

Project Abstract

Class: E&TC-A

Subject: Hardware Interfacing & Sensors Integration

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Real-Time Air Quality Monitoring System Using MQ135 Sensor and Arduino

Title: Development of a Real-Time Air Quality Monitoring System with Alert Mechanism

Objective: The primary goal of this project is to design and implement a cost-effective, real-time air quality monitoring system that utilizes an MQ135 sensor coupled with an Arduino board to detect harmful gases in the environment. The system aims to provide immediate feedback on air quality levels through a 2x16 LCD display and trigger an alert using a buzzer when the air quality crosses predefined threshold values, thereby informing and protecting individuals from potential air pollution hazards.

Background: Air pollution has emerged as a critical environmental issue, with adverse effects on human health and the environment. Traditional methods of air quality monitoring involve complex and expensive equipment that cannot be deployed widely for personal use. Hence, there is a pressing need for a simple, affordable, and effective solution to monitor air quality, especially in urban and industrial areas where pollution levels are typically high.

Methodology:

1. Components and Materials:

- Arduino Uno Board: Serves as the central processing unit of the system.
- MQ135 Gas Sensor: Capable of sensing a wide range of harmful gases such as ammonia, nitrogen oxides, benzene, smoke, and carbon dioxide, providing a general measure of air quality.
- 2x16 LCD Display: Displays real-time air quality readings for user information.
- Potentiometer: Adjusts the contrast of the LCD display for clear visibility under different lighting conditions.
- Buzzer: Acts as an actuator to alert users when air quality deteriorates beyond set thresholds.
- Connecting Wires: For interfacing the components with the Arduino board.
- Power Supply: USB or battery to power the Arduino board and connected components.

2. System Design:

- The MQ135 sensor continuously monitors the concentration of harmful gases in the air. The Arduino board processes these readings to determine the air quality index (AQI).
- The air quality data is then displayed in real-time on the 2x16 LCD, providing users with immediate feedback on the current air pollution levels.
- A potentiometer connected to the LCD allows users to adjust the display contrast for optimal readability.
- The system is programmed to compare the sensor data against predetermined air quality thresholds. When these thresholds are exceeded, indicating poor air quality, the Arduino triggers the buzzer to emit an audible alert, warning users of the potential health risks.

Implementation:

- The project involves setting up the MQ135 sensor to the Arduino board and calibrating the sensor for accurate readings.
- The LCD display and potentiometer are configured for data visualization, while the buzzer is set up to respond to threshold breaches.
- Software development includes programming the Arduino to read sensor data, calculate AQI, display results, and manage the alert system.
- Extensive testing is conducted to ensure accuracy, reliability, and responsiveness of the system under various conditions.

Expected Outcomes:

- A fully functional real-time air quality monitoring system that is both accurate and userfriendly.
- Enhanced awareness of environmental pollution levels among users, promoting healthier living environments.
- A scalable and adaptable system that can be modified for different sensors or expanded functionalities.
- Conclusion: This project aims to address the growing concern of air pollution through the
 development of an accessible, real-time air quality monitoring system. By leveraging the
 capabilities of the MQ135 sensor, Arduino technology, and other simple components, it
 provides a practical solution for individuals and communities to monitor and respond to
 air quality issues, fostering a healthier and more informed society.

Conclusion:

This project aims to address the growing concern of air pollution through the development of an accessible, real-time air quality monitoring system. By leveraging the capabilities of the MQ135 sensor, Arduino technology, and other simple components, it provides a practical solution for individuals and communities to monitor and respond to air quality issues, fostering a healthier and more informed society.