INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 6.078
(Volume 6, Issue 3)
Available online at: www.ijariit.com

IoT based air and sound pollution monitoring system

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ABSTRACT

Transportation sector is the major contributor of increasing air pollution levels in major cities in India. Various authorities like Road and Transportation Office monitor emission levels. This paper states how, using various sensors we can measure emission levels. The data collected is compared against the standards. If it doesn't meet the standards, the vehicle owner receives an alert and the data is also sent to the RTO for further actions to be taken, if needed. Thus monitoring the exhaust for presence and levels of harmful gases emitted, pollution levels can significantly be reduced.

Keywords- *Air pollution, sound pollution, monitoring, emission, vehicle, sensors*

1. INTRODUCTION

Air and Sound pollution has both acute and chronic effects on human health. It ranges from minor upper respiratory irritation to chronic respiratory and heart disease, lung cancer, acute respiratory infections in children and chronic bronchitis in adults, aggravating pre-existing heart and lung disease, or asthmatic attacks. To defeat this issue, we are presenting a system through which the degree of sound and the presence of the hurtful gases in the environmental factors can be identified. To manage it, its observing is significantly suggested.

The fundamental target of this work is to:

- Detect the number of decibels of sound and harmful gases emitted by the vehicle
- Check if their levels are within the standards specified by RTO
- Alert the user if limits exceed
- Send the data to RTO via a Wi-Fi module.

2. RELATED WORK

Throughout the years, there have been a few guidelines made by the Government to control the outflow from vehicles; the majority of them being fruitless at the equivalent. The principles and the course of events for execution are set by the Central Pollution Control Board under the Ministry of Environment and Forests. Bharat stage discharge principles are outflow gauges initiated by the Government of India to control the yield of Air and Sound poisons from inward ignition motor hardware, including engine vehicles. The first emanation standards were presented in Quite a while in 1991 for petroleum and 1992 for diesel vehicles. These were trailed by making the Catalytic converter obligatory for petroleum vehicles and the presentation of unleaded petroleum in the market.

Real-time Air Quality Monitoring System for Bangladesh's perspective based on Internet of things [1] is a work of Air Monitoring System with crisis alert dependent on Internet of Things (IoT), which permits clients to follow the encompassing air nature of their home or office or businesses from anyplace. An alert goes to client of the framework in the event of any hazardous circumstance.

A Raspberry Pi controlled cloud-based air and sound contamination observing framework with temperature and humidity detecting [2] is an IOT-based strategy to screen the Air Quality Index and the Noise Intensity of a region, have been proposed. The suggested innovation contains four modules in particular, the Air Quality Index Monitoring Module, the Sound Intensity Detection Module, the Cloud-based Monitoring Module and the Anomaly Notification Module. The Air Quality Index is estimated thinking about the nearness of the five standards air poisons. At that point the sound force is recognized utilizing

particular sensor. From that point onward, the Cloud-based Monitoring Module guarantees the way toward getting the information with the assistance of Wi-fi module present in Raspberry Pi which satisfies the goal of examination of data on

a periodical premise. At last, the Anomaly Notification Module alarms the client if there should arise an occurrence of an undesired condition.

Smart controlling of indoor air quality dependent on remote checking stage by thinking about structure condition [3] is a work with versatile and convenient observing stage dependent on unmanned airborne vehicle (UAV) is created by consolidating advanced sensor board and explicit correspondence module in this paper. In addition, the air quality checked by UAV-stage will produce significant data for the controlling of indoor air quality for indoor condition in the structures. To meet the indoor occupants' necessities of wellbeing and solace, a fluffy control strategy is proposed in this paper to control the actuators of air cleaner and ventilator. With a decent coordination, a smart domain which meets the comfort level with great indoor air quality (IAQ) can be accomplished.

Air pollution monitoring and prediction using IoT [4] is a paper of an IoT based air pollution monitoring and prediction system. This framework can be used for checking air toxins of a specific region and to air quality examination just as anticipating the air quality. The proposed system will concentrate on the checking of air toxins center with the mix of IoT with an AI calculation called Recurrent Neural Network also called Long Short-Term Memory (LSTM).

3. SYSTEM DESIGN

3.1 System architecture

The proposed system has the following main components:

(a) Sensors
(b) Arduino uno microcontroller
(c) Wifi module
(d) LCD

3.2 Proposed system

(a) Project's basic principle of working is the sensing of data from the sensors.
(b) Convert the analog data into digital form
(c) Process the digital data and display it on LCD.
(d) Compare the threshold value and send it to the IOT page.

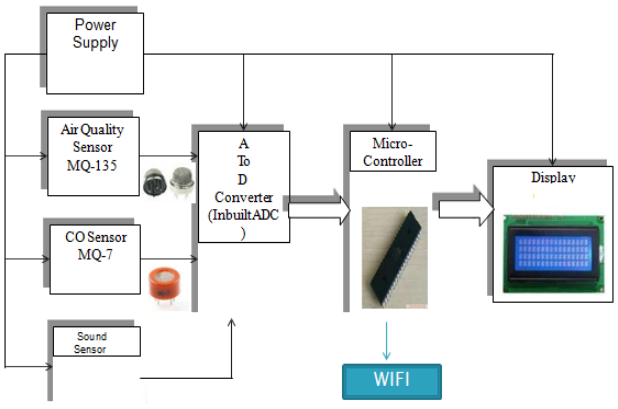

Fig. 1: Proposed System

4. IMPLEMENTATION

The proposed system monitors vehicle emission level and alerts the RTO if the vehicle exceeds the standard limit. RFID is used to authenticate the vehicle user using the RC number. If the authentication is successful the vehicle starts. MQ-7, a semiconductor Sensor for detecting Carbon Monoxide is used. Delicate material of MQ-7 gas sensor is SnO2 with lower conductivity in clean air. It makes recognition by strategy for cycle high and low temperature and distinguishes CO at low temperature (warmed by 1.5V). The sensor's conductivity gets higher alongside the CO gas focus rising. At high temperature (warmed by 5.0V), it cleans different gases adsorbed at low temperature. MQ-135 Gas sensor, a semiconductor Sensor for Carbon dioxide and nitrogen oxides is used. It has wide detecting scope and fetches fast response and high sensitivity. It is stable and has a long life. In this paper the sensors will check the pollutant emitted by the vehicle. If the pollutant rate is more than the threshold value then the output is sent to the telegram Bot through the Wi-Fi module. The system is equipped with Wi-Fi ESP 8266 to send the data to the officials to detect the emission levels of the vehicle. The entire setup comprising Wi-Fi module, LCD Display, microcontroller, sensors are connected to a power supply. The data collected from sensors is analyzed for anomalies, if any, the data is sent to RTO for further actions. The vehicle user is also alerted via the buzzer. There is continuous sensing of data from all the sensors meanwhile. This process occurs continuously for as long as the vehicle is on. If the vehicle emits pollutants more the specified levels, the RC number of the vehicle is sent to RTO and they might issue a warning and tow the vehicle. The message which is sent to RTO contains the pollution data from various sensors and transmitted to a central server that make this data available on the Internet through a Google Maps interface. Thus, the vehicle can be towed in case of abnormal emission levels. Hence the proposed system has special commands for sending alert message to RTO.

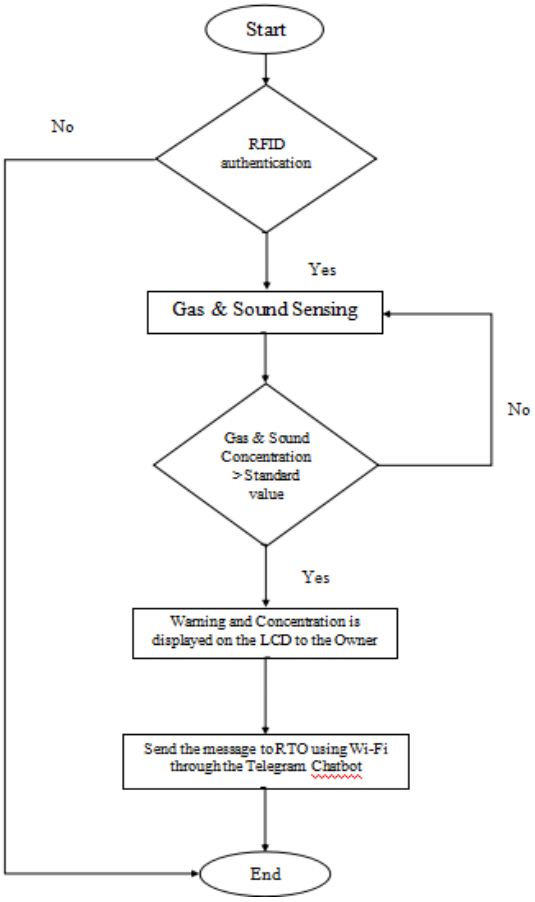

Fig. 2: Implementation

5. RESULT

The proposed Wireless Air and Sound Pollution Monitoring System provides real-time information about the level of Air and Sound pollution emitted by the vehicle, provides alerts in case emission level exceeds safe limit. This information can then be used by the authorities to take prompt actions such as

issuing a notice to the owner or levying fines or ceasing the vehicles. A wireless distributed mobile Air and Sound pollution monitoring system was implemented using the telegram public network along with wi-fi. The system uses city transports to gather toxin gases, for example, CO, NO2, and SO2. The contamination information from different portable sensor clusters is transmitted to a local server that make this information accessible on the Internet through a Maps interface. The data shows the pollutant levels and their conformance to local Air and Sound quality standards.

6. CONCLUSION

This project mainly focuses on detecting pollution levels and indicating it to RTO which is very significant as there is an increase in pollution levels over the last couple of decades. This system is highly beneficial in curbing problems such as ozone layer depletion, etc. It provides features like monitoring pollution levels on mobile applications. Since various sensors are used, the environment can be brought to real life as it interacts with the objects in the network. Thus, this system helps keep the environment free from vehicular emissions and bring it to a halt if the pollution level exceeds standards mentioned by RTO.

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