Measurement and Analysis of Air Pollution

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ABSTRACT: *In this paper I have developed prototype module using semiconductor sensors at the emission release of vehicles which detects the level of pollutants and also indicates this level with a meter. When the pollution emission level shoot the breeze which is already set to threshold level, there will be a buzz in the vehicle to indicate that the limit has been violated and the vehicle will stop after.*

Keywords: Air Pollution Sensors, Threshold Level, GPS, GSM, Solenoid valve, Atmega328.

I.   INTROCUTION

In new era of the 21st century there is a time where the importance for Environmental awareness is incite. One of the main reasons regarding the environment is air pollution which is insidious to all living beings on earth as well as environment . Air pollution imparts to the green houses gases, which causes the green house effect, whose side effects are now well known to all of us after the findings about the hole in the ozone layer. Air pollutants that have serious impact on human health affecting the respiratory system and lungs, they are also carried to the blood and pumped all around the body. These pollutants are also stuck on soil, plants, and in the water, further contributing to human vulnerability and also affecting the sea life. Apart from industries vehicles are the major contributors to air pollution. Carbon dioxides and nitrogen are the main pollutants from vehicles which can be easily detected these days with the help of semi conductor gas sensors. Therefore this paper gives an idea to reduce the air pollution from vehicles which would be very helpful to us.literature survey gives the background information and a brief note about the various research activities, on gas sensors and monitoring systems that can be run at various places and in vehicles. Section II 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.

LITERATURE SURVEY:

The first emission norms were introduced in India in 1991 for petrol and 1992 for diesel vehicles. These were followed by making the Catalytic converter mandatory for petrol vehicles and the introduction of unleaded petrol in the market. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations with upgrade of embedded modules . In India since October 2010, Bharat stage III norms have been enforced for all kinds of automobile sector . In 13 major cities, Bharat stage IV emission norms are in place since April 2010. The phasing out of 2 stroke engine for two wheelers, the stoppage of production of various old model cars & introduction of advanced electronic systems with automatic control strategies have been due to the regulations related to vehicular emissions. The standards, based on European regulations were first introduced in 2000.

Progressively stringent norms have been rolled out since then. The standardized values for the emission levels are referred as given in [1]. 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 [2].

II. PROPOSED SYSTEM :

Focusing on the main parameters like CO, CO2 and NO2 A system with advanced electronic controller At mega328 along with GSM,GPS System, solenoid valve and semiconductor sensors is built. In the paper [3], 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.
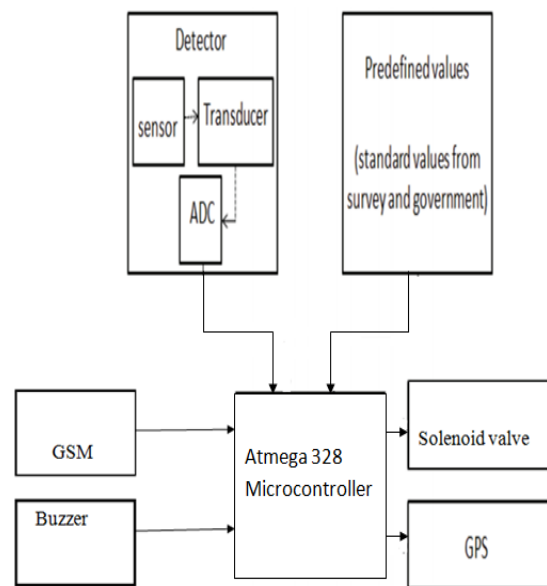

Figure.1.Block diagram proposed system

1.Microcontroller ATMEGA 328

In this paper, At mega 328 is used, which is an 8bit micro controller. It consists of three inbuilt timer/counter which will be used for the timer configuration. The microcontroller is programmed to do three functions namely comparison, timer and triggering circuit. The microcontroller takes in two inputs; one from the smoke sensor's output and another 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 off to inform the driver of the vehicle, about the same and also indicate that the vehicle will come to a halt as soon as the timer runs out.
 Apart from the timer being triggered, a trigger is also given to the GPS, which helps in locating the nearest service station. Once the timer runs out, a trigger pulse is generated by the microcontroller which is fed to the fuel injector, which in turn stops the flow of fuel to the engine, as a result of which, the vehicle comes to a halt.

 2. Alpha-numeric LCD display

A liquid crystal display (LCD) is a flat panel display, electronic visual display, based on Liquid Crystal Technology. A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information. Liquid crystals do not emit light directly instead they use light modulating techniques.

3. Global Position System for Mobiles (GSM)

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. It is estimated that many countries outside of Europe will join the GSM partnership.

4. Global positioning system (GPS)

GPS-634R is a highly integrated smart GPS module with a ceramic GPS patch antenna. The module is with 51 channel acquisition engine and 14 channel track engine, which is capable of receiving signals from up to 65 GPS satellites and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. Small size and high end GPS functionality are at lower power consumption, both of the LVTTL-level and RS232 signal interface are provided on the interface connection.

5. Smoke sensor

The detector consists of blocks namely smoke sensor, transducer . The smoke sensor is the main component of the detector which is embedded on to the exhaust of the vehicle. In this paper, carbon monoxide sensor (MQ-7) which can measure CO concentrations ranging from 10 to 10,000 ppm is considered. This sensor, basically finds usage in sensing carbon monoxide concentrations in (ppm), in the exhaust of cars as shown in figure. 5 and gives an analog output. The MQ -7 gas sensor is mainly made up of SnO_2, whose conductivity varies with the cleanliness of air i.e. it has a lower conductivity in clean air and vice versa.
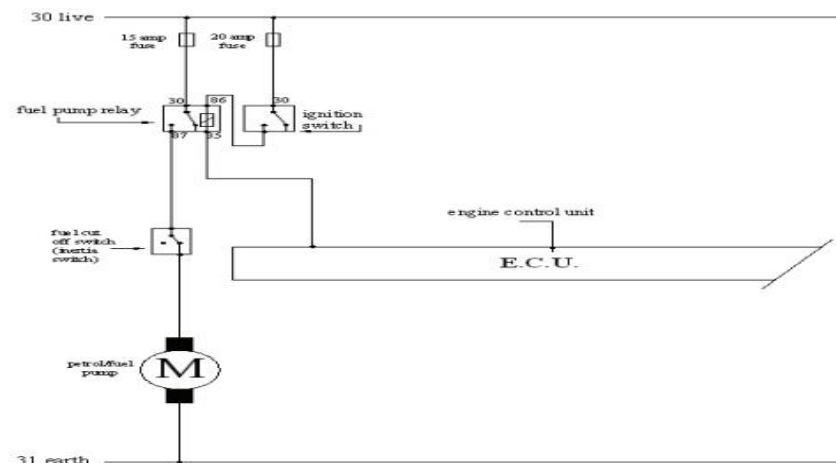

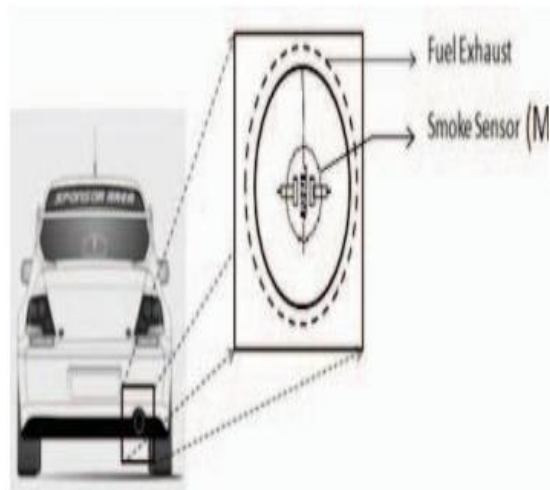Figure 2: Fuel pump wiring circuit

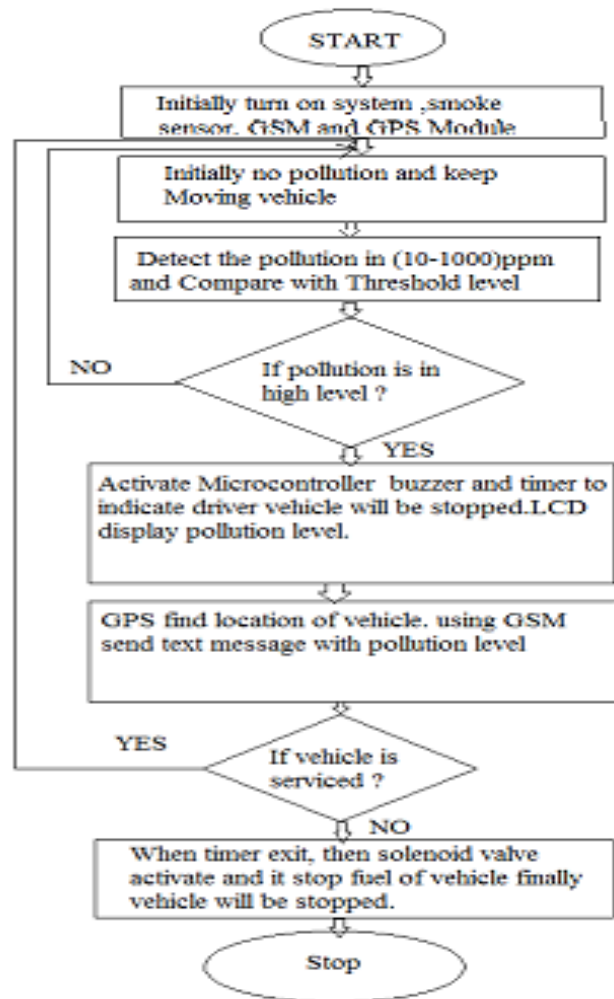Figure 3: Smoke sensor

Measurement and Control: Flowchart

Figure 4: Flowchart of working sequence
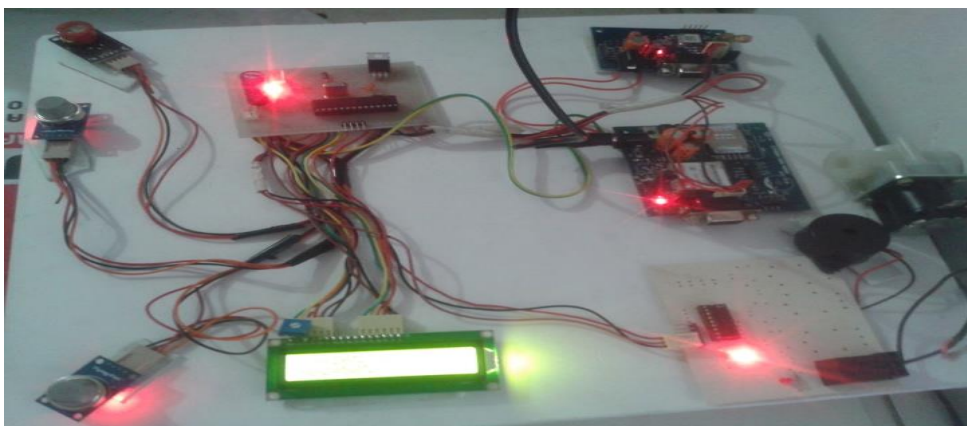
Hardware of corresponding proposed system:

Figure 5. Hardware of proposed system

IV. RESULT AND ANALYSIS:

In this paper I have detected air pollution at Aurangabad city in Maharashtra from India and Corresponding readings for different locations in Aurangabad city has been collected with this project and Readings are shown as below in table (a) with suitable multicolored plot with figure (b) and Result of GSM Messages which show latitude and longitude location as well as Air pollution Co, Co2 and No2 in (c) and LCD images in figure (D).

| Sr.no.	CO (PPM)	CO2 (PPM)	NO2 (PPM)	CORDINATES LOCATION (PPM)	PLACE Aurangabad
1	384	47	67	19.869169 75.331657	Railway station
2	25	46	157	19.861160 75.310203	Kanchan wadi Corner
3	355	37	56	19.854396 75.302116	Waluj MIDC
4	496	42	44	19.837240 75.253410	Baba Petrol pump
5	20	279	45	19.874151 75.315330	Sant Ekanath Rang mandir
6	18	28	178	19.869129 75.331680	Kranti chowk
7	15	83	155	19.885116 75.358207	Central naka
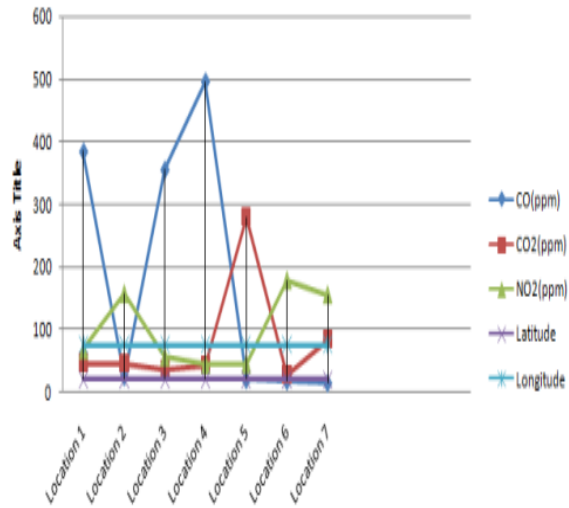
Figure 6.(A): Readings are shown in table   Figure 6.(B): Result of multicolored plot
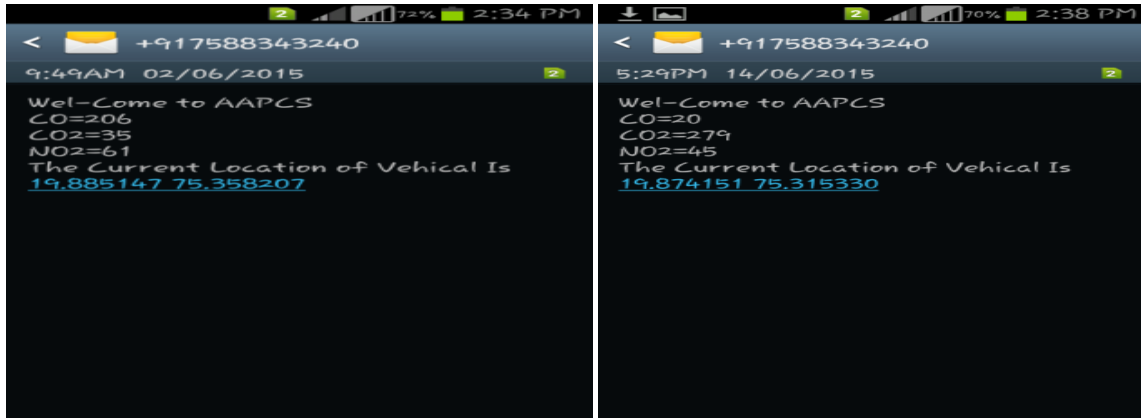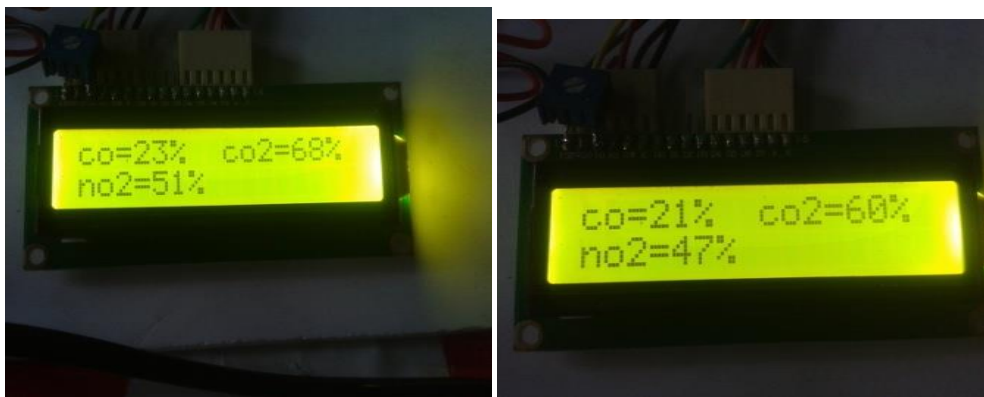

Figure 6. (C): Result of GSM Message

Figure 6. (D): Result of LCD images

V. CONCLUSION:

In this paper here main focus is given on two basic conceptual things. The detection of pollution level and its indication to driver being the first. The remote user notification via GPS and GSM.Technology with latest modules this system can be integrated on mass scale to fulfill the dream of the concept 'smart city'. Along with the time much more advance controller and its subsidiary interfacing devices can be upgraded this technology can also be embedded with internet as a part of 'Internet of kings ' concept and using this system Minimize the air pollution .

VI.ACKNOWLEDGMENTS:

VII. REFERENCES:

[1] Siva Shankar Chandrasekharan, Sudharshan Muthukumar & Sabeshkumar Rajendran " Automated Control System for Air Pollution Detection in Vehicles" 2013 4thinternational Conference on Intelligent Systems, Modeling and Simulation, 2013 IEEE 2166-0662/13.
[2] George F. Fine, Leon M. Cavanagh, Ayo Afonja and Russell Binions " Metal Oxide Semi-ConductorGas Sensors in Environmental Monitoring", Sensors 2010, 10, 5469-5502; doi:10.3390/s100605469
[3] K. Galatsis, W. Wlodarsla, K. Kalantar -Zadeh and A. Trinchi,   "Investigation of gas sensors for vehicle cabin air quality monitoring," vol. 42, pp. 167-175, 2002.
[4] "Trade of Motor Mechanic"; Module 5; Unit 2 Electronic Fuel injection; Phase 2 by FÁS Learning Innovation Unit with Martin mcmahon & CDX Global; Curriculum Revision 2.2 16 -01-07.
[5] LIU Zhen-ya, WANG Zhen-dong, CHEN Rong, "Intelligent Residential Security Alarm and Remote Control System Based On Single
[6] chipcomputer,"vol.42,pp. 143-166,2008. Digiinternational inc,"xbee/xbee-proper modules", available .
http://ftp1.Digi.com/support/documentation/90000982_b.pdf
[7] Atmegacorporation,"atmega328datasheet", available
Http://www.atmel.com/dyn/resources/prod_documents/doc2466pdf
[8] http://wikipedia.org/wiki/Bharat_Stage_emission_standards