# Automobile Pollution Control Using VNode

**Priti Salunkhe[1], Sunita Shinde[2]**

[1] Shivaji University, Annasaheb Dange College of Engineering and Technology, Ashta, India.

pritisalunkhe2015@gmail.com

[2] Shivaji University, Annasaheb Dange College of Engineering and Technology, Ashta, India

shindesunita@yahoo.co.in

**Abstract:** *The advance sensor network is active research area due to the potential of their application. It is applied for collecting physical data in real time and storing for further action. Increase in number of vehicles has also resulted vehicular pollution and problem of the pollution is becoming a major concern for health of the population. Here we solve this problem by introducing VNode, WSN based for vehicle pollution control which is measuring different types of pollutant concentration present in smoke released by the vehicle and specific observation data send to remote server automatically whenever required to the concerned agencies. Hence WSN technology is applicable for vehicle pollution control which is easily access real time data through web of things. The real time data will be available to main groups of users: Owner of the vehicle, Traffic department.*

***Key Words: Wireless Sensor Network (WSN), RF module, GPS module, GSM module and Web of Things.***

## 1. INTRODUCTION

Air pollution has been aggravated by developments that typically occur as countries become industrialized: growing cities, increasing traffic, rapid economic development and industrialization, and higher levels of energy consumption. The high influx of population to urban areas, increase in consumption patterns and unplanned urban and industrial development has led to the problem of air pollution. Currently, in India, air pollution is widespread in urban areas where vehicles are the major contributors and in a few other areas with a high concentration of industries and thermal power plants. Vehicular emissions are of particular concern since these are ground level sources and thus have the maximum impact on the general population.

Vehicles are a major source of pollution in urban areas. The drastic increase in number of vehicles has also resulted in a significant increase in the emission load of various pollutants.

Carbon monoxide, nitrogen oxides, and hydrocarbons are released when fuel is burned in an internal combustion engine and when air/fuel residuals are emitted through the vehicle tailpipe. Gasoline vapors also escape into the atmosphere during refueling and when fuel vaporizes from engines and fuel systems caused by vehicle operation or hot weather. The pollutants in vehicle emissions are known to damage lung tissue, and can lead to and aggravate respiratory diseases, such as asthma. Motor vehicle pollution also contributes to the formation of acid rain and adds to the greenhouse gases that cause climate change.

Recent advances in sensing technology, particularly in the area of wireless sensor networks (WSNs), now enable environmental monitoring in real time. So the proposed work

describe a sensor network in which all vehicles on the time of registration will be attached with a device (Sensor Node), which is able to provide aggregated information about the pollutant concentration .

## 2. LITERATURE SURVEY

Maintenance (I&M), alternate fuel [5].

Vehicular pollution control by using technical and non-technical measure: The technical measures include various parameter as vehicle technology, fuel quality, after combustion technology, alternative fuel, zero emission vehicle, urban road and flyover project, I&M programmer and non-technical measures include parameter are emission warranty, scraping old polluting vehicles, toll tax for commercial vehicles, subsidies for clean vehicles, parking charges and fine [7].

The focus on WSN technology ,because middleware needs to provide common interface for various functional components of WSN like detection and data collection , signal processing ,data aggregation and notification which provides a natural platform for hierarchical information processing[1]. Wireless sensor network protocol automatically controls the environment based on sensing

result, also interfaced with other network such as a Wi-Fi network, cellular network or internet [2].

Kavi K. Khedo1 et al. developed Wireless Sensor Network Air pollution monitoring System (WAPMS) which is used to monitor air pollution. In this new data aggregation algorithm i.e. Recursive Converging Quartiles (RCQ) is used to merge data to eliminate duplicates, filter out invalid readings and summarize them into a simpler form which significantly reduce the amount of data to be transmitted to the sink and thus saving energy[6].

The government has taken a number of measures to control vehicle pollution such as legislation, emission standards for industries, guidelines for sitting of industries, environmental audit , pollution prevention technologies[4] and from transport sector are stringent emission norms, Cleaner fuel quality, Inspection                      and

The vision of the two related research fields Wireless Sensor Networks and Web of Things is on integrating general, real- world things with the Internet or Web, respectively. The Web of Things can be seen as an evolvement of the Internet of Things [10]. New sensor web concept introduced which consists of sensor nodes to collect data and also share their data and adjust their behavior based on that data. Web service encoding is used to allow accessing sensor data, tasking of sensors and alerting based on gathered sensor observation. Thus new sensor web enablement (SWE) concept improves the specification on alerting [3].

## 3. VEHICLE POLLUTION CONTROL

The system detects the CO Emission level from vehicle by using mq-7 gas sensor and displays the pollution level on LCD. It also indicates the pollution level on central office through RF module. If the vehicle crosses the standard level or threshold level, (automatically vehicle speed control) immediately speed of vehicle will be decreases, decreases and finally stop the vehicle otherwise (manually vehicle speed control) driver will drive a vehicle at proper speed by using KEY. During this time, GPS find the location of vehicle in terms of latitude and longitude will displays on LCD. The values of GPS send SMS to service center through GSM module also send E-mail to central office.

## 4. VNODE

The VNode prototype is designed based on a microcontroller board with Atmega16 AVR microcontroller , gas sensors, GPRS module and GPS module to track the present location and time awareness . The web connectivity is established by the GPRS module so that all collected and processed data is available on the web in real time.

A specialized device (VNode) is mounted to the vehicle. This device is able to measure pollutant concentration present in the smoke released by the vehicle and also displays the observations on a local display unit (may be on dashboard of the vehicle). The sensor information once collected in a database on the server may be open to various institutions such as traffic authorities, environmental agencies or private companies.

The design of the VNode can be viewed in Fig. 2 in which microcontroller have been programmed for getting the raw sensor observations from gas sensors and the location information from the GPS module. When the vehicle starts to cross the Specific threshold level of pollution, Alerts enable the users to know the particular vehicle is not meeting Pollution Under Control (PUC) conditions, so that certain action can be taken.

### 1.    Self- Controlled Embedded System

Microcontroller plays a vital role in this embedded system. The remaining modules are GPS, GSM, RF Module, LCD and relay is controlled by microcontroller. Microcontroller takes input from gas sensor output. Based on gas sensor output, microcontroller controls the remaining modules.

Based on programming the EEPROM of microcontroller automatically microcontroller controls all the modules without any manual instructions.

### B. Gas Sensor (MQ-7)

Mq-7 sensor is also known as CO gas sensor. In this paper, sensor is mainly used to detect carbon monoxide (CO) concentrations in vehicle. Whenever the CO concentration increases or exists in vehicle, then sensor conductivity is high. We use simple circuit to convert the change of conductivity to correspond output signal of gas concentration.

Advantages are Long life and low cost. Good sensitivity to CO and combustible gases. It can detect combustible and smoke gases concentration from 300-10000 ppm in air. This sensor can be fixed at emission outlets of vehicle.

### C. Microcontroller

AVR ATmega16,8 bit microcontroller which has the maximum number of pins used to programming IO. The microcontroller is used to perform five functions. First one is, compare emission values with standard values prescribed by Government. Second one is, start the motor as per given speed Third one is, microcontroller activate the GPS to find location of vehicle and display in terms of latitude and longitude. Fourth one is, GSM module is activated by microcontroller to send GPS values to service centre through text message Five one is, RF module is activated by microcontroller to send the E-mail. The microcontroller performs functions according to the software programmed in EEPROM of microcontroller

### D. Global Positioning Systems (GPS)

Whenever the pollution level reaches to maximum limit, a trigger pulse is given to GPS by microcontroller. The GPS is programmed when GPS receives a trigger pulse, it starts showing the location

of vehicle continuously until the vehicle will be stopped.

### E. GSM module

Whenever the GPS starts showing the location, then GSM module automatically sends a GPS values through text message to service center by microcontroller. At the time of registration with service center number, first we have to send text message to GSM module of proposed system for storing service center number in microcontroller.

### 6. RESULTS

**I**. Initially proposed system at idle state as shown in following Fig.5.



**Fig.6. value of CO**

**III.** Whenever pollution emission level beyond threshold level, then sending SMS to the service center as in Fig.7.



**Fig.5. Idle State**



**Fig.7. SMS Sending to service center**

**II**. This display indicating the value of CO in vehicle Fig.6.

**IV**. During this period, GPS automatically find the location of vehicle and display it through the latitude and longitude values by microcontroller. GSM module send both latitude and longitude values through text message to service center shown in Fig.8.

**Fig.8. text message to service center**

**V.** When RF module is activated by the microcontroller then measured CO value is display on the control office as in Fig 9.



**Fig.9. CO value display on the control office**

**VI.** Also CO value is greater than 120 ppm then sending email to control office shown in following Fig.10.

## 7. CONCLUSION

In this paper, we proposed a new approach for vehicle pollution control. The proposed approach is that VNode –WSN for vehicle pollution control focusing on an easy accessibility of real time data via the web by following the web thing approach. Applying VNode in the described use case of measuring the pollution produced by the vehicle and alert to the end user to take proper action for control vehicle pollution.

However sensor alerting based on sensor measurement and defined alert criteria. Also for taken action notification of the end user must depend on alerting functionality. The restricted rang of the sensor allows detecting few types of gases so the gap between low level senor interface and interface of sensor web service need to be closed.

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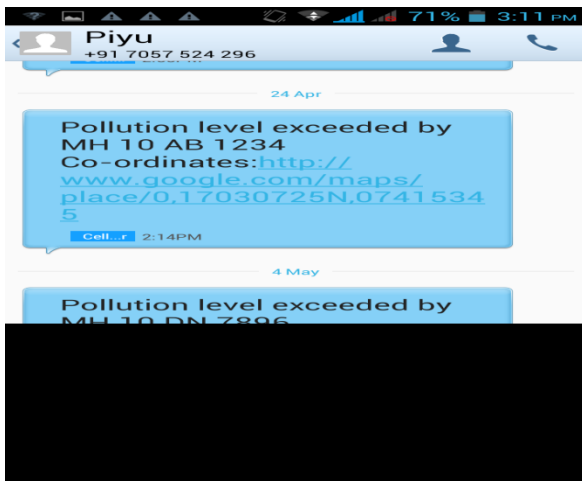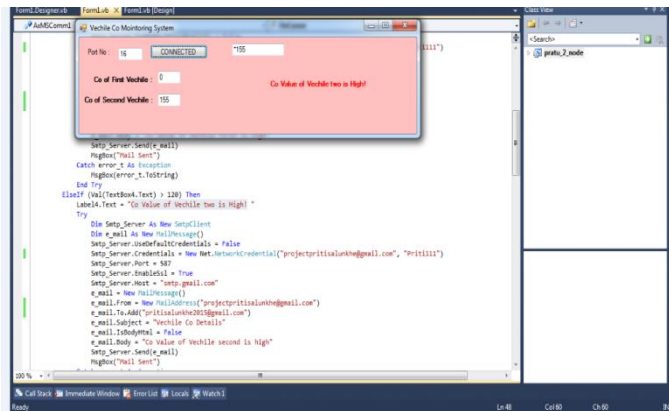
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**Author Profile**

**Prof. Mrs. Sunita S. Shinde.** received bachelor's degree and Masters in Electronics engineering from shivaji university kolhapur and having 15 years' experience. Assistant Prof. at Annasaheb Dange College of Engg. And Technology, Ashta. Her area of interest is Wireless Communication: Vehicular Ad-hoc Network

**Miss. Priti A. Salunkhe.** received bachelor's degree in Electronics & communication engineering from shivaji university Kolhapur. Her area of interest is embedded system.