A Survey Paper on Pollution Free Smart Cities using Smart Monitoring System by Employing WSN on Vehicles

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Abstract— The world we live in had evolved into a world where almost every family has at least one vehicle in their possession to be safe we could assume that each family has on average two vehicles. Now due to the increase in the number of vehicles in the road there is that much of an increase in the pollutant levels being increased onto the environment. The major sources of air pollution are CO, NOx and HC and these are a major degradation factor to the environment. To tackle this problem this paper talks about a monitoring system which is placed on the automobile to measure the pollutant levels emerging from the vehicle. On top of that some safety features have been added as well for the driver and all of the people traveling in the vehicle in the form of an alcohol sensor and a seat belt sensor. How this works is that the sensors are placed on the vehicle and can be connected through the users android device. The android device through a WiFi connection is connected to the server, the server is connected to a database and that database has the administrator PC to view and monitor the data. The safety feature is the addition of the alcohol sensor which is connected to the ignition of the vehicle and how it works is that if the driver has any alcohol and it is detected by the sensor then automobile will not start, hence adding an additional safety measure to the vehicle on top of pollution monitoring. This project works on an IoT environment and there is a lot of scope with smart devices in the future.
Key words: Sensors, WSN, Smart Cities, Live Feedback, Pollution Control. Survey

I. INTRODUCTION

The 21st century saw a large boom in the automobile industry. In India, specifically, the vehicle population is growing at

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a rate of over 5% per annum. Today, there are more vehicles than people moving on roads. Though this increase in vehicle population has shortened the distance between people to a great extent but it has also polluted the air that we are breathing to a devastating condition which has given rise to a number of health issues for the people.The increased amount of vehicles on the road mean that there is a larger amount of harmful pollutants being emitted into the environment that we breathe. The need of the hour is to device a method to effectively and efficiently keep a check on vehicular pollution- the biggest cause of all environment related problems. Working on this aspect, a vehicle pollution control system is being developed which will ensure the participation of every individual in the move against pollution and in turn preserving the community health and Mother Nature.The survey paper will compare the different technologies used in previous methods and compare that with the model proposed in the paper.On top of the aspect of calculating the pollutant levels from the vehicles there is also a safety measure that has been implemented in this system and that is the use of additional hardware and sensors to detect alcohol in the breath and the seat belt sensor which will ensure driver safety.

II. EXISTING SYSTEM

An existing system is the use of Vehnode which is a WSN platform for automobile control.The use of WSN enable environmental monitoring in real time. The working of this Vehnode is that it is first mounted to the vehicle and able to receive the level of pollutants present by the amount of smoke released by the vehicle. The hardware is based on the micro-controller board 89c51 , GPRS model , gas sensors and GPS module to collect data in real time. The software architecture consists of the micro-controllers at the bottom layer to retrieve sensor observations of the gas sensors and also the location and time along with GPS information for processing. Processed data is sent to GPRS module which transmits data mostly through the use of SMS to the server application. The server application consists of Data acquisition acts as a gateway for data at sensor node to server application, specialized alert system which sends alerts to desired user and a database. Observations are accessed using SOAP interface and it is responsible for providing data gathered by VehNode to various web applications.

Another system is the use of mobile GPRS sensors for air pollution monitoring. It consists of a Mobile DAQ unit (data acquisition) and a fixed Internet enabled pollution monitoring server. The mobile DAQ gathers air pollutant levels and packs them in a frame with the GPS location , date and time. This frame is then uploaded to a GPRS modem and transmitted to the pollution server via public mobile networks. A database is there to store data from various clients like environment protection agencies, vehicle registration authorities and tourist and insurance companies. This system is interfaced to Google maps to display real time levels and locations. This system is tested in UAE and was successful. Also this system can report real time pollutant levels and locations of a continuous 24 hour basis.

Another method used in this field was the use of micro-sensor nodes for air pollution monitoring. Previous

research in this field has attempted to create a networked air quality monitoring system and examples of such systems are SensorScop and CitySense which are large scale wireless environment monitoring systems. These models rely on stationary node deployment and an always available power supply. The heating semiconductor sensor will evaluate the target gas concentration by measuring the electrical conductivity of the sensing layer which is composed of a metal oxide material. When the gases touch the sensors surface they are absorbed and the conductivity changes. This is how the gases are measured. The implementation of mounting several gas sensors onto a single sensor board has advantages in terms of cost and installation time.

Another paper that was compared was that of the detection of air pollutants using Zigbee. This system integrates wireless wireless sensor board and CO2 sensors. Zigbee with WiFi and Bluetooth give wireless solution based on Zigbee technology.Zigbee uses the UART communication protocol which stands for Universal Asynchronous Receiver\Transmitter which supports serial communication which is required for wireless communication. The pollution sensors are connected to Zigbee via RS-232 communication standard and the information sent from the Zigbee end devices are collected to the Zigbee coordinator module and that data is saved on to the central server.

III. PROPOSED SYSTEM

By employing WSN on vehicles a system can be created where the efficiency and accuracy of the pollution levels will be having a live feed of the level from the vehicle emissions to monitor the levels of pollutants along with a feature that will be able to receive notifications via a cell phone device when the levels cross the threshold value.
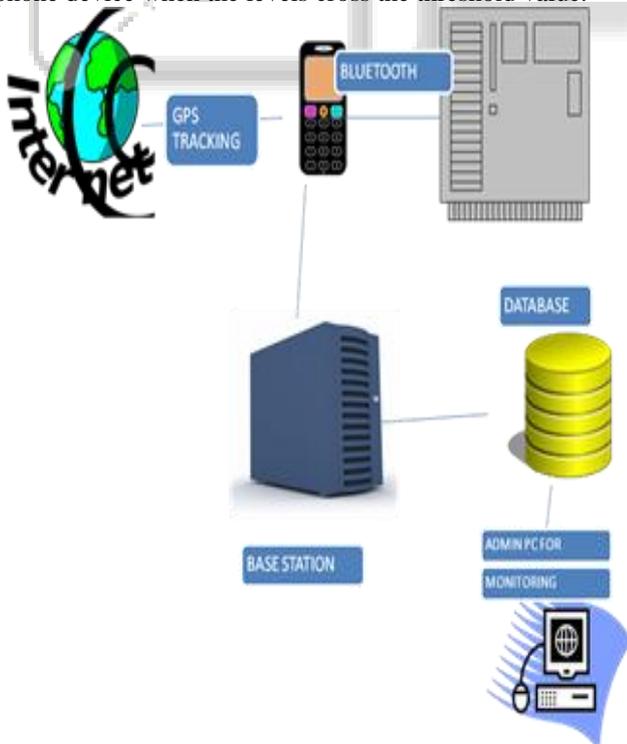

Fig. 1: Proposed Model

The working of this device in real time will work as follows. The hardware consisting of the sensors that we will be using is configured and connected to the vehicle. The mobile device is usually always with the user so when the user is in the vehicle the cellular device is connected to the hardware through the Bluetooth medium. The cellphone is also connected to the internet for GPS tracking. The phone is connected through WiFi to the base station.The base station is connected to the database. Behind the database is the administrator PC where the admin will be controlling and monitoring the data on the system. So in this was the user has access to all of the information that can be received by this system. The use of SOAP protocol is used for communication between various platforms that use objects and has been selected as it is platform independent and users using any platform be it android , be it windows or be it apple will be able to easily communicate with the system. The sensors involved in this system comprise of three types of sensors , the gas sensors to detect and record the pollutant levels of the automobile, a temperature sensor as these gases combust at high temperatures and also a seat belt sensor and an alcohol sensor for added safety.

IV. HARDWARE ARCHITECTURE

To construct a low-cost, portable, monitoring device by combining sensor units, android interface, wifi base station access and a MySQL database using SOAP,. The sensor unit will measure the air quality, the central processing unit for data acquisition and processing, the GPS unit to track the position.

The hardware interfaces we will be using are : Ethernet will be required to access the base station from the cellular device. 89C51 microprocessor : This is a small microprocessor having 40 pins , 5 interrupt pins and 1 serialization pin as this has the optimal requirements.Wifi-Same use as above and a requirement for communications between the android mobile and the server. Bluetooth : All of the hardware sensors will be connected to the interface and to access this interface the cellular device will have to use Bluetooth to interface to this device. Base Station : The base station will be a live feed and have all of the values of the pollutants in real time which can be accessed though wifi and to the cellular device.. Gas Sensor : This will collect the values of the levels of the pollutants of the gases being emitted by the vehicle. Alcohol Sensor(MQ-7): The addition of the alcohol sensor is an added safety precaution which is connected to the ignition. if alcohol is detected on the breath of the driver the car will not start. Seat belt Sensor(MQ-3) : A simple sensor displaying to the user whether the seat belt is put on or not while the engine of the car is active. Temperature Sensor: This is required for the pollutant level reading.

V. SOFTWARE ARCHITECTURE

The software interface that will be used is : Simple Object Access Protocol, is what we will be using as a communication interface between the various components. A Java servlet is a Java program that extends the capabilities of a server, they most commonly implement applications hosted on Web servers. Object serialization- In computer science, in the context of data storage, serialization is the process of translating data structures or object state into a format that can be stored and reconstructed later in the same

or another computer environment. When the resulting series of bits is reread according to the serialization format, it can be used to create a semantically identical clone of the original object. Glassfish Server : This is a web server which will be interfaced to port 8080. The use of android to the system is useful as it is open source and easily available and easy to use.

VI. CONCLUSION

The work being done on the sensors platform for automobiles focuses on easy accessibility of real time data. The using of the SOAP interface enables integration to many platforms like Windows, Android and Apple systems and various other web applications. The use of this system will provide successful results in theory. The main use of this system is to run it on an android base as android is easily available and is an open source software. The more vehicles that have adapted to this system , the better it is for the development of smart cities.

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