

Smart Air Pollution Detection and Monitoring System for Motor Vehicles

Aniket Dhote¹, Wasudeo Rahane² and Priyanka Rajput³ and Yogita Taware⁴

NBNSinhgad School of Engineering, SavitribaiPhule Pune University

Aniketdhote0@gmail.com,

Tawareyogita21@gmail.com,

priyankarajput5145@gmail.com,

wasudeo.rahane@sinhgad.edu

Abstract

Air pollution is becoming a major environmental issue over the past few years. According to a study in 2019, 21 out of 30

highly polluted cities were from India. Many people don't turn their vehicles off even if the traffic is too long. The major reason for concern over the increasing air pollution is not only its harmful effects on human health but also environmental damage.

So we have proposed a Pollution Detection and Monitoring System for Motor Vehicles. It is Smart Air pollution Detection

and Monitoring System. Every vehicle emits gases, but it could give rise to severe problems when this emission crosses the

Standardized values defined by the Pollution Control Board (PCB). In this project, we propose a system that helps us to detect the concentration of harmful gases, i.e. CO, CO₂, and CH₂O as well as PM_{2.5}. A smartphone app is developed which enables us to monitor real-time data and alert users when the corresponding gas emission goes high. The notification helps us to take certain actions to eliminate those pollution causing factors in time.

We can't stop pollution all at once but we can at least slow it down up to some extent. So we have come up with this solution

for a better tomorrow. It will also help RTO in terms of rules, regulations and fine. We will have a lot of information about the

Pollution caused by a particular vehicle which we never had up to date. This will be useful for deciding future strategies regarding pollution reduction.

Keywords:

IoT (Internet of Things), MQ-135 Sensor, Arduino, IDE, GND, VCC

I. Introduction

Nowadays, various companies provide technological solutions for indoor air pollution like air purifiers, yet there has not been any effective solution for outdoor air pollution. Emission of poisonous gases from industries and vehicles are not only hazardous for humans, but the marine life is also getting adversely affected. According to the World Health Organisation, air pollution is a major

issue these days. Consequently, numerous researches have been done in order to minimize the harmful effects of air pollution.

Monitoring air quality is a better option to prevent the environment from hazardous emissions that cause air pollution. By capturing the actual information about the quality of air, it can help us in formulating the vehicle design policies accordingly.

The main objective of the Smart Air pollution Detection and Monitoring System is to monitor air pollution which is an emerging issue these days. It is necessary to monitor air quality and keep it under control to provide a better and healthy environment for all. Due to its flexibility and low cost, the Internet of Things (IoT) is getting very popular in today's times. Due to urbanization and increase in vehicles on road, the atmospheric conditions have been severely affected.

Harmful effects of air pollution include irritation of the throat, eyes, nose as well as various problems like bronchitis, heart diseases, pneumonia, lung cancer, asthma. Monitoring gives us measurements of pollution causing agents, which can then be analyzed, interpreted and presented. This information can then be analyzed in multiple ways. Analysis of monitored data allows us to assess how air quality index is affecting the environmental factors. Even though electric vehicles are promoted, but people do not use electric vehicles in large numbers.

Hence, this paper proposes a technique for characterizing the air quality that relates the emission values to the air quality index.

Hence, this paper proposes a methodology of characterizing the air quality by building a model that relates the sensor values to the air quality index.

i.MQ-135

This sensor is used for sensing different types of gases. The operating voltage of this gas sensor is from 2.5 V to 5.0V. It is high sensitivity sensor to other gases. It is used in offices, factories and vehicles etc. Its price is minimum than any other sensor and its range is maximum.



Fig. 1 MQ-135

ii.Arduino UNO

Arduino UNO combines the ease-of-use of the classic boards with the latest technologies. It is cost efficient as well as durable and can be used for many. It has not Bluetooth support and also Wi-Fi. It can be connected through cable and there is green light for the output data. It accepts voltage between 7 and 20 volts and it is same as NANO.

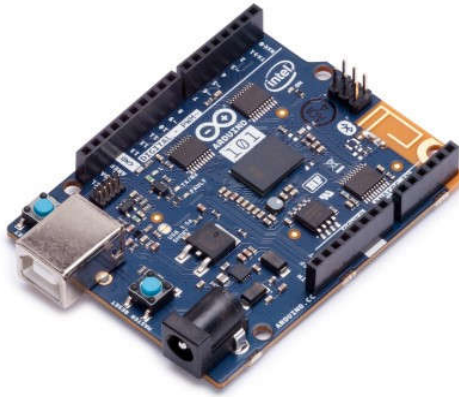


Fig.2 Arduino UNO

II. Literature Survey

“Towards a Smart Sustainable City: Air Pollution Detection and Control” states that an application is monitoring pollution level in the air. The sensors are connected to the microcontroller and then readings are sent using Wi-Fi module. These readings will be compared with the fixed value and then take action against them. This method avoids spreading of the various kinds of diseases [1].

“An IoT Based Air Pollution Monitoring System for Smart cities” proposed system for smart cities. Raspberry Pi is often used for the communication between the hardware and android application [2]. Consistent with the sensor data received, the info is often plotted within the type of graph. “Low-Cost air sensing system” introduced the system that ought to be cost effective and budget-friendly [3]. This technique contribution is that it monitor from houses by installing number of modules. Regression techniques are often employed in that paper for better understanding and simple to implement.

“Internet of Things Mobile- Air Pollution Monitoring System (IoT-Mobair) states that developing kit with the mobile application [4]. Feature of that application is to indices of air quality for various cities, daily forecast of air, health risk, different form of feature utilized in that paper.” IoT based Vehicle Anti-collision and Pollution Control System” proposed that the accident that happened on the road it detect it and show the pollution level on LCD display [5]. It’s used for prevent the accident and shows the direction of obstacles.” Vehicle Collision Detection and Avoidance with Pollution Monitoring System using IoT” is based on to avoid accident and detect real-time pollution using accelerometer device fit into the vehicle. They will use the MQ-7 sensor for output data.

We are using the sensor MQ135 due to its min-max detection range (10ppm-10000ppm). And also of its cost i.e. (Rs175). The sensors accustomed to sense this current status of pollution. The sensor should be connected to the vehicle with arduino connected to the battery. User can view the status of pollution on the application. This can sensed all type of gases under pollution. This data should be stored at cloud. User will get notification when its vehicle crosses the limit set by authorities. After getting multiple notifications, if user isn’t taking note within seven days then notification are sent to authorities like RTO.

III. Motivational Scope

Over the years, there have been several accidents occurring due to overspeed, carelessness in driving, drink and drive etc. in place like school zones etc. where many people cross roads frequently. Hence some technology has to implement to avoid such accidents from occurring. Day by day, we know that pollution should be increased all over world. The use of this idea is to reduce pollution for motor

vehicle. Using MQ-135 sensor data should be sensed minimum to maximum range that should reduce the pollution and keep the environment healthy and safe. Developing an application is an easiest way to send an alert to the user and rto officer that user can take precaution to stay environment healthy and rto officer can take appropriate action against them who can higher than the ppm value that set by the government. It is also low budget device that the sensor should be about low cost so new cars i.e. BS VI will be introduced using this technique that we are developing. Firebase should be used for the safe saved data that data should be stored by sensor and those values send to the user as well as rto officer. Those date should be safely saved at cloud.

IV. Emission Norms Table

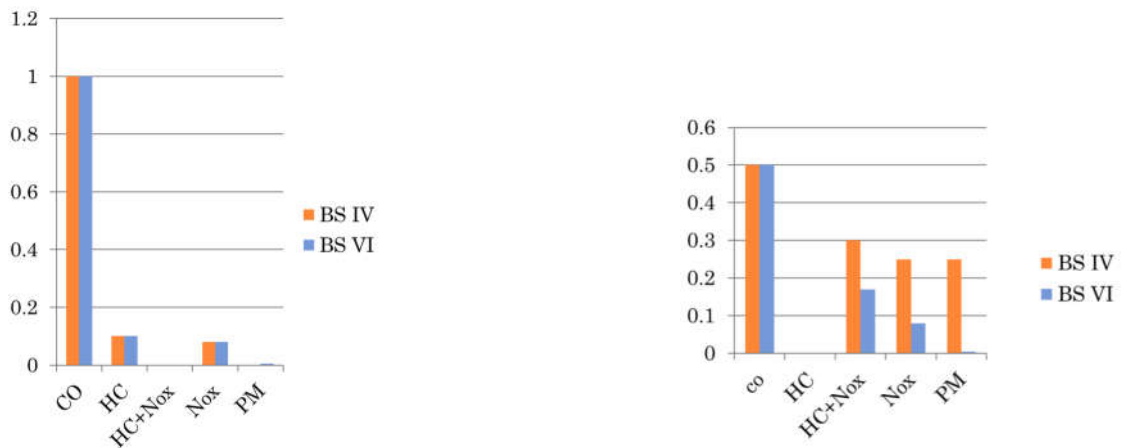


Fig.4

V. Range of different GasSensors:

Model	Detection range	cost
MQ-2	200ppm – 5000ppm	220 rs
MQ-3	20ppm – 1000ppm	139 rs
MQ-6	200ppm – 1000ppm	140 rs
MQ-8	100ppm – 10000ppm	175 rs
MQ-131	10ppm – 2ppm	2136 rs
MQ-135	10ppm – 10000ppm	150 rs
MQ-136'	1ppm – 200ppm	1936 rs

VI. Proposed System

This paper states that we are using minimum to maximum range of sensor i.e. MQ-135 and its cost is also minimum other than any sensor. We are using arduino UNO that used for connection between the data of sensor that send and at the receiver end data received to the user and rto admin. We are using

Wi-Fi module to stored data on firebase and that data then transferred to that particular user and rto admin.

In application side, login for two constraints first is user and the second is rto admin that both should receive data from the cloud that are using via Wi-Fi module. When sensor can sensed data and that data stored on cloud it should transferred to the user and the rto and if the value of PPM is more than the rto should fixed that value then the user should pay the particular fine to driving their vehicle. If the use will not pay fine their license should be suspend for couples of month.

VII. Architecture System

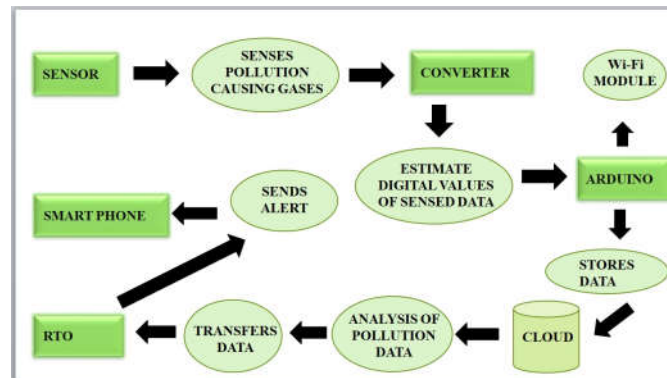


Fig.5 Architecture

VIII. Schematics

- Arduino UNO& MQ - 135 Sensor
- Connect A0 in MQ 135 to Analog pin 0
- Connect Vcc in MQ135 to 5V in Arduino 101
- Connect GND in MQ135 to GND in Arduino

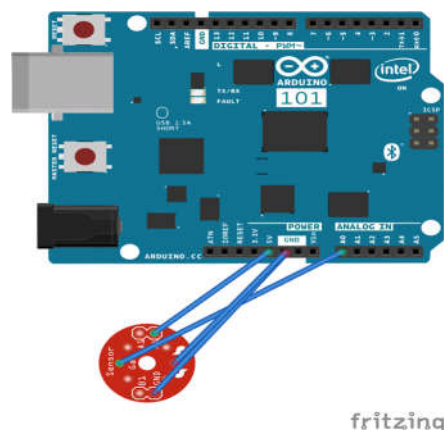


Fig.6

IX. Existing System

Different types of sensors can be used in existing system that has minimum range than MQ-135 sensor. So for maximum range of detection we can use this. In daily life, we can use PUC system that detects the pollution. But this system is the fraud system that many vehicle user can take the PUC without checking it so overcome to the fraud system we can build this system to control pollution all over world.

X. Algorithm

Step 1: Two logins on the app:

1: for RTO admin

2: for user

Step 2: values can be sensed.

Step 3: Then after taking value, the value should be stored at firebase cloud then

Step 4: check ppm value is high or low then step 5

Step 5: Data should be send to both user and the RTO

Step 6: Android app should be divided into two parts as step 7 and 8.

Step 7: vehicle driver can login to see the ppm value of their vehicle

Step 8: RTO admin can check which vehicle can polluting the environment

Step 9: then user can be pay fine if his/her vehicle polluted the area.

Step 10: RTO admin can check it later.

XI. Conclusion

In a country like India pollution is the major problem towards environment. Due to pollution, numbers of people also died and environment should be unhealthy that the oxygen should be decreased day by day. To decrease pollution and stay environment healthy this project will be small step towards it.

In the paper “Smart Air Pollution Detection and Monitoring System for Motor Vehicles” we have discussed about the IoT system using android application that detect and monitor system for motor vehicle. That sensor should be sensed data through exhaust system of motor vehicle that data goes through firebase and that data from firebase send to user and RTO officer and take precaution against to stay environment healthy and safe. RTO officer should take fine from the user who can break the rule of that values.

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