

Real-time Air Quality Monitoring System

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ABSTRACT

Air pollution is the world's largest environmental threat to human health and one of the major preventable causes of death and disease. According to WHO, the ambient and household air pollution together account for 7 million premature deaths globally every year, making it more deadly than a combination of malaria, tuberculosis, and AIDS. This paper represents the idea of presenting the real time air quality readings to the people to make them understand how hazardous the air quality is getting around them day-by-day. This system of ours integrates with the gas sensors like MQ-2 sensor (detects harmful gases like LPG, Methane, Smoke etc.), MQ-7 (detects carbon monoxide), DHT-22 (measures the temperature & humidity) and an ultrasonic sensor (uses high-frequency sound waves to detect object or measure distances) and lastly an LCD to show the real time monitoring with the help of Arduino.

Keywords: - Environmental Threat, Gas Sensors, Arduino, Real-Time Monitoring.

1. INTRODUCTION

Nowadays, air condition has gotten very polluted these recent days. As we all are aware about the Delhi air pollution in which an analysis of Global Burden of Disease (GBD) 2023 data found that air pollution is the second largest health risk in Delhi, accounting for nearly 15% of all deaths in city. This means that roughly one in every seven deaths in Delhi was linked to long-term exposure. Air pollution may contain a lot of dangerous substances such as ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon [1]. Air condition in every part of India or over the world causes severe headaches, serious respiratory diseases and many more which people are not aware about.

As this research paper helps people let know what air they are breathing and what precautions should be followed to live in non-polluted area/city. With the help of some of the Gas sensors and ATmega328P microcontroller we present the small model which will help people who works in small factory-based companies or for educational purpose to show the monitoring of air quality in Real-time using LCD.

2. LITERATURE REVIEW

This paper discusses about the monitoring of the system that gives the information about the environmental conditions and gives a brief technical knowledge about the environmental problems and trying to make some new advancements in it. This system is developed by using an Arduino board, ATmega328P microcontroller which proves a low-cost

portable system and also having low power consumption. As the sensors will gather the data from various environmental parameters and provide the data to ATmega328P microcontroller as it will read all the collected data from the gas sensor and later on display those readings on LCD or serial monitor with the help of Arduino IDE. This experiment results demonstrate that the system can accurately measure the concentrations of carbon monoxide, LPG, Methane and Smoke.

3. METHODOLOGY

This proposed air quality monitoring system is based on continuous sensing, processing and displaying the gas sensors' concentration using IoT technology. An ATmega328P acts as a brain or central processing unit of this system. The MQ-2 & MQ-7 sensors are interfaced with an Arduino to detect smoke, LPG & monoxide, while DHT22 measures the temperature & humidity and also an ultrasonic sensor to detect an object at a particular distance & make beeping sound with the help of a buzzer. These gas sensors generate analog signals corresponding to the concentration of gases present in the surrounding air. These signals are then converted into digital values using the inbuilt analog-to-digital converters of the Arduino. This research focuses on deployment at the urban scale. The goal of this research is to fill important gaps in earlier studies & enhance air pollution control by incorporating smart monitoring systems.

Block Diagram

This block diagram of real-time air quality monitoring system shows the integration of the gas sensors such as MQ-2, MQ-7, DHT-22 sensor to an Arduino board to an ATmega328P microcontroller and then displaying it on LCD(Liquid Crystal Display).



Fig -1 Block Diagram

4. PROPOSED SYSTEM

An IoT based air quality monitoring system is proposed that uses an MQ-2 gas sensor, MQ-7 sensor and DHT-22 sensor interfaced to an Arduino which then transfer the data signals to ATmega328P which will process the whole data signals from the sensors and display it on LCD. This system core goal is to: sense, process and display. As this project is very easy to understand and cope up with it can be mainly used for small area based location and for educational purpose which makes the school level student to dive into the world of hardware.

Comparison

Proposed System	Previous Proposed System
Low-cost portable system	Expensive sensors are used
Uses only 3 sensors	Uses 5-10 sensors at a time for calibration suitable for research industrial use
Sufficient for basic monitoring	Used for large area based monitoring
Fire/smoke detection is good	Better with alarm integration
It is very easy to maintain	Harder due to many sensors

Circuit Diagram

This circuit diagram of real-time air quality monitoring system shows how the Gas sensors are integrated with the help of jumper wires to its particular Arduino pins to get the desired output of this system.

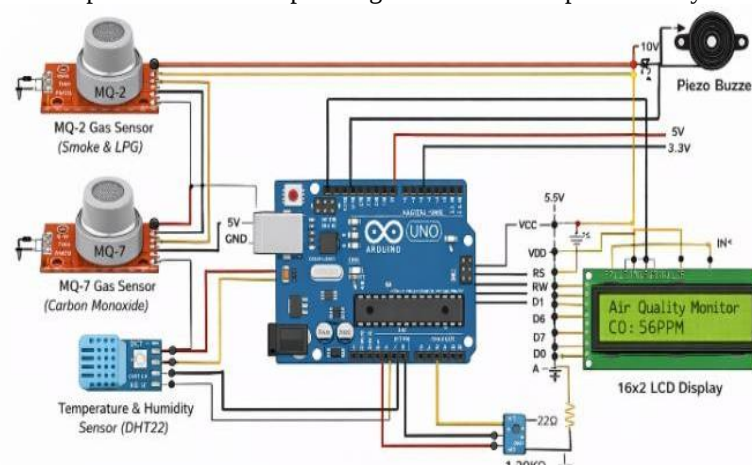


Chart -2 Circuit Diagram Of Real-Time Air Monitoring System

5. CONCLUSION

This proposed system can monitor harmful combustible gases like LPG, Methane, Smoke, Carbon monoxide and can also measure temperature and humidity. All these pollutants are easy to sense and measure with the help of gas sensors such as MQ-2, MQ-7 and measure temperature and humidity with DHT-22 sensor with the help of

Arduino board and ATmega328P microcontroller which processes the entire data and display it on LCD for people to understand it better and act upon it. The air monitoring system can help in the innovation of new practices to overcome the problems of the highly polluted areas, which is a major issue. Further by additional sensors for the system pollution levels for more different harmful gases can be monitored.

6. REFERENCES

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