

ENGINE SELF-TEST WITH AIR POLLUTION DETECTION AND REMOTE INFORMATION SYSTEM

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Abstract

Vehicles and Industries are one of the major sources of Environmental Pollution. Detection and Controlling of toxic gasses from the vehicles are significant to reduce Air Pollution. The semiconductor sensor at the emission outlet of a vehicle will sense the level of pollutants and inform this level to the Microcontroller (ARM). When the pollution or emission level shoots beyond the preset threshold level then the message of detection is forwarded to both user and RTO as well as there will be a buzzer in the vehicle that starts buzzing to indicate that the limit has been breached and the information of the detection is forwarded to both the user and the RTO office. Once the information of the detection is forwarded to both the ends (i.e. User and RTO), the vehicle will stop for the certain period of time and as well as the GPS in our detecting system inside the vehicle starts locating the nearby service centers which has been given by the RTO officer via GPS. By the implementation of this project as real time will help to control the air pollution.

Keywords: ARM, Embedded control, Sensor, Android, GSM, GPS.

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1. INTRODUCTION

One of the major concerns regarding the environment is air pollution. Air pollution is addition of any harmful gaseous to the atmosphere, which causes the damaging of the environment, human health on quality of life in urban area that can endanger the health of human beings, plants, animals, or damage materials reduce visibility or release undesirable odors. By this one of the great problems faced in urban areas throughout the world is the increase in vehicles due to imbalance between the public transport and the increase in population, mobility and last mile connectivity. This increase in the number of vehicles has lead to increase in congestion and the increase in pollution by the private vehicles.

Transportation is one of the major activity of economic activity and it is beneficial for the social interactions. While the transportation sector is also a major source of air pollution in Bangalore, estimated to account for nearly all of carbon monoxide (CO), more than 80% of nitrogen oxides (NOx). The growing problems related to traffic are congestion, accidents, pollution and lacks of security are also very worrisome. The key question is how to reduce the adverse environmental impacts and other negative effects of transportation without giving up the benefits of transportation.

2. RELATED WORK

In 2002, the author has chosen the commercially available gas sensors which are compared with the fabricated MOO3-TiO2 and MOO3- WO3 thin films [3]. The laboratory tests showed that the MOO3 based sensors possessed comparable gas

sensing properties. In 2010, Metal oxide semiconductor gas sensors are utilized in a variety of different roles and industries [2]. They are relatively inexpensive compared to other sensing technologies, robust, lightweight, long lasting and benefit from high material sensitivity and quick response times.

In 2010, the author has introduced an online GPRS-Sensors Array for air pollution monitoring has been designed, implemented and tested [6]. The proposed system consists of a Mobile Data-Acquisition Unit (Mobile-DAQ) and a fixed Internet-Enabled Pollution Monitoring Server (Pollution-Server).

In 2012, Mahadevappa Harish has made an attempt to study on urban air pollution in the Bangalore city by the emission of the gases by vehicles which will emit from them [7]. The present day environment crisis demands a change in attitude, which initiatives can be taken to rescue environment from destruction in the city of Bangalore.

In 2013, the author said that the vehicles have become an integral part of every one's life because of the situations and circumstances which demand the usage of vehicles in this fast paced urban life. As a coin has two sides, this has its own effects, one of the main side effects being air pollution. Every vehicle will have emission but the problem occurs when it is beyond the standardized values[9].Air pollution contributes 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 pollution is not

only harmful to the environment but, also to all other living beings on earth. As the technology increase, the degree of automation (minimizing the man power) in the almost all sectors are also increases. Wireless Sensor Networks (WSN) is gaining the ground in all sectors of life; from homes to factories, from traffic control to environmental monitoring [8]. Air pollutants that are inhaled have serious impact on human health affecting the lungs and the respiratory system. They are also taken up by blood and pumped all round the body. Hence pollutants are also deposited on soil, plants and in water further contributing to human exposure and also affecting the sea life.

3. PROPOSED SYSTEM

3.1. Embedded Control to Indicate the Air Pollution

Control and monitoring of the air pollution is by the service of the vehicle which is provided with the help of Microcontroller and the detected information of the beyond standardized pollutant level will be forwarded to the user and RTO via GSM. Then the user of vehicle gets a message of booked vehicle's data and RTO has given a chance to repair the vehicle by locating the nearby service centers. If the user ignored the message then the engine of the vehicle will come into the cut-off condition and the user unable to start the vehicle. Fig-1 shows the functional block of the proposed system using ARM Cortex M3 microcontroller and Chart-1 shows the working of the engine self test with air pollution detection system

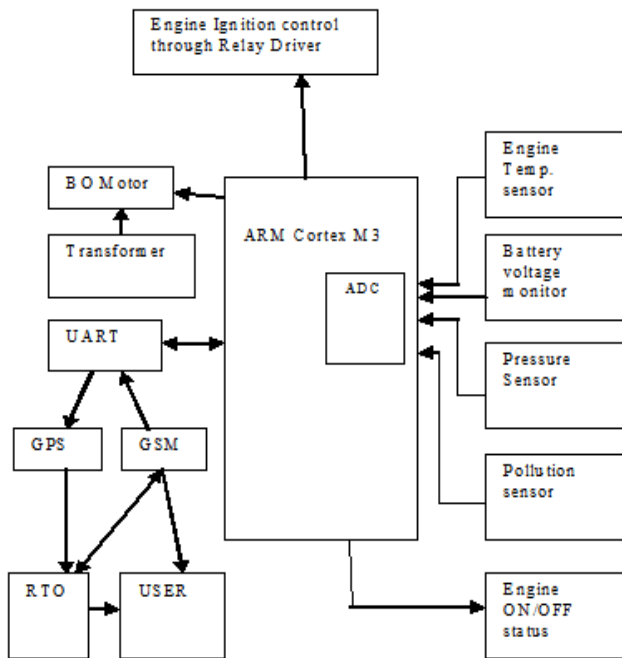


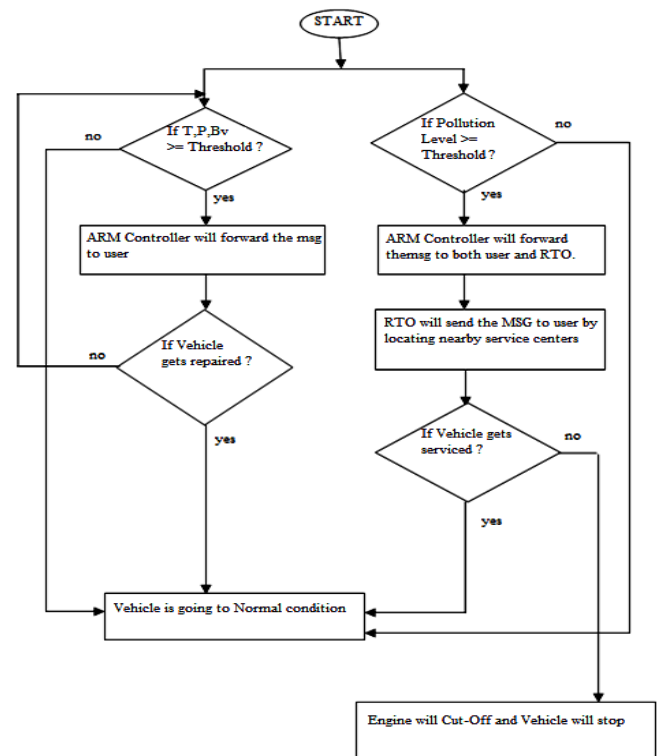
Fig-1: Engine Self-Test with air pollution detection system.

3.2 Android Control

Android is a mobile operating system that is based on a modified version of Linux. Android applications developed using tools such as JDK, Android SDK, and eclipse, Android development Tool. Architecture of Android consist of four layers such as Linux kernel, Libraries, The Web Kit library provides functionalities for web browsing. Applications layer is top layer, here we will find applications that ship with the Android device (such as Phone, Contacts, Browser, etc), as well as applications that we download and install from the Android Market.



Fig. 2: Android Menu of Air pollution operating Control system



T – Temperature, P – Pressure, Bv – Battery Voltage

Chart-1: Flow Chart of Air Pollution Control System

3.3 Features of LPC1343 of ARM Microcontroller

- ❖ Has 8 Channel 10 Bit ADC
- ❖ 32 Kb of on-chip flash programming memory.
- ❖ 8 Kb of SRAM
- ❖ In-System Programming (ISP) and In-Application

Programming (IAP) via on-chip boot loader software.

- ❖ Single UART and Power-On Reset (POR).
- ❖ High-current output driver (20 mA) on one pin.
- ❖ High-current sink drivers (20 mA) on two I2C-bus pins in Fast-mode Plus.
- ❖ Integrated PMU (Power Management Unit) to minimize power consumption during Sleep, Deep-sleep, and Deep power-down modes.
- ❖ GPIO pins can be used as edge and level sensitive interrupt sources [11]

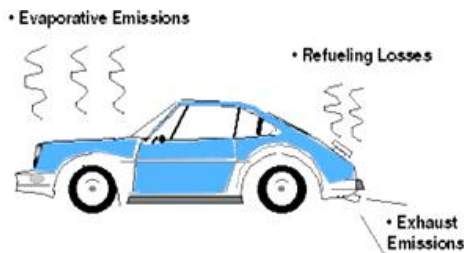


Fig-3: Emissions from a Car.

3.4 GSM

In the proposed project GSM is used for sending and receiving messages between vehicle user and RTO office if the air pollution is exceeded beyond the threshold value.

3.5 GPS

In this project the GPS is used to locate the nearby service centers for the vehicle repair at the time of pollution level exceeds the set threshold level.

3.6 Sensors

In this project we used three sensors like temperature sensor, pressure sensor and MQ7 pollution sensor. All the three sensors sense level of the engine temperature, pressure and pollutants of the vehicle which is forwarded to controller to compare the values with threshold value.

The Temperature sensor (LM35) has an output voltage that is proportional to the Celsius temperature. The scale factor is $.01V/°C$.

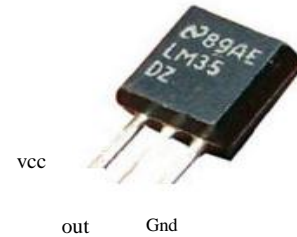


Fig-4: LM35 Temperature sensor

A pressure sensor measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical. There is also a category of pressure sensors that are designed to measure in a dynamic mode for capturing very high speed changes in pressure.

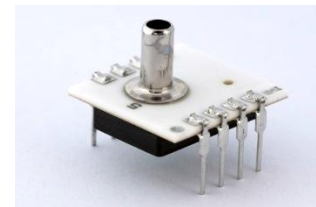


Fig-5: Digital air pressure sensor

For the detection of pollutants we were used MQ-7 Semiconductor Sensor for Carbon Monoxide Sensitive material of MQ-7 gas sensor is SnO_2 , which with lower conductivity in clean air. It make detection by method of cycle high and low temperature, and detect CO when low temperature (heated by 1.5V). The sensor's conductivity is higher along with the gas concentration rising. When high temperature (heated by 5.0V), it cleans the other gases adsorbed under low temperature. MQ-7 gas sensor has high sensitivity to Carbon Monoxide. The sensor could be used to detect different gases contains CO; it is with low cost and suitable for different application.



Fig-6: MQ7 Pollution Sensor.

3.7 Relay Driver

Relays drivers are the electromagnetically operated switches which are used for the controlling of engine ignition system. The electro mechanical relay is a remote controlled switch capable of switching multiple circuits, either individually simultaneously or in sequence.

4. CONCLUSIONS

The Air Pollution is one of the major issues that we are facing today. Pollutions in earlier days were negligible. But nowadays pollution is increasing day by day because of so many reasons like (Industrial growth, Development of Automobile Industries Chemical industries...etc). So in order to reduce the pollutions from such type of sources and to protect the environment from toxic gasses, it is possible with the help of some of the semiconductor sensors such as MQ7, MQ3, MQ2...etc that helps in detection, monitoring, and self-test of vehicles with the help of Microcontrollers.

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