

Vehicle Pollution Monitoring and Control Based on the Internet of Things

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Abstract - Automobiles have become an indispensable element of everyone's daily life. In today's fast-paced urban environment, circumstances often necessitate the use of personal vehicles. However, just as every coin has two sides, the widespread use of automobiles brings its own consequences—one of the most significant being air pollution. Although all vehicles produce emissions, the problem becomes severe when these emissions exceed established limits.

A major cause of this violation of emission standards is the incomplete combustion of the fuel supplied to the engine, which often results from poor vehicle maintenance. With advancements in semiconductor sensors capable of detecting various gases, this research proposes using such sensors at vehicle emission outlets to monitor pollution levels. The system will display the emission levels on a meter, and when pollution exceeds a predefined threshold, the vehicle will emit a warning buzz. After a specified period, the vehicle will automatically come to a halt, allowing the driver to safely park. When the timer expires, the system will cut off the engine's fuel supply, requiring the vehicle to be towed to a mechanic or service station.

This solution incorporates Internet of Things (IoT) technology—an integration of computer science and electronics. In this system, embedded computing is coupled with sensing devices to enable real-time monitoring and control of vehicle emissions.

atmospheric conditions. The harmful effects of pollution range from mild allergic reactions—such as irritation of the eyes, nose, and throat—to more serious health issues including bronchitis, heart disease, pneumonia, lung infections, and aggravated asthma.

Monitoring enables the measurement of air pollutants and noise pollution levels, which can then be analyzed, interpreted, and presented for further use. This information can be applied in various ways, especially for assessing the daily extent and severity of air and sound pollution.

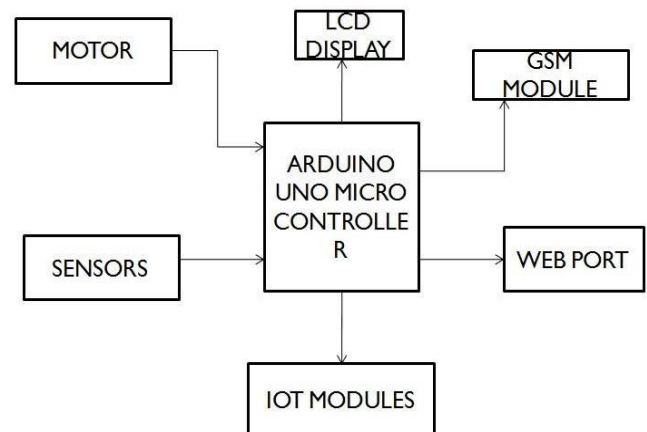


Figure 1 System Architecture

Keywords: IoT, Vehicle Emission, Monitoring, Control

I. INTRODUCTION

The main objective of the IoT-based Vehicle Pollution Monitoring System is to address the growing issue of vehicle-generated pollution. It is essential to monitor air quality and keep it under control to ensure a healthier and more sustainable future. Due to its flexibility and low cost, the Internet of Things (IoT) is becoming increasingly popular for such applications.

Rapid urbanization and the rising number of vehicles on the road have significantly affected

In the proposed system, the collected data is continuously analyzed and updated for use by authorized personnel. When pollution levels exceed a predefined threshold, a signal is transmitted to the vehicle's Engine Control Unit (ECU). The ECU then takes corrective action—ultimately stopping the engine once the critical pollution threshold is reached. This mechanism helps ensure proper control and enforcement of emission standards.

II. LITERATURE SURVEY

Real-Time Wireless Vehicle Pollution Monitoring using GSM and Web Portal (*International Journal of Advanced Research in*

Computer and Communication Engineering, IJARCCCE, Vol. 5, Issue 7, July 2016) This system uses feedback mechanisms and GSM technology to remotely monitor vehicle pollution levels and control over-pollution tests. It enables Regional Transport Offices (RTOs) to monitor parameters such as carbon dioxide levels and vehicle temperature from anywhere in the world.

GSM-Based Tele-Alert System (IEEE, July 2016) This module provides mobility to vehicle owners by detecting carbon dioxide levels in vehicles and sending alert messages through the Global System for Mobile Communications (GSM). By informing vehicle owners in advance, they can take appropriate action to reduce critical carbon dioxide emissions.

Multi-Alert Vehicle Pollution Monitoring using Wi-Fi (International Journal of Computer and Communication Engineering, Vol. 8, No. 17, July 2016) Wireless Sensor Networks (WSNs) are increasingly applied in pollution monitoring and control. Continuous monitoring of carbon dioxide levels in vehicles is often challenging, and this system addresses that by providing constant measurements using wireless sensors.

III. DRAWBACKS OF EXISTING SYSTEM

- The detection has already done through traffic signaling lights.
- Message has sent through WI-FI.
- But this system failed in petrol vehicles.
- The next methodology is ODD or EVEN vehicles, but this also failed.
- Public sectors has also been introduced, there were also some drawbacks

IV. PROPOSED SYSTEM

The IoT-based vehicle pollution monitoring and control project was developed to measure engine parameters and improve both combustion efficiency and overall dynamic performance. The system monitors engine performance using various sensors that track key parameters such as engine temperature and vibration.

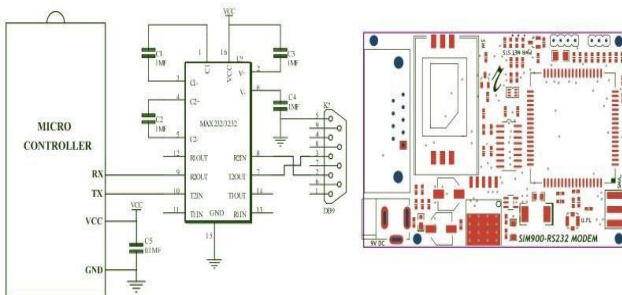


Figure 2 Pin Diagram

A performance monitoring and data acquisition system is integrated with enriched engines, enabling real-time assessment of engine behavior. The hardware architecture and

communication protocols for the system are carefully designed to ensure accurate data collection and transmission. By continuously measuring critical engine parameters, the system can identify performance issues early, optimize combustion, and reduce harmful emissions, thereby improving both vehicle efficiency and environmental safety. The engine performance measurement and control system is built using various sensors to monitor parameters such as engine temperature and vibration. A performance monitoring and data acquisition system for enriched engines is designed, with clearly defined hardware architecture and communication protocols. To enable effective engine performance monitoring, corresponding system software and a user-friendly man-machine interface are developed. By controlling the flow rate of carbon monoxide and adjusting the intake air components of the engine, the system optimizes engine performance, improves fuel efficiency, and reduces harmful emissions.

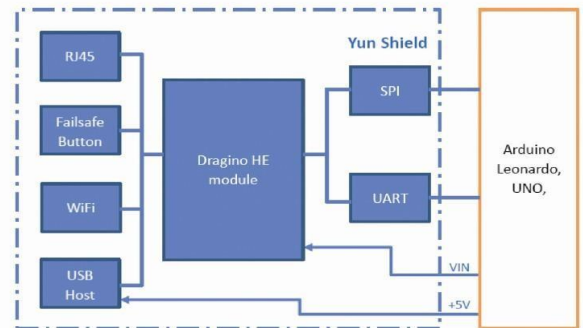


Figure 3 Schematic Diagram of the Engine Performance Monitoring and Control System

V. IMPLEMENTATION

The Arduino controller uses C programming to implement vehicle pollution monitoring and control in an engine-based IoT system. The IoT device functions as a server, informing the car user about the engine's CO₂ emission status, engine temperature during operation, and the surrounding weather conditions. It also measures the engine's vibration corresponding to various displacements relative to the road.

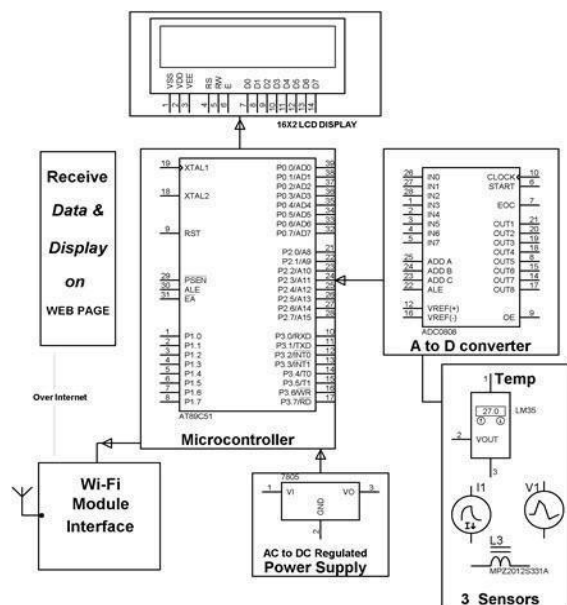


Figure 4 Interfacing GSM Modem

VI. ADVANTAGE AND APPLICATION OF PROPOSED SYSTEM

Advantage

- Carbondioxide value can be known.
- Pollution can be controlled.
- It is applicable to all vehicles.
- Eco-friendly
- Life-spanning (5years).

Application

- Industrial application
- Prevention control pollution level
- Security safes application
- Vehicle security systems

VII. CONCLUSION

The primary goal of installing a carbon monoxide sensor in automobiles is to ensure the safety of the vehicle's engine and the air it breathes. It raises the level of vehicle security. As a novel step of web server control, it monitors illegal users and locates automobiles that cause air pollution. Theft incidents are readily reduced with this technique.

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