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Department of Electronics & Communication Engineering

Academic Year 2014-15

Annexure I

1. Project Title: Effective air pollution check for automobile

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1. Abstract & Objective

1.1 Abstract

Vehicles have become an integral part of every one's life. Situations and circumstances 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. The primary reason for this breach of emission level being the incomplete combustion of fuel supplied to engine, which is due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avoided but, it definitely can be controlled.

With the evolvement of semi-conductor sensors for detecting the various gases, this project aims at using those semi-conductor sensors at the emission outlets of vehicles which detects the level of pollutants and also indicates this level with a meter. 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 breached and the vehicle will stop after a certain period of time. A cushion time will be given for the driver to have the vehicle checked at the service station. During this time period, the GPS starts locating the nearest service stations. After the timer runs out, the fuel supplied to the engine will be cut-off and the vehicle stops. A message will be sent to the driver as well as to the pollution check office informing the situation using GSM module. Fine will be impounded for the registered vehicle for neglecting the checkup. The synchronization and execution of the entire process is monitored and controlled by a micro controller. This Project, when augmented as a real time project, will benefit the society and help in reducing the air pollution.

1.2 Motivation

Air Pollution is a major threat for many countries in the world. For densely populated countries like China and India, it is even worse. So by using different safety systems like detection of CO & Smoke, GPS and GSM technologies, we can reduce the air pollution from vehicles. Thus, make the world a better place to live.

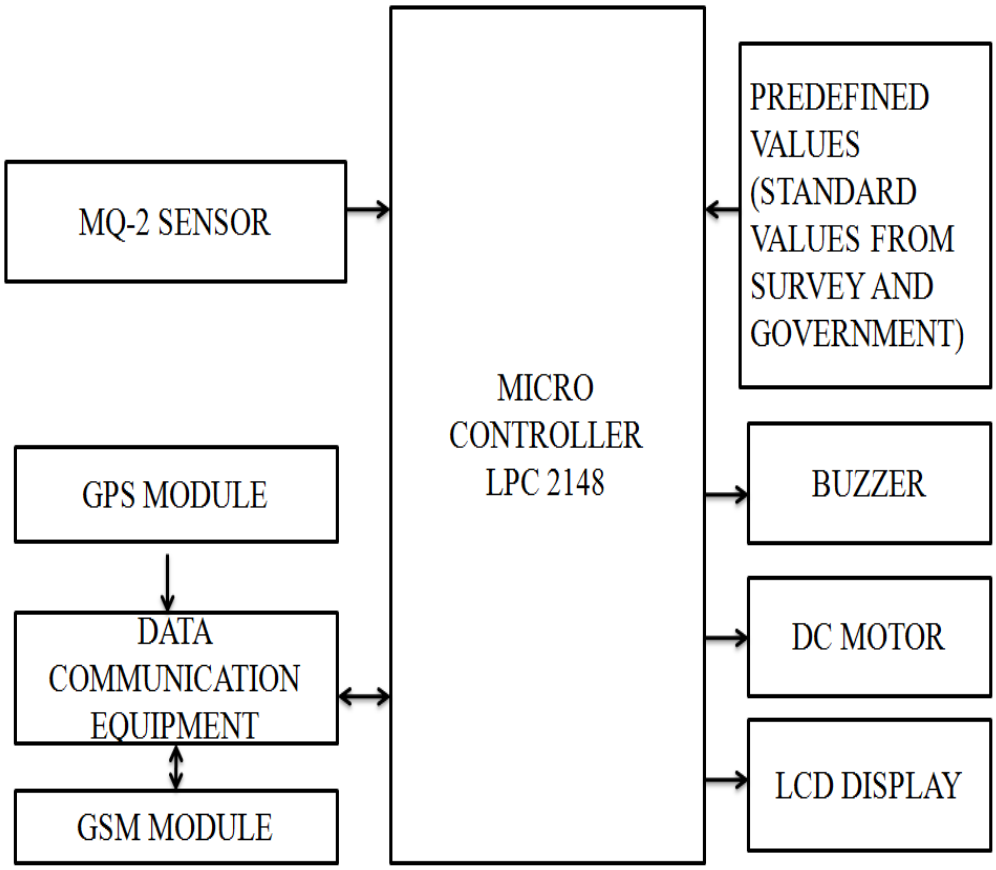
1.3 Objective

The aim of our work is to provide notifications to the driver in vehicles to reduce pollution which constitutes the major part of the pollution all over the world. The main purpose is to reduce pollution in vehicles.

2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:



2.1.3. Working:

First the Mq-2 gas sensor is exposed to smoke emitted from Automobiles which converts the smoke levels to electrical signals, these electrical signals are sent to the Microcontroller. The Microcontroller on receiving those signals it converts them to digital values which are compared with the threshold values if exceeds levels, the buzzer will alert the driver. If driver neglects, system will stop vehicle by stopping fuel to engine at specified intervals of time. If the pollution reaches maximum limit, microcontroller gives a trigger pulse to the GPS module which is programmed such that it gives the location of the vehicle. At the same time GSM module will send a message to pollution control office about details of vehicle. If driver doesn't take any action regarding pollution level within specified time, the flow of fuel to engine will be stopped using fuel injector.

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2.2 Technical Specifications:

2.2.1 Mq-2 Gas Sensor:

MODEL NO			MQ-2
Sensor type			Semi conductor
Standard encapsulation			Bakelite
Detection gas			combustible gas and smoke
Concentration			300-10000 combustible gas
Circuit	Loop voltage	VC	≤ 24V DC
	Heater voltage	VH	5.0±0.2V AC or DC
	Load resistance	RL	Adjustable
Character	Heater resistance	RH	31Ω±3Ω(Room Tem.)
	Heater consumption	PH	≤900 mW
	Sensing resistance	RS	2KΩ-20KΩ(in 2000 ppm C3H3)
	Sensitivity	S	Rs(in air)/Rs(1000 ppm isobutane)≥5
	Slope	α	≤0.6(R5000ppm/R3000ppm CH4)
Condition	Tem. Humidity		20℃±2℃;65%±5% RH
	Standard Test circuit		Vc:5V±0.1V; VH:5V±0.1V;
	Preheat time		Over 48 hours

2.2.2 Buzzer:

Features

• The PS series are high-performance buzzers that employ uni morph piezoelectric elements and are designed for easy incorporation into various circuits.

•They feature extremely low power consumption in comparison to electromagnetic units.

• Because these buzzers are designed for external excitation, the same part can serve as both a musical tone oscillator and a buzzer.

• They can be used with automated inserters. Moisture-resistant models are also available.

• The lead wire type (PS1550L40N) with both-sided adhesive tape installed easily is prepared.

2.2.3 **Global Positioning System (GPS):**

The GPS Error Budget

The GPS system has been designed to be as nearly accurate as possible. However, there are still errors. Added together, these errors can cause a deviation of **+/- 50 -100** meters from the actual GPS receiver position. There are several sources for these errors, the most significant of which are discussed below:

Atmospheric Conditions

The ionosphere and troposphere both refract the GPS signals. This causes the speed of the GPS signal in the ionosphere and troposphere to be different from the speed of the GPS signal in space. Therefore, the distance calculated from "Signal Speed x Time" will be different for the portion of the GPS signal path that passes through the ionosphere and troposphere and for the portion that passes through space.

Ephemeris Errors/Clock Drift/Measurement Noise

As mentioned earlier, GPS signals contain information about ephemeris (orbital position) errors, and about the rate of clock drift for the broadcasting satellite. The data concerning ephemeris errors may not exactly model the true satellite motion or the exact rate of clock drift. Distortion of the signal by measurement noise can further increase positional error. The disparity in ephemeris data can introduce 1-5 meters of positional error, clock drift disparity can introduce 0-1.5 meters of positional error and measurement noise can introduce 0-10 meters of positional error.

Selective Availability

Ephemeris errors should not be confused with Selective Availability (SA), which is the intentional alteration of the time and epherimis signal by the Department of Defense. SA can introduce 0-70 meters of positional error. Fortunately, positional errors caused by SA can be removed by differential correction.

Multipath

A GPS signal bouncing off a reflective surface prior to reaching the GPS receiver antenna is referred to as multipath. Because it is difficult to completely correct multipath error, even in high precision GPS units, multipath error is a serious concern to the GPS user.

2.2.4 Global System for Mobile communications (GSM)

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and time division multiple access transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots. 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 3GSM in Australia, Canada and many South American countries. GSM supports data transfer speeds 9.6 kbit/s, allowing the transmission of basic data services such as SMS (Short Message Service). GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available. The transmission power in the handset is limited to a maximum of 2 watts in GSM850/900 and 1 watt in GSM1800/1900.

2.2.5 Liquid Crystal Display (LCD):

Most of the LCD modules conform to a standard interface specification. A 14pin access is provided having eight data lines, three control lines and three power lines. The connections are laid out in one of the two common configurations, either two rows of seven pins, or a single row of 14 pins. The 16 *2 LCD Pin diagram is shown in below Figure bellow

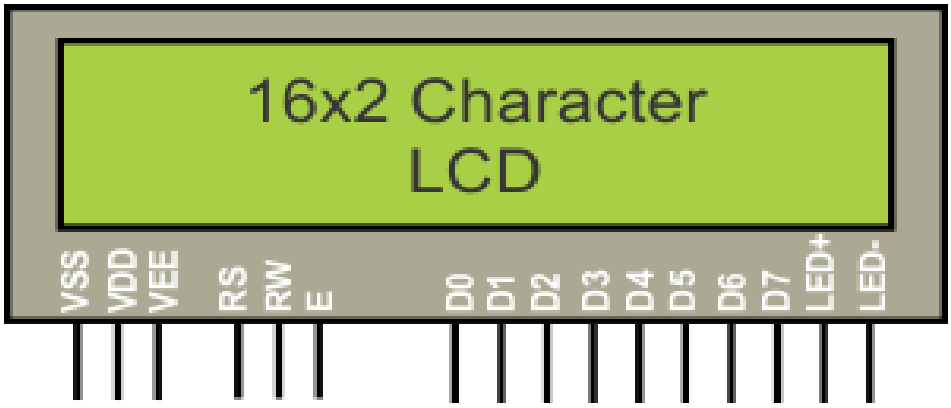

Figure: Pin Diagram of LCD

ARM7 based LPC2148:

ARM7 based LPC2148 is used as the microcontroller to implement this project. It is based on reduced instruction set computer, commonly known as RISC. This result in a high instruction throughput and impressive real time interrupt response from a small and cost effective chip.

General Description

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 Kb to 512 Kb. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 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 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 Kb up to 40 Kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and highprocessing power.

Features

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 Kb to 40 Kb of on-chip static RAM and 32 Kb to 512 Kb of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 Kb of endpoint RAM. In addition, the LPC2146/48 provides 8 Kb of on-chip RAM accessible to USB by DMA.
- One or two (LPC2141/42 vs. LPC2144/46/48) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44□□s per channel.
- Single 10-bit DAC provides variable analog output.
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.
- Multiple serial interfaces including two UARTs (16C550).
- Two Fast I2C-bus (400 Kbit/s), SPI and SSP with buffering and variable data length

capabilities.

- Vectored Interrupt Controller (VIC) with configurable priorities and vector addresses.
- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- Up to 21 external interrupt pins available.
- 60 MHz maximum CPU clock available from programmable on-chip PLL with settling time of 100s.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz
- Power saving modes include idle and Power-down.
- Processor wake-up from Power-down mode via external interrupt or BOD.
- Single power supply chip with POR and BOD circuits:
- CPU operating voltage range of 3.0 V to 3.6 V (3.3 V10 %) with 5 V tolerant I/O pads.

Results & Analysis

3.1 Results & Analysis:

This project mainly consists of LPC2148 Microcontroller, Sensor technology, LCD display, Relay, GPS, GSM. The Figure bellow shows the physical view of Effective Air Pollution Check For Automobiles.

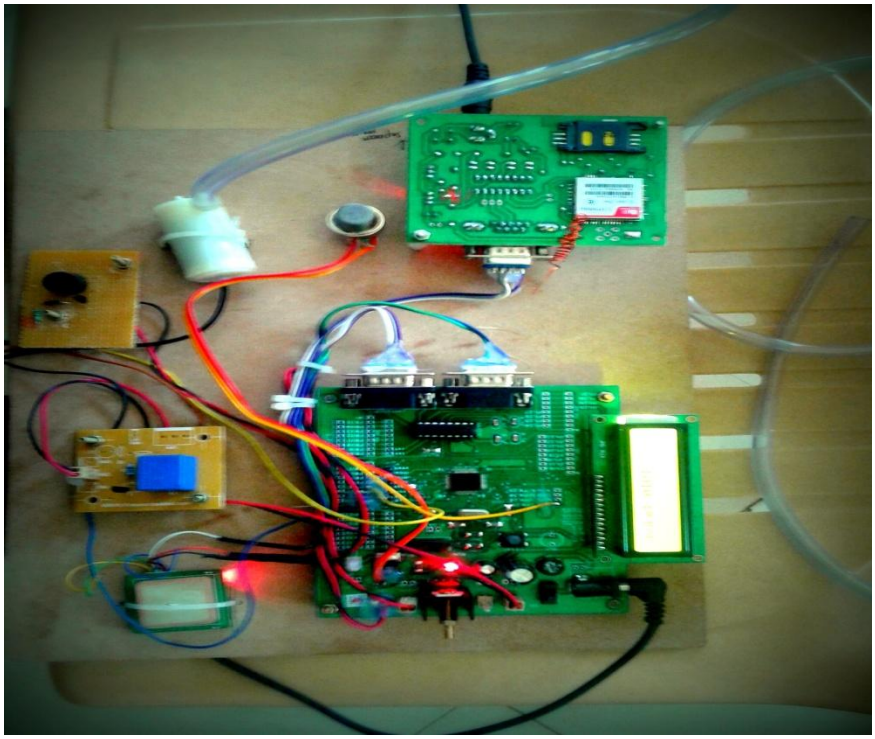

Figure: Project Hardware Kit

- First insert the SIM in the GSM module and switch on the power supply, So that the modem is initialized which will be displayed on the LCD display shown in Figure bellow.

Figure: Modem Initialization

- Now the smoke sensor is exposed to smoke and whenever the smoke exceeds threshold value micro controller activate the buzzer to alert the driver.
- Different smoke values detected by the sensor displayed on the LCD are shown bellow.

Figure: Different smoke values

- The smoke values will be sent to the registered mobile number and also to the control

station and those messages are shown in the Figure bellow.

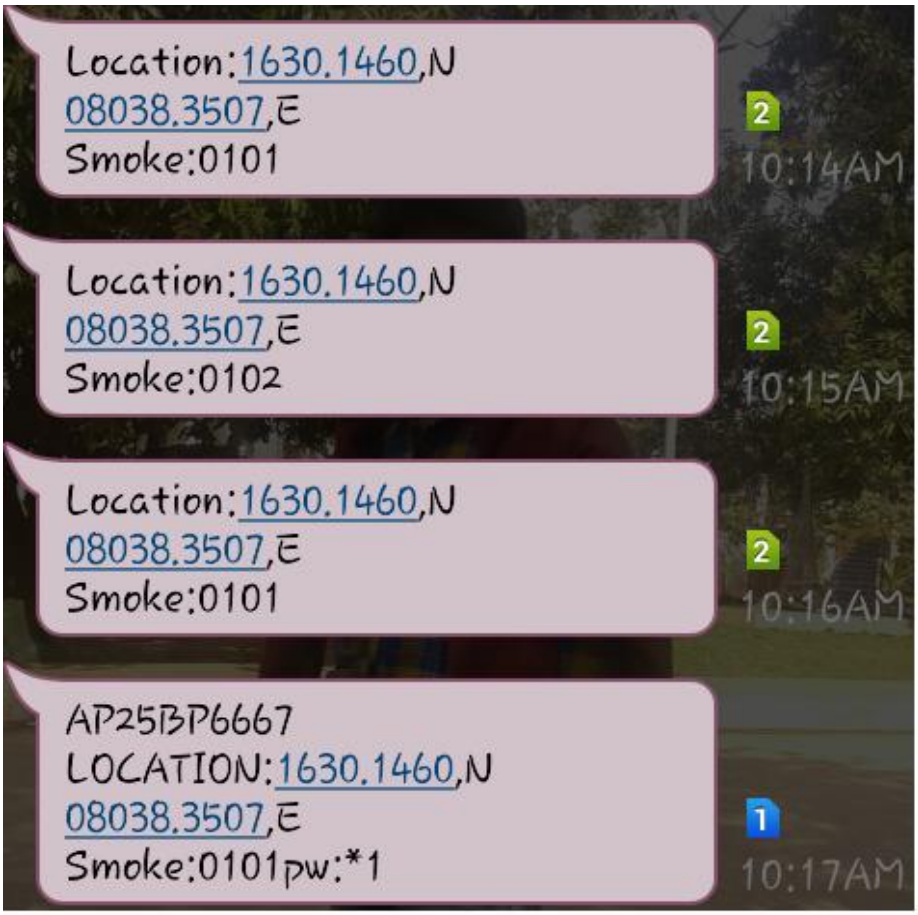

Figure: Output messages to the mobile

3.1. Conclusion

This project is started with the main aim of effective reduction in the pollution that is emitting out from the automobiles. It has reached its goal by sending the information of the pollution in the automobiles to the required persons who are responsible and the information such as pollution level, position of the vehicle which is obtained through GPS module is sent to authority of pollution control board. They can take necessary actions based on condition of the automobiles pollution level and the automobiles can be controlled from the pollution control office.