

IoT based Air Pollution Monitoring and Controlling System for Vehicles

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Abstract: Air pollution is one of the main environmental issues. At that situation, in most of the countries air pollution is the major problem. Because of industrialization and huge number of vehicles. Mostly vehicles releases polluted harmful gaseous from incomplete combustion fuel of motor vehicle. At that time incomplete combustion of fuel of motor is main reason of air pollution. The vehicle releases combustion of gases, but the main problem is occurs when the release gaseous above the standard values. The is most important common reason for air pollution is emission level being the incomplete combustion of the fuel which is supplied to the engine of motor vehicle. So they occur to the improper servicing of vehicles on time. This emission from the vehicles which cannot be completely avoided but in certain thing we can able to control this. Generally motor vehicles passes harmful poisonous gaseous Carbon Dioxide (CO₂), Carbon Monoxide (CO) these gaseous are present in environment for minimum 50% of the total atmospheric pollutants gaseous. The main purpose of the project is to detection and controlling the air pollution generated by motor vehicles. In which, device will be attached to near the Silencer of motor vehicle. System will be built using Arduino uno, MQX Sensors, IoT Cloud, Dashboard, LCD Display, Speakers, Controlling and Locking System. The Vehicles generates harmful gases which causes the pollution and when the pollution crosses the threshold value, sensors will detect and then device will give intimation to the owner as well as the driver of vehicle. The intimation to owner will be sent through web based android app and intimation to driver will be given through LCD display and Speaker. If owner or driver of motor vehicle doesn't repair or maintain vehicle and vehicle again and again repeatedly generates pollution above standard value, then second intimation will be send to owner of vehicle. And if the owner of vehicle same process repeats for third time, then air pollution controlling device will lock the vehicle after 10 kilometers and send the all details of the vehicles to RTO.

Keywords: Arduino uno, MQX-135 Sensors, Carbon Dioxide (CO₂), Carbon Monoxide (CO), Dashboard, Embedded System, Internet of Things (IoT), IoT Clouds.

1. Introduction

The current time day by day environmental and social problems are growing very rapidly. In developing nations, a large number of people travel daily for shopping, work and social or personal reasons. In modern world, developing nation and smart city we cannot imagine a life without motor vehicle. The developing nation requirement of the number of vehicles is increasing very fast. The India is six biggest countries to manufacturer of motor vehicle. In India today's large-cities are

like Nashik, Delhi, Mumbai and pune more number of vehicles is running on road. In some ways, we have seen our life is depended on motor vehicles. Likewise, a coin has two sides then vehicles also have positive and negative effect. One of the mostly occur negative effects is air pollution. The mostly vehicle air pollution effects on human health, climate and environment because of many people die mostly in metropolitan cities main reason is vehicle air pollution.

The main reason of air pollution is the incomplete combustion of fuel in the engine of a motor vehicle. They support to emission of different gases contributing to increase in the level of vehicle air pollution and mostly affecting the climate and environment. In current situation increasing number of vehicles is main reason of increase in co and co₂ concentration in the atmosphere. The causes of air pollution are Carbon dioxide (CO₂), Carbon monoxide(CO), Nitrogen dioxide(NO₂), Sulfur Dioxide(SO₂), Lead(pb), Ammonia(NH₃), Particular matter(PM), Ground Level Ozone(O₃). Detection and control of these gases in an important area of work, when due to the improper maintenance of vehicles. This emission level of harmful gases from vehicles cannot be completely avoided but, it surely can be completely controlled.

The Internet of things (IoT) allows objects to be sensed or in controlling. In the IoT, the development of air pollution monitoring system device will help to detect, control and measure pollution related parameters of motor vehicle. So we will implement and developed system for air pollution detection in vehicles that is pollution is high or low level as compare to standard value because of it depend on combustion of fuel in motor vehicle. so we will build it up and implement it using Arduino uno and other components. Our system is more important in motor vehicle to detect air pollution gaseous like Carbon Dioxide (CO₂), Carbon Monoxide (CO). System implementation we are using Hypertext Transfer protocol (HTTP) for communication between two component and Message Queue Telemetry Transport protocol (MQTT) for transferring vary fast data and also assures that data or information is not manipulated and 100% data transmission is successfully completed. IoT cloud (Internet of Thing) is used for storing details of all motor vehicles.

2. Literature survey

Air pollution is mostly social and environmental problem. It generally leads to a many different of adverse effects on climate, ecosystems and human health. Then taking appropriate decisions in a timely period it totally depends on the measurement and analysis of the parameters of the air, which creates the need for the development of real time system is an air quality detection, monitoring and controlling system. In this paper we present an most cost-effective measurement of different environmental parameters, based on a mqx gas-sensor. The device has been tested and the measurement was compared with the output data of the local environmental control authority stations. The preliminary results show that this approach can be used as an economical alternative to the professional grade systems.

Table 1
Literature Survey

| Title | Publication | Year | Description |
|--|--|------|--|
| Development of IOT based vehicular pollution monitoring system | International Conference on Green Computing and IOT | 2015 | Sensors for vehicle pollution system that specialize in a straight forward accessibility of real time data through internet of things. |
| Air pollution and particulate matter detector using raspberry Pi with IOT based notification | IEEE 9 th International on Humanoid (HNICEM) | 2017 | The components included in the Hardware is a Dust Sensor which will measure the particulate matter area, Carbon Monoxide Sensor for measuring the gas detected, microcontroller, and Raserry Pi in order to send data through email. |
| Vehicle pollutants control using sensors and Arduino | Third International Conference on Sensing, Signal Processing and Security(ICSSS) | 2017 | The basic objective of this paper is to control the vehicle effluents like carbon dioxide, carbon monoxide that may harm to system. |

3. Methodology

This section introduces us architecture of the system and Modules of the system. It also contains the input to the module processing and required output to the system.

A. System architecture

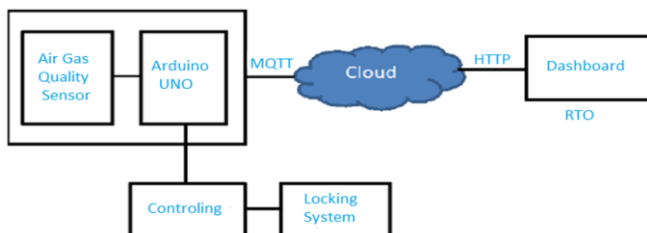


Fig. 1. System architecture of pollution detection and control using IOT

The system architecture shows the block schematic of the system. It shows the various levels of the system and their individual functionality. The system architecture is an efficient way of representing the working of a system.

B. Prototype model

1) Gas-Sensor

The use MQX-135 gas sensor which will sense both carbon dioxide and carbon monoxide gas produced by the motor vehicles.



Fig. 2. MQX-135 Sensor

4. Arduino UNO

The ARDUINO UNO is used which less in cost and have features like Bluetooth and Wi-Fi. It is a microcontroller board uses an interface between the various sensors and other compound. It will send omen (intimation) the driver as well as owner of the motor vehicles which are generating air pollution above standard value and the omen will be send two times and third time strictly no intimation (omen) will be given to driver or owner and after 10km the starring of vehicle will be locked by using controlling and locking system and the all details of motor vehicle will be send to the RTO.

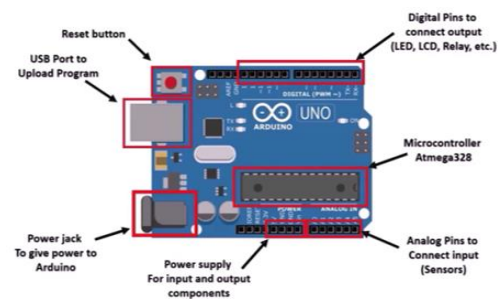


Fig. 3. Arduino UNO

5. MQTT

The MQTT is one of the most commonly used protocols in IOT projects. It stands for Message Queue Telemetry Transport is designed for devices which run on low power, low bandwidth and lightweight messaging protocol which use to gives the 100% successfully transmission of data with high speed.

6. IoT Cloud

IOT cloud use to store permanent information and access only login client. It use to stores details of all vehicles and it will only pass the details of those motor vehicles which are

generating air-polluted gas above the threshold value to send the RTO.

7. HTTP

HTTP stand for Hypertext Transfer Protocol is an application protocol. It is use in Data communication between two devices. Our module use in sending all detail of pollution generated motor vehicle to android application (dashboard). Dashboard is use to display all detail of pollution generated motor vehicles.

8. Dashboard

Dashboard is an Android application which is use RTO to see details of pollution generated vehicle.

A. System features

- This system will reduce air pollution in cities where there is huge amount of vehicle usage.
- The vehicle owner has to take note of their vehicle maintenance on time because this system will notify the police about the damage made by the vehicle.
- Other than that it will help to make the environment clean and healthy according to the people living in that environment.

9. Conclusion

The proposed system plays an important role in real time air pollution controlling and monitoring for vehicles. This paper proposes an evolution method based on monitoring and controlling air pollution for vehicle. Vehicle emissions have detrimental effects on air quality. There is an increase the level of air pollution over the last couple of years, increasing to

several environmental problems and affect human health issues. This automated system is more important to take strictly the action against air pollution control. The system detects of pollution air and inform to the owner of vehicle through message is successfully implemented. Hence, we conclude our project proposal is all about for the beneficiary to the people in our society and prevent them from the hazardous gas.

10. Future Scope

Future work includes adding a GPS & GSM module along with tachometer. This not only indicates the owner when there is slight change in pollution content but also helps the owner to find a service station nearby. Owner will receive a message followed my change of smoke level and change of LED light and buzzer audio. All measures are taken so those owners never miss notification. When the vehicle comes to halt state the location of nearest service station informing them that the vehicle is in halt state. So the owner want be stuck for a long time.

References

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