VNode: Wireless Sensor Network for Vehicle pollution Control

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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. With the increase in number of vehicles has also resulted vehicular pollution, 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. For this purpose each vehicle is part of the web required. The real time data will be available to main groups of users: Owner of the vehicle, Traffic department.**

Index Terms— Wireless Sensor Network (WSN), Web of Things, GPRS, and GPS.

I. 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 .

A. Measures to Control Vehicular Pollution

The government has taken a number of measures 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 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].

II. RELATED WORK

A. WSN

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].

B. Web of Thing

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].

III. VNODE

The VNode prototype is designed based on a microcontroller board with Atmega 328P-PUmicrocontroller , gas sensors, SM5100B-D GPRS module and GTPA010 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.

IV. PROPOSED WORK

The design of the VNode can be viewed in Fig. 1 in which microcontroller has 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 actions can be taken.
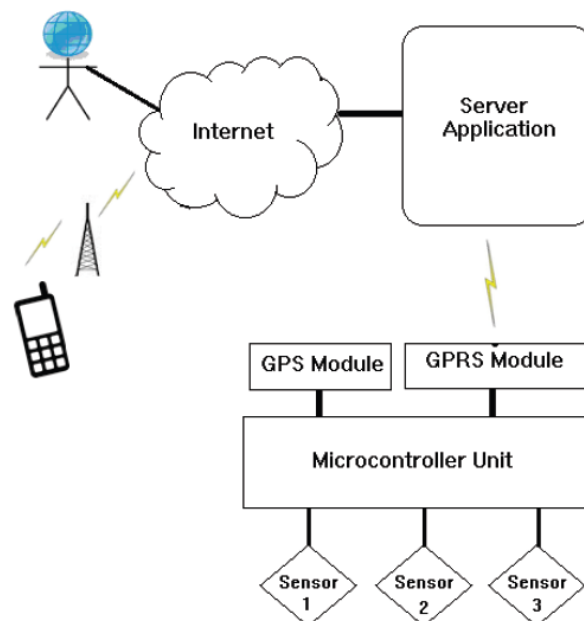

Fig.1. Block diagram of proposed work

A. Methodology

It is proposed to carry out the proposed work in the following stages:

Stage I: - Implementation of Sensor to Sense the Vehicle Pollution:

The vehicle pollution is sensed by sensor which is connected to AVR microcontroller for further proceed.

Stage II: -Implementation of Hardware Design:

Vehicle pollution control system composes of AVR microcontroller. The proposed work is going to implement transmitter section by interface AVR microcontroller with GPS & GPRS module.

Stage III: - Implementation of Communication System:

GPS system is used to find the position information of the vehicle & GPRS system is used to send gathered information to the data center also GSM system is used for mobile communication and INTERNET system is used for E-mail.

V. 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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