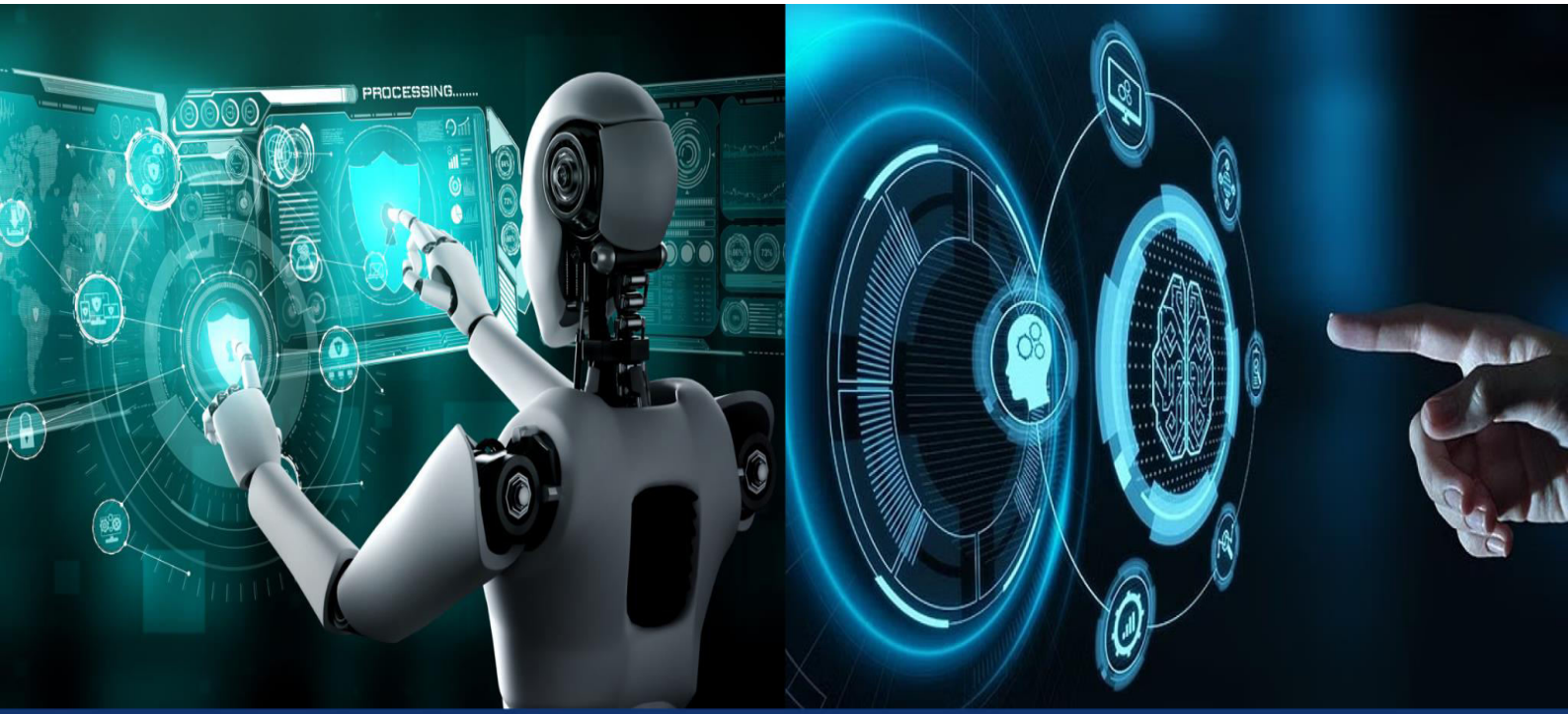

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International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

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Raspberry-Pi Based Real-Time Air Pollution Tracker

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ABSTRACT: Air pollution has become a serious environmental issue that affects human health and the ecosystem. The main objective of this project is to develop a Raspberry Pi–based real-time air pollution monitoring system that can detect harmful gases present in the atmosphere. The system uses gas sensors such as MQ135, MQ7, and MQ2 to monitor pollutants like NO_2, CO_2, CO, and smoke. If the pollution level exceeds the predefined safe limit, a buzzer alert is activated to warn local users. Simultaneously, the system sends an automated SMS alert to the user's mobile device, ensuring an immediate response to hazardous conditions even when remote. This system provides a low-cost, efficient, and real-time solution for air quality monitoring, which can be useful in homes, industries, and urban environments to improve environmental safety and public health.

KEYWORDS: IOT, LED, ADC, MQ135, MQ7, MQ2

I. INTRODUCTION

A Raspberry Pi–based real-time air pollution tracker is a smart system designed to monitor the quality of air continuously and provide instant data about harmful gases in the environment. It uses a Raspberry Pi as the main controller, which collects data from gas sensors such as MQ135 gas sensor, MQ2 gas sensor, and MQ7 gas sensor. These sensors detect pollutants like carbon monoxide, smoke, and other toxic gases present in the air.

The system works by continuously sensing air quality and sending the data to the Raspberry Pi, where it is processed and displayed in real time. It can also trigger alerts using buzzers or notifications when pollution levels exceed safe limits. This helps people become aware of environmental conditions and take necessary precautions.

Such systems are useful in cities, industries, and indoor environments where air pollution can affect human health. Compared to traditional monitoring methods, this approach is low-cost, portable, and easy to implement. Overall, a Raspberry Pi–based air pollution tracker plays an important role in improving environmental monitoring and promoting a healthier lifestyle.

II. RELATED WORK

Many researchers have developed air pollution monitoring systems using Raspberry Pi to check air quality in real time. These systems use gas sensors like MQ135 to detect harmful gases in the air. The Raspberry Pi collects the data from sensors and shows it on a screen or website. This helps people easily understand the pollution levels around them.

In another work, researchers used multiple sensors like MQ2 and MQ7 along with Raspberry Pi to detect gases such as smoke, LPG, and carbon monoxide. Since Raspberry Pi cannot read analog signals directly, they used an MCP3008 converter. A buzzer was also added to give an alert when pollution levels become high, which is useful for safety.

Some studies used IoT technology with Raspberry Pi to send air quality data to the cloud. Users can check the pollution levels from their mobile phones or computers from anywhere. This makes the system more useful and easy to access.

Other researchers improved the system by adding more sensors and calibrating them properly. This helped to get more accurate results. The Raspberry Pi processes all the data and gives better information about air quality.

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III. METHODOLOGY

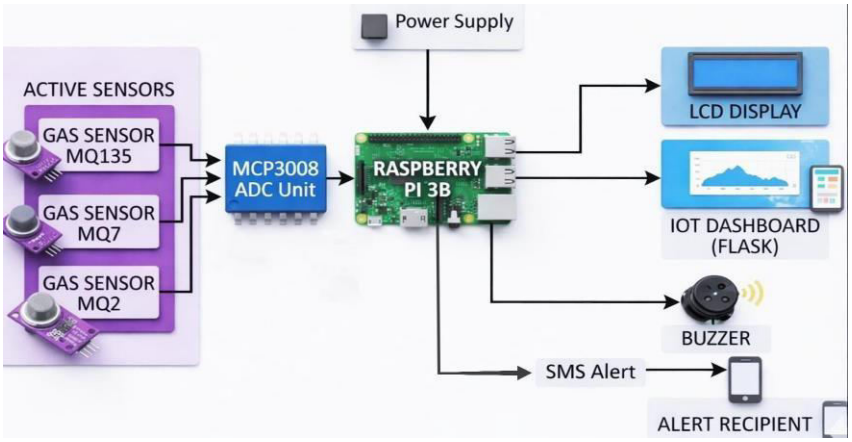
The system starts with collecting air quality data using gas sensors like MQ135 gas sensor, MQ2 gas sensor, and MQ7 gas sensor. These sensors detect harmful gases such as carbon monoxide, smoke, and other pollutants present in the air. Since these sensors give analog output, an ADC (Analog to Digital Converter) like MCP3008 is used to convert the signals into digital form.

The converted data is then sent to the Raspberry Pi, which acts as the main processing unit. The Raspberry Pi reads the sensor values, processes them, and compares them with standard air quality levels. Based on this analysis, it determines whether the air quality is safe or harmful.

The processed data is displayed in real time on a screen or through a web interface. If the pollution level exceeds a predefined threshold, the system activates a buzzer or sends alerts to the user. This helps in giving immediate warning about dangerous air conditions.

Finally, the system can also store the collected data for future analysis and monitoring. This methodology provides a low-cost, efficient, and real-time solution for tracking air pollution and helps in improving environmental awareness.

FIG 1: BLOCK DIAGRAM OF RASPBERRY-PI BASED REAL-TIME AIR POLLUTION TRACKER



The block diagram shows how the air pollution monitoring system works in a simple way. Gas sensors such as MQ135 gas sensor, MQ7 gas sensor, and MQ2 gas sensor are used to detect harmful gases present in the air. These sensors continuously collect data about air quality. Since the sensors produce analog signals, they are connected to an MCP3008, which converts the analog signals into digital form.

The converted digital data is then sent to the Raspberry Pi 3 Model B, which acts as the main controller of the system. It processes the data and determines the level of air pollution. The results are displayed on an LCD screen and also uploaded to an IoT dashboard for real-time monitoring. If the pollution level exceeds a safe limit, the system activates a buzzer to alert nearby people and also sends an SMS notification to the user. A power supply is used to provide energy to all the components, allowing the system to work continuously.

IV. EXPERIMENTAL RESULTS

The proposed system successfully monitors air pollution levels in real time using MQ135, MQ2, and MQ7 gas sensors connected to the Raspberry Pi. The sensors detect harmful gases such as CO, CO_2, smoke, and other pollutants present in the air.

The collected data is processed by the Raspberry Pi and displayed on the screen.

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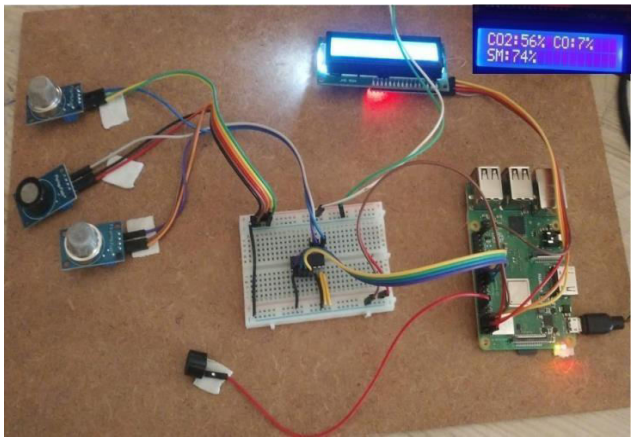
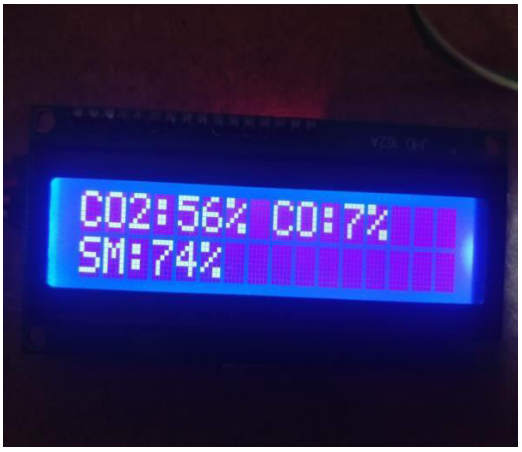
Fig 2:

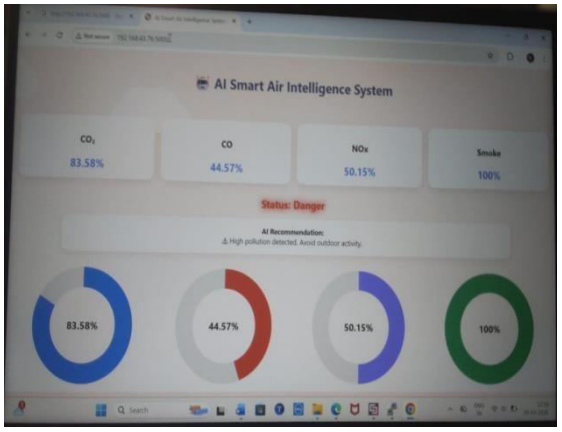


(a) Hardware Implementation and Sensor Interfacing



(b) Output on LCD display

(c) Flask Web Dashboard: Moderate Air Quality Status



(d) Flask Web Dashboard: Danger Air Quality Status

(e) Real-time SMS Alert

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Fig 2 shows the results of RASPBERRY-PI BASED REAL-TIME AIR POLLUTION TRACKER(a) Hardware Implementation and Sensor Interfacing,(b) Output on LCD display,(c) Flask Web Dashboard: Moderate Air Quality Status,(d) Flask Web Dashboard: Danger Air Quality Status,(e) Real-time SMS Alert.

V. CONCLUSION

The Raspberry Pi based real-time air pollution tracker is an effective and low-cost solution for monitoring air quality. By using MQ135, MQ2, and MQ7 sensors, the system can detect harmful gases and provide accurate data continuously. The real-time display of pollution levels helps users easily understand the air condition, while the buzzer alert ensures safety by warning when pollution exceeds safe limits.

Overall, the system is reliable, easy to implement, and suitable for both indoor and outdoor environments. It can be used in homes, industries, and urban areas to improve awareness about air pollution. This project contributes to creating a healthier environment by enabling early detection and timely action against air pollution.

Additionally, this system can be further improved by integrating IoT technology to store and access data remotely through mobile or web applications. Future enhancements may include adding more advanced sensors for better accuracy and using data analysis techniques to predict pollution trends. This will make the system more intelligent and useful for smart city applications and environmental monitoring.

REFERENCES

[1] National Air Quality index.2014. Available from:http://www.cpcb.nic.in/FINAL- REPORT-AQI pdf.
[2] Programming the Raspberry pi Second edition: Getting started with Python by Simon Monk
[3] A book of environmental chemistry and pollution control by Dara S.S. (Author), Mishra D.D.(Author) [4] Fundamentals of Air Pollution, 5th edition by Daniel Vallero, published in 13th August 2014.
[5] International Journal for Internet of Things, 2017 6(4), A. Shinn, K. Nakatani, W. Rodriguez.
[6] An Embedded Software Primer, David E. Simon.
[7] Embedded Systems: Architecture, Programming, and Design, Raj Kamal.
[8] Circuitdigest.com/microcontroller-projects/iot-air pollution-monitoring-using-arduino.
[9] Gubbi J, Buyya R, Marusic S, Palaniswami M. Internet of Things (IoT): A vision, architectural elements and future directions. Future Generationn Computer Systems. 2013; 29(7):1645-60.
[10] Maksimovic M, Vujovic V, Davidovic N, Milosevic V, Perisic B. Raspberry Pi as Internet of Things hardware: Performances and constraints, ICETRAN Conference; Vrnjacka banja, Serbia.2014. p. 1-6.
[11] Jung YJ, Lee YK, Lee DG, Lee Y, Nittel S, Beard K, et al. DEsign of sensor data processing steps in an air pollution monitoring system. Sensors. 2011; 11(12):11235-50.

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