

IoT based Vehicle Pollution Control and Breaker of Existing Even/Odd Rule

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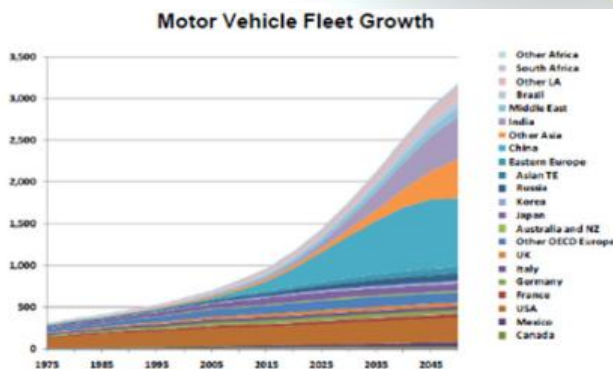
Abstract— In this paper we propose the system which detect the pollution emitted from the vehicle and intimates to the driver through LCD .In addition the number of persons travelling in a vehicle is counted by fingerprint scanner and the distance travelled by the vehicle is measured by using speed sensor, The overall information about the vehicle emitted pollution, number of person travel in the vehicle and distance travelled by the vehicle is sent to RTO unit through GSM using IOT based technology and it will be stored in RTO unit database. Two types of taxes are implied on the vehicle by RTO, one is based on the pollution emitted by the vehicle, and another based on the number of persons travelled and distance travelled by them.

Keywords—Speed-Sensors, Internet-of-Things (IoT)

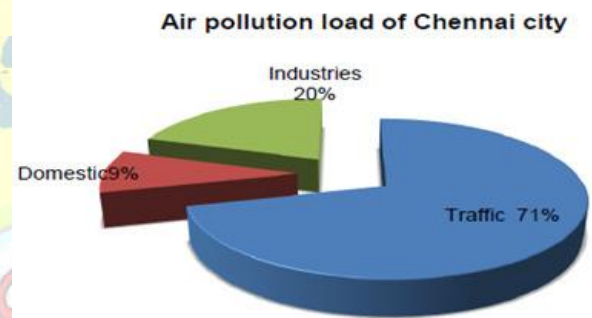
I. INTRODUCTION

Over the past decades there has been a rapid increase in Motor Vehicle population in Indian cities. The main cause of increase in vehicle population is everyone in the family own the individual car and has two or three cars per family.

Problem Identification I: Vehicular emissions are the main source of air pollution in urban environment.



IoT expands the internet that connects various objects wirelessly. IoT is a network where many objects that surround us will be networked in one form or another.



Improving public transport and encouraging people to curb.

Regarding to vehicular emissions Penalizing heavy vehicles that release high amounts of toxics.

Problem Identification II:

COMMON ILLNESSES CAUSED DUE TO POLLUTANTS

Children	Adults	Elderly
Poorly developed lungs, pneumonia, bronchitis, asthma	Asthma, chronic obstructive pulmonary disease (COPD), lung cancer	Asthma, COPD, recurrent respiratory tract infection, heart disease, increase risk of stroke

DEATH BY BREATH

PREMATURE MORTALITY (DEATHS PER YEAR) IN THE MOST POLLUTED MEGA CITIES



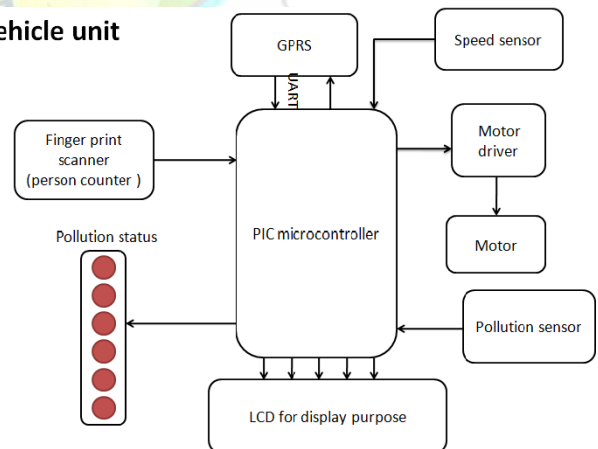
Existing System:

- Manually Controlled Process of detecting the Smoke/Speed levels in the vehicle.
- Difficult to Sense Smoke Emission
- Manual Operation for transferring the information
- Higher probability of accident occurrence

II. PROPOSED SYSTEM AND ARCHITECTURE

- The pollution levels are sent to the respective driver so that he will control the pollution emission from his vehicle.
- Motor driver unit is used to control the speed of the vehicle.
- speed sensor is used to measure the speed of vehicle and the distance travelled by the vehicle.
- Finger print sensor is used as the person counter, which gives the information about the number of persons travelled in a vehicle.
- Tax can be implied for the vehicle according to the level of pollution emitted and number of persons travel in the vehicle and distance travelled by the vehicle.
- So that everyone have intension to reduce their vehicle tax, thus the number of person travel will be more and the owner of vehicle will maintain the emission of gasses below the rated level.
- The public transport is encouraged in the proposed system.

Vehicle unit



RTO unit

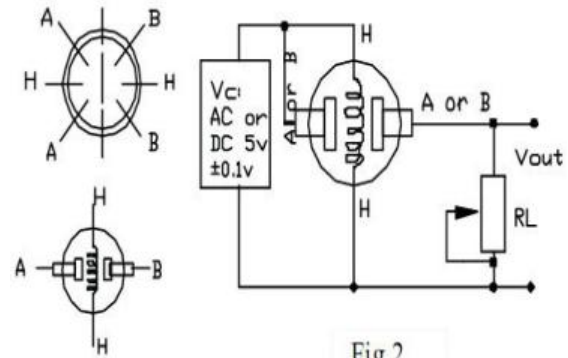
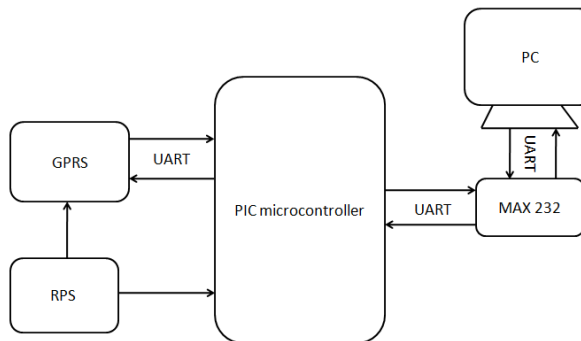


Fig.2

Hardware and software requirements:

1) PIC Microcontroller -18F4520:

In the late 1970s, GI introduced PIC 1650 and 1655 – RISC with 30 instructions.

We prefer PIC microcontrollers because of the Variety of choices (8-bit to 32-bit), Affordable (Low Cost), Low Power, Reasonable Size, Convenient Packaging, Through Hole (Dip), Surface Mount (SMD)

The features are low-cost, self-contained, 8-bit, Harvard structure, pipelined, RISC, single accumulator, with fixed reset and interrupt vectors.



Features of MQ 6:

Continuous Analog output, High Sensitivity to LPG, butane, propane, Small sensitivity to alcohol, smoke, Good sensitivity to Combustible gas in wide range, Long life and low cost, Simple drive circuit and compact size.

Specification of MQ6 LPG GAS Sensor:

Detection Range: 100ppm - 10,000ppm

Fast Response Time: <10s

Heater Voltage: 5.0V

Dimensions: 18mm Diameter, 17mm High excluding pins, Pins - 6mm High

3) SPEED SENSOR:

A rotary encoder, also called a shaft encoder or speed sensor, is an electro-mechanical device that converts the angular position or motion of a shaft or axle to an analog or digital code.

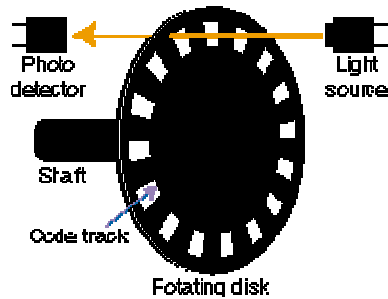
There are two main types: absolute and incremental (relative). The output of absolute encoders indicates the current position of the shaft, making them angle transducers. The output of incremental encoders provides information about the motion of the shaft, which is typically further processed elsewhere into information such as speed, distance, and position.

Operation of speed sensor:

2) MQ 6 Gas sensor:

MQ 6 Gas sensor is used as **LPG, Butane and Propane. Sensor** to generate alarm when there is leakage of these gases from the source. MQ6 is a highly sensitive gas sensor to **petroleum** based gases but less sensitive to **Alcohol** and **Carbon dioxide**. This simple sensor can be installed in the kitchen to give warning alarm if there is leakage of LPG.

MQ SENSOR CIRCUIT DIAGRAM:



4) FINGER PRINT SENSOR:

A fingerprint sensor is an electronic device used to capture a digital image of the fingerprint pattern. The captured image is called a live scan. This live scan is digitally processed to create a biometric template (a collection of extracted features) which is stored and used for matching. Many technologies have been used including optical, capacitive, RF, thermal, piezoresistive, ultrasonic, piezoelectric, MEMS. This is an overview of some of the more commonly used fingerprint sensor technologies.



5) GPRS:

The GPRS core network is the central part of the general packet radio service (GPRS) which allows 2G, 3G and WCDMA mobile networks to transmit IP packets to external networks such as the Internet. The GPRS system is an integrated part of the GSM network switching subsystem.

The network provides mobility management, session management and transport for Internet Protocol packet services in GSM and WCDMA networks. The core network also provides support for

other additional functions such as billing and lawful interception.

GSM is nothing but Global System for Mobile communications. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity.

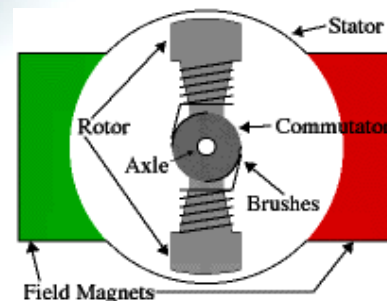
SIM900:

- 1: quad-band(900/1800/1900) GPRS Class 10
- 2: Sleep mode(about 2.5mA)
- 3: Over - temperature automatic shutdown
- 4: SIM card detection function
- 5: Supply voltage range 3.4 ... 4.5 V
- 6: Low power consumption

SIMCom presents an ultra compact and reliable wireless module-SIM900. This is a complete Quad-band GSM/GPRS module. Designed with a very powerful single-chip processor integrating ARM926EJ-S core and solutions.

6) DC MOTOR:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

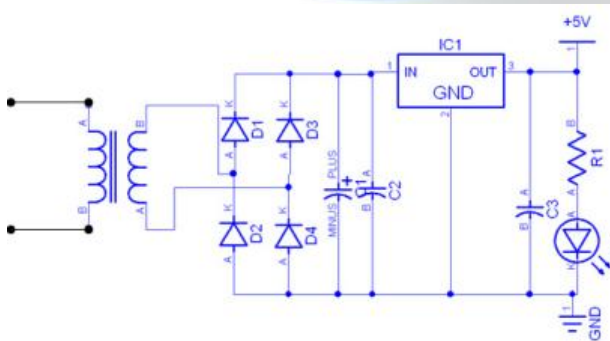


Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all that Beamers

will see), the external magnetic field is produced by high-strength permanent magnets¹. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.

7) Regulated Power Supply:

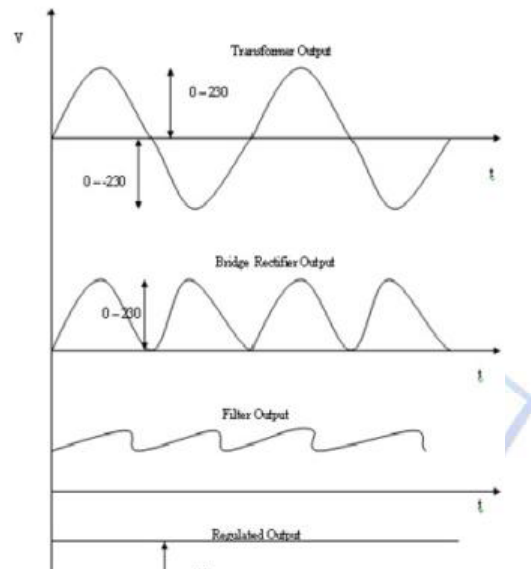
- Input voltage given is 230V.
- The device cannot withstand with 230V of power supply so the voltage is reduced using the step down transformer.
- But , the Alternative current will remain same so rectifier is being used which converts an alternating current into a direct one by allowing a current to flow through it in one direction.
- After rectification process, There will be some amplitude variation present in a DC power supply due to insufficient filtering , so capacitors are used for the filtering process.
- For constant voltage supply Regulator is being used.
- In order to avoid noise in the circuit again filters are placed.
- LED is placed for indicating the performance of the circuit, if the circuit is shorted then the LED turns OFF.
- Finally, the output is obtained.



Almost all electronic devices used in electronic circuits need a dc source of power to operate. Christo Ananth et al. [3] proposed a system about Efficient Sensor Network for Vehicle

Security. Today vehicle theft rate is very high, greater challenges are coming from thieves thus tracking/ alarming systems are being deployed with an increasingly popularity .As per as security is concerned today most of the vehicles are running on the LPG so it is necessary to monitor any leakage or level of LPG in order to provide safety to passenger. Also in this fast running world everybody is in hurry so it is required to provide fully automated maintenance system to make the journey of the passenger safe, comfortable and economical. To make the system more intelligent and advanced it is required to introduce some important developments that can help to promote not only the luxurious but also safety drive to the owner. The system "Efficient Sensor Network for Vehicle Security", introduces a new trend in automobile industry.(The combination of a transformer, a rectifier and a filter constitutes an ordinary dc power supply, also called an unregulated power supply).

Graph of Regulated Power Supply



Since the microcontroller is a digital device , it is mandatory to supply +5V DC supply.

- The supply from the battery or the AC supply are to be regulated to +5V DC in order to feed the microcontroller.

III. Background And Frame Work

Architecture of IoT Vehicle Pollution Control System

The architecture of IoT Vehicle pollution Control system is shown above It consists of two network modules: 1) Vehicle Unit; and 2) RTO Unit

The Vehicle (in our scope of project it is Car), When its smoke level is under the threshold value as prescribed by the Government the LCD module inside the Car indicates "Pollution Normal Level".



When its smoke level is equal to the threshold value as prescribed by the Government the LCD module inside the Car indicates "Pollution Marginal Level".

When its smoke level is above the threshold value as prescribed by the Government the LCD module inside the Car indicates "Pollution Abnormal Level".

B. IoT system

Through IoT technology, the smoke sensor can detect the pollution level and send the status to the RTO unit dynamically while in the running condition. The message is sent via the GSM Technology. (i.e.) The message is sent via the packets in the GPRS Technology.

Moreover, the RTO unit has a data base being maintained for each and every individual vehicle using the SQL database server. And when the message of the abnormal pollution level status is received, they send a message to stop the vehicle's Engine.

C. Wireless sensors

Smoke, Speed sensors are used to collect the parameters of the vehicle and these data fed to the controller for processing. These sensors continuously monitor the vehicle pollution level by providing alarms and trigger a message when there is any abnormal pollution level detected.

1) Finger Print Sensor (IR sensor)

Infrared radiation is the portion of electromagnetic spectrum having wavelengths longer than visible light wavelengths, but smaller than microwaves. Infrared waves are invisible to human eyes. An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

2) CCS software

A compiler is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language, often having a binary form known as object code). The most common reason for wanting to transform source code is to create an executable program.

This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language. The compiler includes built-in functions to access the PIC microcontroller hardware such as READ_ADC to read a value from the A/D converter. Discrete I/O is handled by describing the port characteristics in a PROGRAM. Functions such as INPUT and OUTPUT_HIGH will properly maintain the tri-state registers. Variables including structures may be directly

mapped to memory such as I/O ports to best represent the hardware structure in C.

3) LCD Display

LCD display is used here to indicate the parameters such as BP, temperature and also flash the message during the medication time. More microcontroller devices are using 'smart LCD' displays to output visual information. The following discussion covers the connection of a Hitachi LCD display to a PIC microcontroller. LCD displays designed around Hitachi's LCD HD44780 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 8 x 80 pixels of the display. Hitachi LCD displays have a standard ASCII set of characters plus Japanese, Greek and mathematical symbols.

For a 8-bit data bus, the display requires a +5V supply plus 11 I/O lines. For a 4-bit data bus it only requires the supply lines plus seven extra lines. When the LCD display is not enabled, data lines are tri-state which means they are in a state of high impedance (as though they are disconnected) and this means they do not interfere with the operation of the microcontroller when the display is not being addressed.

IV. Implementation

1) Vehicle Unit:

The Vehicle Unit consists of three different colors LEDs namely, Green, Yellow and Red. Green LED indicates that the Pollution is under Threshold Level. Yellow LED indicates that the Pollution is equal to Threshold Level. Red LED indicates that the Pollution is above the Threshold Level.

The Finger Print Sensor is used to count the no of persons travelling inside the Car. When each and every person is entering the car, they place their finger print's, and the LCD module displays that the Person increased by 1. Like wise we have maintained the count of person's by 4.

Each and Every time a person enters the car the imposed tax on them gets reduced by 25%, Likewise 2 persons gets reduced by 50%, 3 person's it gets reduced by 75%, altogether when 4 person's are travelling the Tax consumption gets reduced by 100%.

The periodic Tax payment will be indicated to the driver via the LCD display module over a period of 6 months, If they refuse to pay the tax within stipulated period then the vehicle will be stopped.

Like wise when the Abnormal level of the pollution is reached also, the Alarm in the Vehicle turns on and the LCD display also indicates that the "Pollution Level Abnormal" is reached.



V. Conclusion AND FUTURE SCOPE

An IoT-based Vehicle Pollution Control platform, which dynamically connects smoke and speed level sensors attached to Car for Pollution level monitoring and intelligent tracking and stopping for traffic management. This whole paper mainly focuses on two things. The First thing is the concept of detecting the level of Pollution and indicating it to the driver. There is an increase in the level of Pollution over the last couple of decades, leading to several Environmental problems. There will be a huge population, who do not take the pollution from their vehicles seriously, which has already resulted in several environmental problems such as Ozone layer depletion and so on. So, this system will be highly beneficial in curbing this problem. Secondly, instead of using their individual car who are in the same family, can use a Single car for all the members of the family, which will reduce the vehicle pollution as well as the traffic in the metropolitan cities. Today, the most widely adapted technology for the Internet is the standard web services. Wireless identifiable embedded vehicle pollution control systems at the edge of the network should be connected to web services and make use of comparable functionalities and this will prove to be a challenge in the future for the internet. The Internet of Things will change our society, and will bring seamless 'anytime, anywhere' dynamically and monitoring over fast reliable and secure networks. This implies that we are approaching the end of the divide present between digital, virtual and physical worlds.

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