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Automated Air Pollution Detection in Vehicles

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Abstract: The beginning of 21st century was the time when importance for environment awareness was instigated. One of the major concerns regarding the environment is air pollution. Air pollution contributes to the green house gases which cause green house effect, whose side effects are now well known to all of us after the findings about hole in ozone layer. These pollutants are also deposited on soil, plants, and in the water, further contributing to human exposure and also affecting the sea life. In the view of above several regulations made by the Government to control the emissions from vehicles, most of them are being unsuccessful. This paper aims at using those sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter.
Keywords: *Vehicle, air pollution, microcontroller, GSM*

I. INTRODUCTION

An Embedded System is a combination of computer software and hardware, A system is a way of working, organizing or or doing one or many tasks according to fixed plan. Program or set of rules. And it can perhaps other parts or additional mechanical, & designed to perform a specific function. A good example is of an embedded system is the microwave oven. Almost every household has one, and tens of millions of them are used every day.

This is in direct contrast to the personal computer in the family room. It is to comprised of computer software and hardware and mechanical components the example of this components are disk drivers. However, a personal computer is not designed to perform a specific function rather; it is able to do many different things. Many people use the term general-purpose computer to make this distinction clear. As shipped, a general-purpose computer is a blank slate; the manufacturer does not know what the customer will do wish it. One customer may use it for a network file server another may use it exclusively for playing games.

Frequently, an embedded system is a component within some larger system. For example, modern cars and trucks contain many embedded systems. One embedded system controls the anti-lock brakes, other monitors and controls the vehicle's emissions, and a third displays information on the dashboard. In some cases, these embedded systems are connected by some sort of a communication network, but that is certainly not a requirement.

If an embedded system is designed well, the existence of the processor and software could be completely unnoticed by the user of the device. Such is the case for a microwave oven, VCR, or alarm clock. In some cases, it would even be possible to build an equivalent device that does not contain the processor and software. This could be done by replacing the combination with a custom integrated circuit that performs the same functions in hardware. However, a lot of flexibility is lost when a design is hard-cooled in this way. It is much easier, and ceaper, to change a few lines of software than to redesign a piece of custom hardware.

Now a day‘s population has been increased rapidly. Along with the population pollution also increases. In earlier cases a common man vehicle is by cycle. But now a day the cycle was replaced with motor cars and bikes. If the vehicles are not maintained in proper manner pollution get increases.

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It might be because of people negligence or government negligence or entire system negligence. In order to avoid this problem it could be great integrated with automated control system for Air pollution And Disaster detection in vehicles. Here the pollution is not avoided completely. But it can be controlled. Air pollution contributes to the green house gases, which causes the green house effect. When the pollution emission level shoots beyond the already set threshold level, there will be a buzz in the vehicle to indicate that the limit has been reached and the vehicle will stop after a certain period of time, a caution time given for the driver to park his/her vehicle. After the timer runs out, the fuel supplied to the engine will be cut off and the vehicle has to be moved to the mechanic or to the nearest service station. The synchronization and execution of process is monitored and controlled by a microcontroller.

The main aim of it uses semi conductor sensors at emission outlets of vehicles. It also detects the level of pollutants and indicates that with a level of meter. It uses a threshold level. When the pollution level shootsbeyond the threshold level the motor speed will be reduced after certain period of time. This will detect the level of pollution and indicating it to driver. After the timer runs out. The fuel supplied to engine will be cut off and vehicle will be stopped.

The Existing system consisting of Which is used to detect the pollution level and give signal to the fuel injector through Microcontroller which will cut the fuel to the engine. The proposed system consisting of the microcontroller is placed with the LPC2148 processor to improve the efficiency. An additional device is going to added for accident information purpose i.e. an alert message is send to the relation phone using GSM.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics. A sensor is a device which receives and responds to a signal when touched. A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes. Vehicle accidents are most common if the driving is inadequate.

These happen on most factors if the driver is drowsy or if he is alcoholic. Driver drowsiness is recognized as an important factor in the vehicle accidents. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20% of all vehicle accidents. But the life lost once cannot be re-winded. Advanced technology offers some hope avoid these up to some extent.

MEMS easily grab the information from vehicle, if any change occurs above threshold voltage immediately it sends signal to LPC2148 processor.

II. LITERATURE SURVEY

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 and 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. 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. 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

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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.
In last few decade government made a rules and regulation for the vehicles. Central pollution control board set the emission standard under the ministry of Environment and this are first introduced in India in 1991 and 1992 for petrol and diesel respectively.
Many of the people research on the air pollution detection in vehicles. In the 2002 author chosen gas sensors and compared them.
In 2006 author told about the cabin safety. He used various sensors for the toxic gases like CO, HC, and VOC in the car cabin [2].
In 2010 Author said that the metal oxide semiconductor gas sensor are utilised in variety of different roles in industries. Metal oxide semiconductor gas sensors are inexpensive, robust, lightweight and long lasting than other sensors technologies and benefit from high material sensitivity and quick response times [3].
In 2012 Author described an embedded system for vehicle cabin toxic Gas detection and Alerting. A system is developed using GSM and GPS for detecting toxic gases [4].
In 2013 automated control system for air pollution detection is developed for vehicles. A relay circuit is used for the control of ON and OFF position of the fuel pump [5].
Automated air pollution detection system is developed in 2014 for vehicles. In this technique various sensors are used for hazardous gas detection.GSM and GPS system are used for sending and receiving data and locating nearest work station[6].
In 2014 an Author described about various vehicle sensors like sensor for safety, distance sensor, Night vision sensors,Speed sensor etc.[7].

III. COMPONENTS USED FOR IMPLEMENTATION OF SYSTEM

A. Arduino Uno

Fig 1: Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (which 6 can be used as PWM outputs),6 analog pins,16MHz ceramic resonator. USB connections, power jack, ICSP plug, and a reset button. It contains everything needed to support the microcontroller, simply use the USB cable or power it with a AC-to-DC adapter or battery is connected to a computer begins.

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B. Liquid Crystal Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

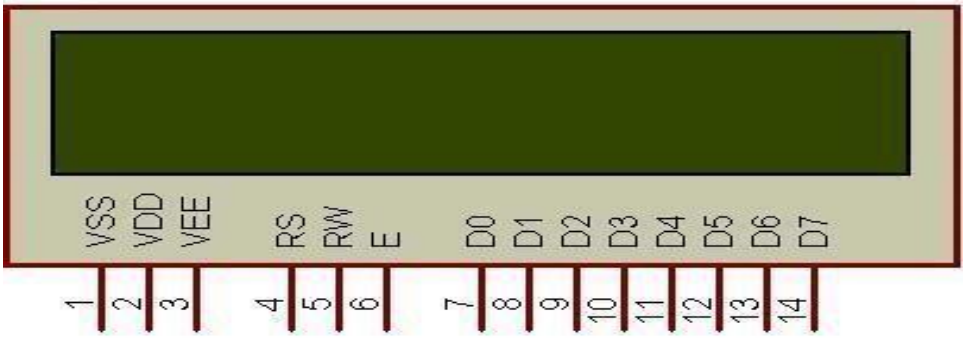

Fig 2: LCD C.GSM Modem

The words, —Mobile Station‖ (MS) or —Mobile Equipment‖ (ME) are used for mobile terminals Supporting GSM services. A call from a GSM mobile station to the PSTN is called a —mobile originated call‖ (MOC) or —Outgoing call‖, and a call from a fixed network to a GSM mobile station is called a —mobile Terminated call‖ (MTC) or —incoming Call‖.

Fig 3: Representation of GSM modem

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service). GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries. By having harmonized spectrum across most of the globe, GSM‘s international roaming capability allows users to access the same services when travelling abroad as at home. This gives consumers seamless and same number connectivity in more than 218 countries. Terrestrial GSM networks now cover more than 80% of the world‘s population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available.

D. Smoke sensor

Features

1. High sensitivit

y to LPG, natural gas , town gas

2. Small sensitivity to alcohol, smoke.
3. Fast response .

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4. Stable and long life
5. Simple drive circuit Application

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, natural gas , town gas, avoid the noise of alcohol and cooking fumes and cigarette smoke.

E.Relays SPDT

Fig 4: Representation of Relay

A relay is isa operated switch and used to isolate electrical circuit with another circuits. Relays are consisting of coils which are used to open and close switch contacts. There are two circuits are isolated with each other. They are lower circuit voltage and higher circuit voltages. The lower circuit uses to trip relay. The higher circuit which controls a separate circuit. Relays can be found in Industrial control circuits, car audio systems, auto mobiles, water pumps and in high power audio amplifiers.

E. MAX 232 IC

We know that the main function of Max 232 IC is to change the signal of TTL logic level into its corresponding RS-232c level signal & then Rs-232c level signal to its corresponding TTL level signal. This IC is very useful while making a connection between two devices to transfer the data.

For instance, almost all the microcontroller's functions are on the waveform of TTL logic. These microcontrollers include a UART that can be used to transmit & receive serial data because they work over the TTL level thus they send & receive composed TTL waves from data while typical PC functions on the level of RS-232 waveform.

If we want to send the data from the microcontroller to a personal computer then we require changing data to Rs 232 level from TTL. So MAX232 IC is the best solution for converting this data. This IC works up to 120 Kbits per sec and it includes two receivers & two driver channels.

Fig 5:MAX 232 IC

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IV. RESULTS AND DISCUSSION

This system directly tackles the challenges posed by vehicular emissions, providing a scalable solution for cities grappling with air quality issues. Through its seamless integration into existing vehicles and collaborative efforts with regulatory bodies, the existing method contributes to a comprehensive strategy for mitigating air pollution.

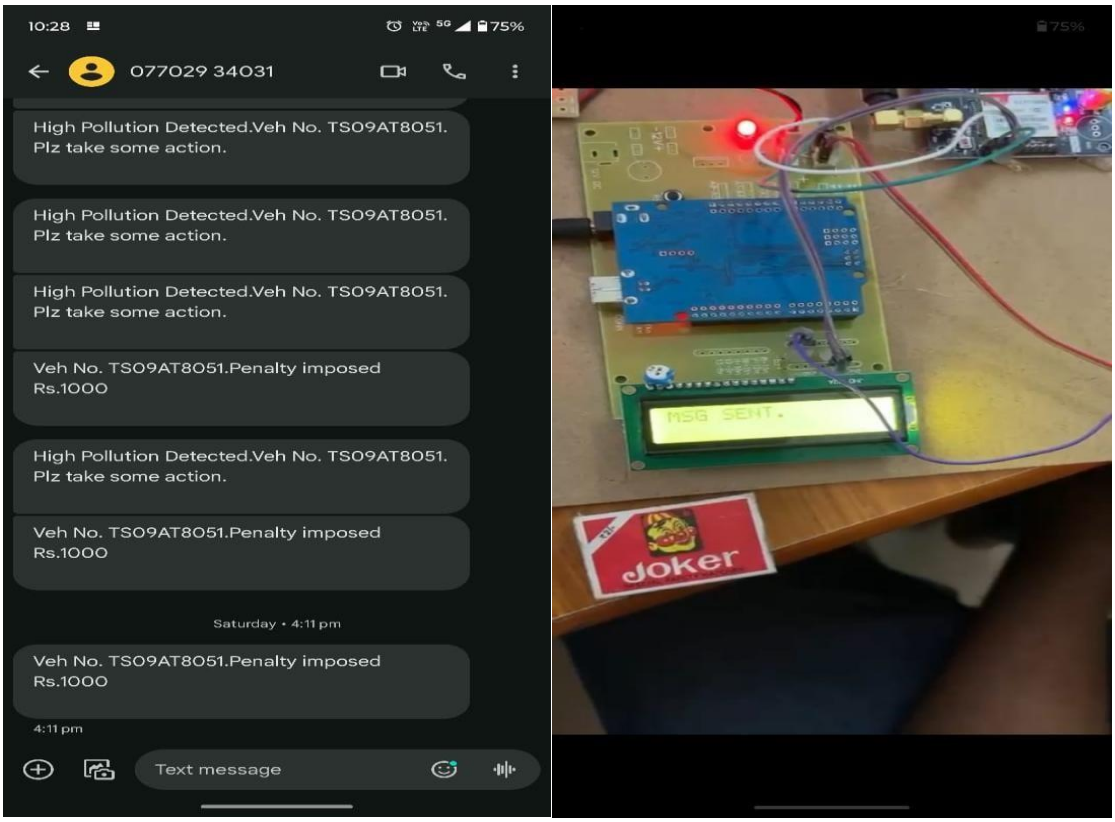

Fig 6: Results

V .CONCLUSION

The Project of —**Automated Air Pollution Detection in Vehicles** has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC‘s and with the help of growing technology the project has been successfully implemented.

Design is done to meet all the specifications and requirements. Software tools like Keil U vision Simulator, Preload to dump the source code into the microcontroller, Or flash magic for the schematic diagram have been used to develop the software code before realizing the hardware. It could be used as a valuable tool for real time traveler information, congestion monitoring, and system evaluation. The system can be used to quickly respond to the unexpected accidents which occur on highways or busy roads in cities.

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