A Survey on Intelligent System for Vehicle Emission Monitoring

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Abstract-*The global environment is currently facing a major issue of air pollution. Vehicles have become an integral part of every one's life. The major reason behind this is usage of ignition vehicles. In solution for this the aim of project is to design Arm controller-based pollutinggas detector from the vehicles. The objective of the proposed system for the moving vehicles is to monitor NO2, humidity, Temperature, CO, SO2 level of air contamination by using NO2 sensor, humidity sensor, Temperature sensor, SO2 and CO sensor. In this system monitors the pollution created by the vehicles. If any vehicle crosses its threshold value then it will get reported to the traffic department and agencies of the national environment.*

Keywords--*GSM, Arm controller, RFID, Sensors*

I. INTRODUCTION

The beginning of the 21st century was the time when importance for Environmental awareness was instigated. One of the major concerns regarding the environment is air pollution. Air pollution contributes to the greenhouse gases,which causes the greenhouse effect, whose side effects are now well known to all of us after finding that the hole in the ozone layer. Air pollution is not only harmful to the environment but, also to all other living beings on earth. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system; they are also taken up by the blood and pumped all-around the body. These pollutants are also deposited on soil, plants, and in the water, further contributing to human exposure and also affecting the sea life. Vehicles are one of the major contributors to air pollution apart from industries. The main pollutants from vehicles are the oxides of carbon and nitrogen, which can be easily detected these days with the help of semiconductor gas sensors. Therefore, in this paper an idea is suggested, which would be very helpful in reducing the amount of pollution from vehicles. The rest of the paper is organized as follows.

Section II gives the background information and a brief note about the various research activities, on gas sensors and monitoring systems.Section III discusses about the various blocks of the proposed system. Section IV concludes the paper with an idea to implement the same as a real time project.

II. RELATED WORK

Over the years, there have been several regulations made by the Government to control the emission from vehicles; most of them being unsuccessful at the same. The standards & the timeline for implementation are set by the Central Pollution Control Board under the Ministry of Environment & Forests. Bharat stage emission standards are emission standards instituted by the Government of India to regulate the output of air pollutants from internal combustion engine equipment, including motor vehicles.

On April 29, 1999 the Supreme Court of India ruled that all vehicles in India have to meet Euro I or India 2000 norms by June 1, 1999 and Euro II will be mandatory in the NCR by April 2000. Car makers were not prepared for this transition and in a subsequent judgment the implementation date for Euro II was not enforced.

The standards, based on European regulations were first introduced in 2000. Progressively stringent norms have been rolled out since then. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations. Since October 2010, Bharat stage III norms have been enforced across the country. In 13 major cities, Bharat stage IV emission norms are in place since April 2010. The phasing out of 2 stroke engines for two wheelers, the stoppage of production of various old model cars & The standardized values for the emission levels are introduction of electronic controls have been due to the regulations related to vehicular emissions.

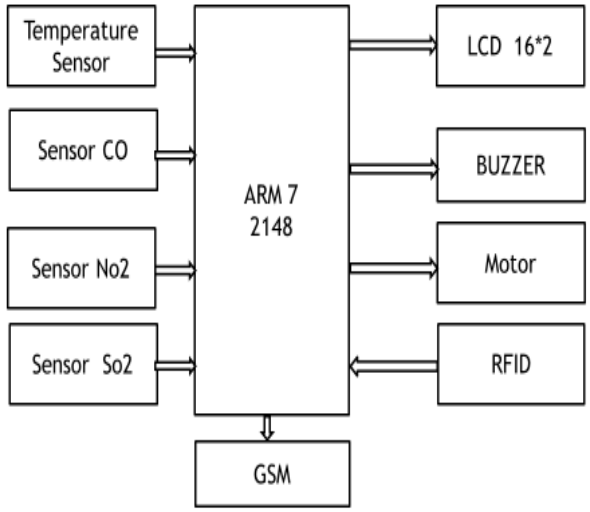
The sensing of the emitted gases is done using various sensors and devices. The past decade, has seen several research activities that have been taking place to develop semiconductor gas sensors.

The quality of air in the car cabin was analyzed using semiconductor (MOS) gas sensors. In this paper, the semiconductor sensors have been used

to detect the pollutant level of the vehicles. This paper concentrates mainly on three blocks; smoke detector, microcontroller and fuel injector. The smoke detector detects the pollutants (CO, NOx, etc.)continuously. The microcontroller compares the level of pollutants with the stipulated level allowed by the government. When the pollutant level exceeds the standardized limit, it sends a signal to the fuel injector. On receiving a signal from the controller, the fuel injector stops the fuel supply to the engine after a particular period of time.

Author introduced a system MANET(Mobile ad hoc network) routing algorithm is used which has nearly 28 mobile nodes provide a coverage area of 300 meters around the city[1].When a vehicle attains certain threshold pollution level then the engine gets automatically switched off[2].As this system is designed with low cost and low power, yielding high accuracy, this can be extended to home, transport and industrial applications [3].It detects the level of pollutants and also indicates this level with a meter [4].It is a portable low power, low cost wireless optical counter [5].This system monitor the pollution and noise created by vehicle & if it crosses threshold value then it will get reported to the traffic department [6].System will facilitate monitor the sensors values in order to send alerts for the air pollution caused by the vehicles [7].This system monitors the emission quality of the vehicles when they are waiting in the signals and that saves the time and money to the user [8].A data management system for managing a high capacity of sensor data measured data and shared data [9].Conventional air automatic monitoring has high precision [10].

III. BLOCK DIAGRAM



A) ARM CONTROLLER

Controller used here is ARM7-LPC2148 arm controller. It has a 128-bit wide memory interface and unique accelerator architecture enable.32-bit code execution at the maximum clock rate. The 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 is ideal for applications where miniaturization is a key requirement, such as access control. Serial communication interfaces ranging from a USB 2.0 full-speed device, multiple UART, SPI, SSP to I2C-bus and on-chip SRAM of 8 KB up to 40 KB are also available. It is very well suited for communication gateways and protocol converters, large buffer size. Several 32-bit timers, single or dual 10-bit analog-to digital converter (s), 10-bit digital-to-analog converter, Pulse-width modulation channels and 45 fast General-purpose input/output lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

B) SENSORS

a. Temperature Sensor

Temperature sensor is used to measuring the temperature level and its units are degree Celsius. These will either analog or digital values. The operating range of normal travelling vehicles is 75-90 degree Celsius.

b. Carbon Monoxide Sensor

CO is a pale, smells, colorless, non-irritating gas produced to the high concentration of CO levels in the travelling vehicles of 0-50 per unit on moderate level. It is highly smoke, dust and human activities to burn the fuel and which is produced to the CO gas pollutant. It causes many respiratory problems.

c. Nitrogen Di Oxide Sensor

It is a high temperature device which is used to measure the NO2 level in the environment. By oxidizing the NO2 of 60% level, it increases the fraction of NO2 in order to diesel oxidization catalyst.

C) GSM

There are many GSM modems available in the market and most of them are onto TTL logic but some of them use RS232 standards and again it becomes a problem to communicate with GSM modem by using Micro controller, Arduino or any other TTL platform. MAX232 is used to solve this problem.

D) LCD DISPLAY

LCD interfacing with 8051 is a real-world application. In recent years the LCD is finding widespread use replacing LED's (seven segment LED's or other multi segment LED's). The declining prices of LCD's. The ability to display numbers, characters and graphics. This is in contrast to LED's, which are limited to numbers and a few characters. An intelligent LCD displays two lines, 20 characters per line, which is interfaced to the ARM7board.Incorporation of a refreshing controller into the LCD, thereby relieving the CPU to keep displaying the data. Ease of programming for characters and graphics.

E) RFID

Passive and active these are two categories of RFID tags. Passive tags have no battery life and Active tags have battery life through the RFID implementation of mobile technologies and automatic recognition, technologies become easier for smart card. With the help of wireless networks, RFID makes the conventional retail process fast, transparent and efficiency.

IV. PROPOSED FRAMEWORK

The microcontroller is programmed to do mainly three functions namely: Comparison, timer and triggering. It takes two inputs one from the smoke sensor and the other being the pre-defined threshold value specified by the government. When the smoke sensor output is more than the threshold value, the microcontroller triggers the timer circuit and an alarm is set on to inform the driver of the pollution in the vehicle and that it will come to the halt state. Semiconductor sensor MQ-2 is used to detect the smoke whose range is 300ppm to 10000ppm. CO Sensor having low conductivity in a clean environment is connected to an ARM processor.

When this sensor is exposed to the pollutants its conductivity increases generating a signal in the circuit which disables the motor. An automatic SMS is also generated by a gsm module which is connected in the circuit. The vehicle location can be traced by GPS module and the location is sent to the pre-defined number stored in the memory.

Pollutants	Permissible Limit
Nitrogen dioxide	60-80g/m3
Carbon monoxide	2-4mg/m3
Sulphur dioxide	60-80g/m3

GPS is used to trace the position.GPS receiver gets the information of the location from satellites. In our project we used Model Pro Gin SR87 which tracks 27 Satellites.

Global System for Mobile (GSM) technology is used to establish cellular connection (SIM900). It is used for transmitting mobile voice and data services. Sends message to the predefined mobile number.

UID of cars: Each car should be registered with means of a vehicle registration number fed into the system during vehicle registration at the RTO office.

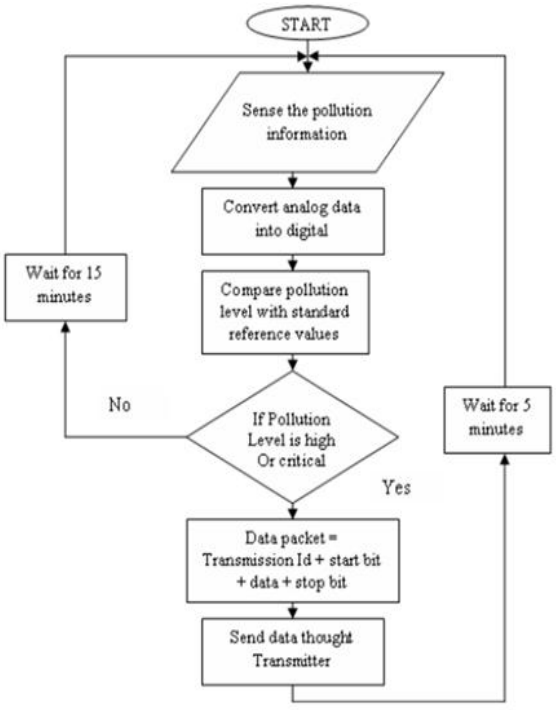
For existing cars, the system should be installed in the car with the details fed manually by an authorized person.

This will ensure that each car has an UID with future scope evolving on the fields of Smart Card DL, RFID tags.

Since each car will be a potential Wi-Fi Hub and with latest proposal of government to install Wi-Fi hotspots over the cities, the car can be easily tracked by concerned authorities...

Toll Management: The project "Automated Toll system" mainly deals with automated toll collection using RFID. Our main aim is to run the toll system using solar energy & load sensor. In turn we are saving the power needed for running the toll gate. Each and every customer will be having RFID card and whenever he/she approaches toll system they just have to scratch their card and the corresponding amount will be deducted. So we are conserving the energy as well as we are making the process of toll collection simpler.

V. FLOWCHART



CONCLUSION

The whole paper mainly focuses on two things. The first thing is the concept of detecting the level of pollution and indicating to the driver. There is an increase in the level of pollution over the last couple of decades, leading to several environmental problems. The second reason is that this paper when arguments as a real time project will benefit the society and help in reducing the air pollution.
By introducing different sensors and making it more automation process and by intimating the RTO vehicles condition periodically.

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