MIT School of Engineering
Department of Computer Science and Engineering

Project Synopsis

Group ID: LYCORE613
Project Title: Air Pollution Monitoring System
Group Members:

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Problem Statement: *"Air pollution is rising due to industries and vehicles, but existing monitoring systems are costly and not accessible in real time. There is a need for a simple, low-cost IoT-based solution to monitor harmful gases and alert users immediately."*

Abstract: *"This project presents an IoT-based Air Pollution Monitoring System using NodeMCU and MQ135 sensor to detect harmful gases like* CO_2*,* NH_3*, and Benzene. The data is sent to the ThingSpeak cloud for real-time visualization, while a buzzer provides instant alerts during unsafe air conditions. The system is low-cost, scalable, and suitable for homes, schools, and urban areas to promote environmental safety and awareness."*

Literature Survey: *Air pollution monitoring has been an active area of research, and several IoT-based systems have been proposed to overcome the limitations of traditional monitoring methods. Traditional systems are often expensive, complex, and limited in terms of scalability. With the advancement of low-cost sensors, microcontrollers, and cloud platforms, IoT has emerged as a practical solution for real-time, distributed environmental monitoring.*

Parmar et al. (2020) developed a prototype for an environmental air pollution monitoring system using low-cost semiconductor gas sensors integrated with Wi-Fi modules. The data was gathered by Raspberry Pi and displayed on a web server using a MEAN stack. Their work demonstrated the feasibility of deploying affordable monitoring nodes for environmental assessment.

Malleswari et al. (2022) emphasized the integration of IoT devices into smart city infrastructure. Their study highlighted the ability of IoT to collect environmental data in real time, providing pollution-related insights that can be easily shared and used for decision-making.

Pal et al. (2023) proposed an IoT-based air pollution monitoring system using Arduino, where harmful gases like CO_2, NH_3, smoke, and benzene were tracked. They integrated LCD displays and web servers to make monitoring accessible and user-friendly. An alarm was triggered whenever pollution levels crossed the threshold, demonstrating a direct alert mechanism for the public.

Dhingra et al. (2019) introduced IoT-Mobair, a mobile air pollution monitoring system using Arduino, gas sensors, and Wi-Fi modules. Their system provided pollution updates along travel routes through a mobile app, enhancing user awareness and mobility-based decision-making.

Xiaojun et al. (2023) proposed a real-time monitoring and forecasting system using IoT and neural network techniques. By reducing hardware costs significantly and incorporating predictive analytics, their system could not only monitor pollution but also forecast trends, enabling preventive action.

Kumar and Jasuja (2019) implemented a real-time standalone system using Raspberry Pi with sensors for PM2.5, CO_2, CO, and other environmental parameters. Data was transmitted to the IBM Bluemix Cloud for visualization, ensuring reliable monitoring and comparison with government datasets.

Okokpujie et al. (2021) designed a smart monitoring system that logged data to a remote server and provided analysis in real time. Data was displayed both locally and through cloud platforms, making it accessible from mobile devices. This approach validated the use of IoT in creating portable yet reliable monitoring solutions.

Shah et al. (2019) proposed a similar IoT-based monitoring system, with the ability to monitor gases like CO_2, NH_3, NOx, and benzene in real time. Their system offered both web server access and local alarms, providing a dual mode of awareness for users.

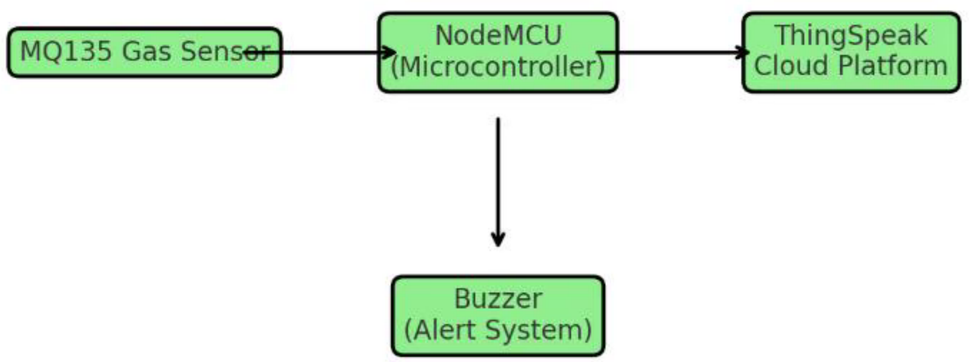
Ayele and Mehta (2023) took IoT-based monitoring a step further by integrating machine learning techniques, specifically Long Short-Term Memory (LSTM) networks, for predicting future pollution levels. This predictive modeling approach added significant value by enabling authorities to plan preventive measures.

Gupta et al. (2019) developed an IoT-based system for smart cities, capable of monitoring not only gases but also temperature, humidity, PM2.5, and PM10 levels. Data was accessible globally through an Android app, making it relevant for city-level implementations.

Summary

"This project develops an IoT-based Air Pollution Monitoring System using NodeMCU and MQ135 sensor to detect harmful gases like CO_2, NH_3, *and Benzene. The data is transmitted to the ThingSpeak cloud for real-time monitoring and displayed through graphs. A buzzer provides instant alerts when pollution levels exceed safe limits. The system is low-cost, scalable, and suitable for homes, schools, and urban areas, promoting environmental safety and public health awareness."*

Proposed System (Block Diagram):



Conclusion: *"The IoT-based Air Pollution Monitoring System successfully detects harmful gases in real time and provides instant alerts through a buzzer and cloud-based dashboard. By using low-cost hardware and the ThingSpeak platform, it ensures affordability, scalability, and easy deployment. This system not only raises awareness of environmental conditions but also contributes to public health and can serve as a foundation for larger smart city pollution monitoring networks."*

References:

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IEEE, 2023.

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5. Kumar, Somansh, and Ashish Jasuja. *"Air quality monitoring system based on IoT using Raspberry Pi."*
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7. Shah, Harsh N., et al. *"IoT based air pollution monitoring system."*
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IEEE, 2023.

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9. Gupta, Harsh, et al. *"An IoT based air pollution monitoring system for smart cities."*
IEEE, 2019.

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