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Vehicale Pollution Monitoring Using IoT

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Abstract:-The objective of this paper is to watch pollution on roads and track a vehicle that causes pollution, to unravelthis downside, several countries and regions have already bestowed a series of emissions standards, meantime some ways has been developed, as well as update motor engine or up the standard of the gasoline. However, these actions have not caused hanging impact, as we tend to expect. During this system, Radio Frequency Identification (RFID) technology as an inexpensive and mature wireless communication methodology is adopted to gather and transmit emissions data of vehicles and Internet of Things (IoT) concept is proposed. Moreover, The RFID devices have to be put in on the traffic lights so reliable reading of emissions signals from a vehicle may be interrogated once the vehicles stop ahead of the red light .By applying the system; it is possible to smoothly realize green traffic network.

Key Point:- Inspection system design, Internet of Things, Radio Frequency Identification, General Packet Radio System.

I. INTRODUCTION

The environmental problems are growing now days. Air pollutants from cars, buses and trucks can worsen respiratory diseases and trigger asthma attacks. Transportation is responsible for more than 50 percent of carbon monoxide in the air. The air pollution may lead to Chronic obstructive pulmonary disease (COPD) and escalates risk of cancer. The public health is affected due to pollution from vehicles. One of the major reasons of air pollution is emission of polluting gases from vehicles which is responsible for almost 70% of the total air pollution. To control the air pollution, the amount of air pollution needs to be monitored and vehicles causing the pollution should be identified. Internet of Things can be helpful in cities for monitoring air pollution from vehicles and also pollution data on different roads of a city can be gathered and analyzed.

Air pollution is an important factor affecting the quality of the lives of millions. Most of the pollutants in the air are a result of emissions from cars, trucks, buses, factories, refineries and natural occurrences like volcanic eruptions and forest fires. Because people breathe in contaminated air, they are exposed to many health risks. Air pollution might cause cancer, premature death, developmental disorders to children, harm reproductive systems, result in asthma attacks, or cause lung cancer. It may also cause wheezing and coughing, shortness of breath, harm to cardiovascular system, increase susceptibility to infections, lung tissue redness, or swelling. US Federal laws like Clean Air Act are designed to control and regulate air pollution.

Based on the motor vehicle registrations across states, the number of vehicles including cars and trucks on the roads increased by 30% in the last ten years [1]. Number of trucks alone almost doubled in the last ten years. On an average, a commuter spends more than fifty two minutes in travel per day(two way)and in some big cities he/she spends more than four hours per day (two way) inside the car [2]. According to India department of transportation, the total length of roads is four million miles and two hundred and forty six million vehicles travel on these roads [3]. Significant number of communities is built around these roadways. Motor vehicles emit a variety of gases such as Carbon Dioxide (CO2), Carbon Monoxide (CO), Nitrogen Oxides (NO/NO2), Particle Matter (PM10) and Ozone, which are by-products that come out of the exhaust systems. These emissions contribute significantly to the air pollution and smog especially in big cities. More than fifty three thousand people die per year because of these vehicular air pollutants [4].

II. LITERATURE SURVEY

Few locations, with usually high volume of traffic, may be identified to be monitored. In this framework, for each monitored location, the IOT readers are placed on the either side of a road with a fixed short distance in between them. Each vehicle passing through the road is equipped with a passive IOT tag.[2] Sensor nodes, composed of gas sensors, are placed on the roadside. The sensor nodes may be identified and addressed by unique IP address or a unique ID. These nodes gather sensor data continuously and send it wirelessly to the server.[1] Whenever the sensor nodes sense abrupt rise in pollution, search is initiated for concerned IOT tags, i.e. vehicles causing pollution are identified using the IOT tag attached on them. Pollution data is printed on arduino terminal not sent on internet server.[4]The IOT readers identify corresponding tag number and transmit the same via the GPRS modem to the server. This frame work also generates alert when pollution level increases. Authorities may take appropriate actions accordingly.[1] All the gathered data may be monitored and analyzed by

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authorities concerned. The system has a significant meaning in terms of cost and effectiveness in comparison to other non-IOT based vehicle detection system as image processing solution, GPS and satellites solution requires a large number of expensive and powerful equipment for processing.[2] Also Wireless sensor along with active IOT can be used in the wireless sensor system to monitor the vehicular pollution based on IOT. At monitor location, the IOT reader, wireless gas sensors are integrated along with microcontroller. This entire system is placed in either of the road.[1] Whenever the vehicles equipped with IOT tags passed through the sensor node, IOT reader presented in the monitoring system detects the vehicles and the sensors measures quality of the air produced by that vehicle. The sensed continuous data is sent to the microcontroller for verification of the pollution level of the vehicle. The microcontroller verifies the levels of the pollutants of the air produced by the vehicle.[3] If the pollutants levels are beyond the threshold levels, then it sends the warning message to the vehicle owner. The same data is displayed on the Liquid Crystal Display (LCD). The information about the levels of CO2 and SOx, vehicular number, IOT of the vehicle and time and date of vehicle are also sent to the server of the authorized agencies.[2] This information is stored in the server database for future analysis. In this system using wireless sensor network that provides a framework for collecting the sensor data at any place using IOT. Another proposed system consists of two modules vehicle unit and remote monitoring unit. Vehicle units, which resides in a vehicle consists of CO2, LPG GAS sensors, IOT tags and GSM modem. Remote monitoring server area holds the server unit, GSM modem and Laptop. XAMPP is used as local respective authority to take necessary disciplinary action.[3]With increasing concerns about impact of air pollution on health, EPA is required to monitor and assess air pollution levels across the country. There are around four thousand monitoring stations setup across US, which monitor air pollution as part of State and Local Air Monitoring Stations (SLAMS) network. For example in the state of New Jersey, there are nineteen stationary air-monitoring stations, out of which only six stations report carbon monoxide.[2]

III. System Architecture

A. Design Goals

For realizing a vehicle pollution monitoring using IOT, we need to have a very lightweight, self-powered sensor module that could detect air pollutants like CO/NO2/SO2 with high precision. Sensor module needs to be easy to carry, function continuously.

Our design intends to synthesize electro-chemical sensors, smart phones, cloud services and spatial databases to enable an air pollution information sharing community of interested users. Significant portion of the research was involved in choosing an electro-chemical sensor module, building iPhone application, spatial query enabled web services and analysis of results. Many gases such as H2, O2, CO, NO2, NO, O3, SO2 and H2S can be measured with specifically designed electrochemical gas sensors. Appropriate materials for sensor, sensor geometry and dimensions are critical for optimum performance of gas sensors. Electro chemical properties of the sensor materials, geometry and physical dimensions of the sensor device have direct correlation to the response time, accuracy, durability, precision, electrical signal quality and sensitivity of the sensor device to the gas under study. For example, in a typical CO gas sensor, the molecules of CO are oxidized At The anode surface to produce CO2[33].The current generated on the sensing electrode is related to the rate of CO reaction.

$CO + H_2O \Rightarrow CO_2 + 2\,H^+ + 2\,e^-$

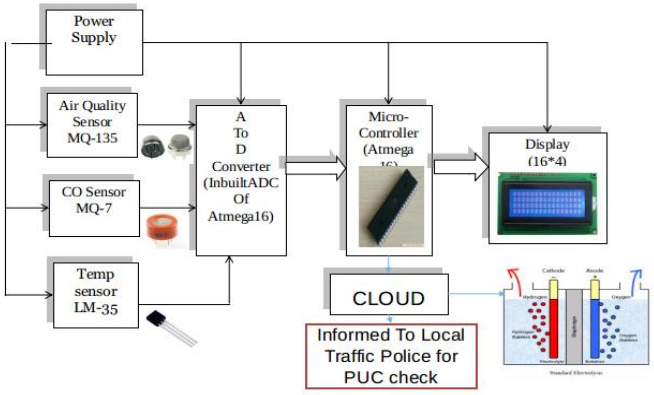

Fig. 1 Block Diagram

B. Temperature sensor LM35

The LM35 series are precision integrated-circuit temperature sensors. Its output voltage is linearly proportional to the Celsius temperature for a large range of temperature values. The LM35 thus has an upper hand over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

LCD

A liquid-crystal display is a flat panel, electronic visual display that uses the light modulating properties of liquid crystals. Liquid crystal does not emit light directly. The working of LCD depend on two sheets of polarizing material with a liquid crystal solution in between them. When an electric current is passed through the liquid, it causes the crystals to align so that it blocks out light and does not allow it to pass[10].

IV. Result Analysis

1) Air Pollution of the area of device installed is send over a internet on things speak

To test the prototype, we installed device to measure air pollution ear traffic region. MQ135 sensor the pollution level 200pp mon26March.This data is send over a internet on things speak.

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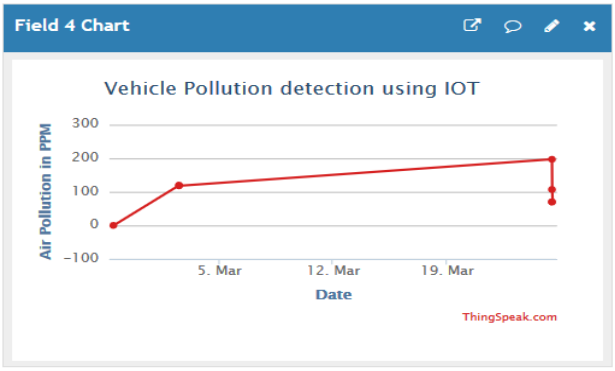
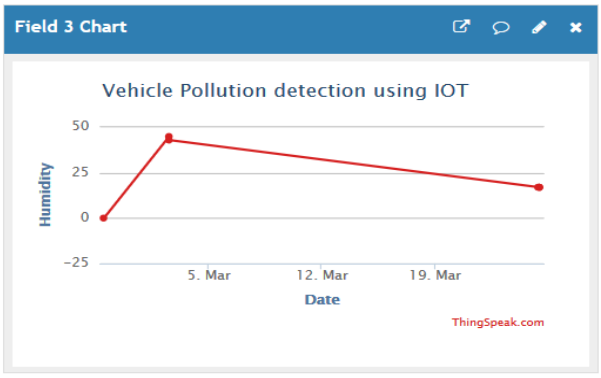
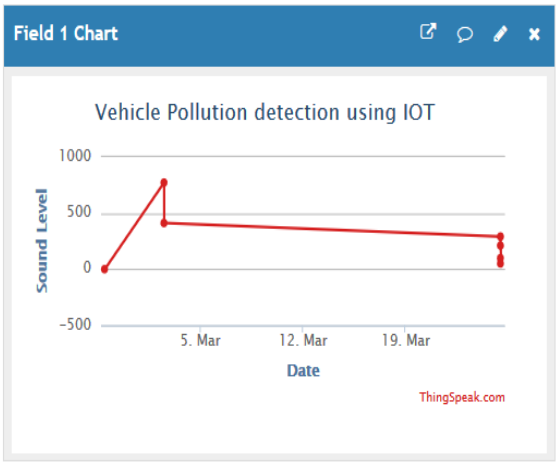


2. Temperature of the area of device installed is send over a internet on things speak



LM 35sensorsencethe surrounding temperature in voltage &31℃ calibration is done by the sensor on26March.Thisdataissendoverainternetonthingsspeak.

4.Sound Pollution of the area of device installed is send over a internet on things speak



Sensor the surrounding humidity 20 cubic mon 26 March. This data is send over a internet on things speak.

V. CONCLUSION

The Automatic Air & Sound management system is a step forward to contribute a solution to the biggest threat. The air & sound monitoring system overcomes the problem of the highly-polluted areas which is a major issue. It supports the new technology and effectively supports the healthy life concept. This system has features for the people to monitor the amount of pollution on their mobile phones using the application.

So, it becomes very reliable and efficient for the Municipal officials along with the Civilians to monitor environment.

Letting civilians also involved in this process adds an extra value to it. As civilians are now equally aware and curious about their environment, this concept of IOT is beneficial for the welfare of the society. And it is implemented using the latest technology.

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