IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

DETECTION OF VEHICLE EMISSION AND ACCIDENT USING IOT

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Abstract: There is increase in the number of automobiles ,hence the air pollution is also increasing. It is very important to resolve the problem of air pollution resulting from automobile exhaust gases.In this paper a system is proposed which uses Radio frequency identification (RFID) technology as a low-cost and mature wireless communication method to collect and transmit emission information of vehicles and Internet of Things (IoT) concept is used. .Hence with the help of notification via the SMS the owner will be notified and further measures will be taken.By applying the system, it is possible to smoothly realize a green traffic network.

As the usage of vehicles is increasing drastically, the hazards due to vehicles is also increased. The main cause for accidents is high speed, drunk and drive, diverting minds, over stress and sometimes due to electronic gadgets. This paper also deals with accident detection system that occurs due to carelessness of the person who is driving the vehicle.This introduces accident alerting system which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicle then the accident might occur. Once the accident occurs, this system will send information and location to the person's emergency contact number.

Keywords- Inspection system design, Internet of things((IOT), Radio frequency identification (RFID), Accident detection

- ## Introduction

Due to urbanization the usage of vehicles like cars, bikes is increased hence people are going under tremendous risk due to ever increasing pollution and accidents. Not only it affects the person driving but it affects the society as a whole. The imperfect (incomplete) combustion in the engine of a vehicle leads to emission of different harmful gases leading to increase in the pollution and unfavourably affecting the environment.Many developed countries have established motor emission standards ,tremendous innovations have been made in the technology of vehicle engines, the quality of gasoline, manufacturing of cars. Although government forces all cars for testing or examining periodically as the local standard, the actual vehicle on-road emissions are usually higher than the standards. Even after all this measures nothing has brought the striking effect as we expect it. Detection and control of these gases emission source in the environment is an important area of work. Emission of these gases from vehicles cannot be completely avoided but, it definitely can be controlled. As a solution to the above problem, the system is proposed for emission level control of vehicle. The system is provided with the sensors, data from the sensors is used to check the pollution level and accordingly the control action is carried out.The other problem due to increase in vehicles is accident. To reduce the accident rate, this paper introduces a optimum solution. Automatic alert system for vehicle accidents is introduced,which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicle then the accident might occur hence in such scenario the emergency contact number of the driver and the emergency helpline will be notified with SMS and E-Mail using GSM and also the location through GPS

- **RELATED WORK AND MOTIVATION**

Existing Method: When it comes to PUC testing of diesel cars, the accelerator of the car is completely pressed to get an accurate reading on the level of emission. This procedure is repeated five times, and each time the reading is noted down, then the average of these readings are taken as the final reading.
When it comes to PUC testing of petrol vehicles, the car is switched on and the engine is kept running without applying the accelerator. This process is done only once and an accurate reading is noted as the final reading**.**
This process requires continuous human efforts and is tedious. It requires the car owner to continuously keep the emission level in check.

Proposed Method: In the paper a system is proposed which uses RFID and IoT technology. In this the RFID devices(reader) needs to be installed on the traffic lights and the RFID tag on the vehicle. The system is provided with the sensors, data from the sensors is used to check the pollution level and the data is stored in the tag These radio waves transmit data from the tag to a reader, which then transmits the information to an RFID computer program. If the emission level exceeds the PUC board level value then the control system is used as a vehicle notification center, its chief role is to notify drivers with SMS or E-mail to repair their cars as soon as possible until detected qualified. By applying the system, it is possible to smoothly realize a green traffic network.
As the usage of vehicles is increasing drastically, the hazards due to vehicles is also increased. The main cause for accidents is high speed, drunk and drive, diverting minds, over stress and sometimes due to electronic gadgets. This paper deals with accident detection system that occurs due to carelessness of the person who is driving the vehicle. This introduces accident alerting system which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicle then the accident occurs. Once the accident occurs, this system will send information notified with SMS and E-Mail using GSM and also the location through GPS to the person's emergency contact number and the hospital.

- **ARCHITECTURE**

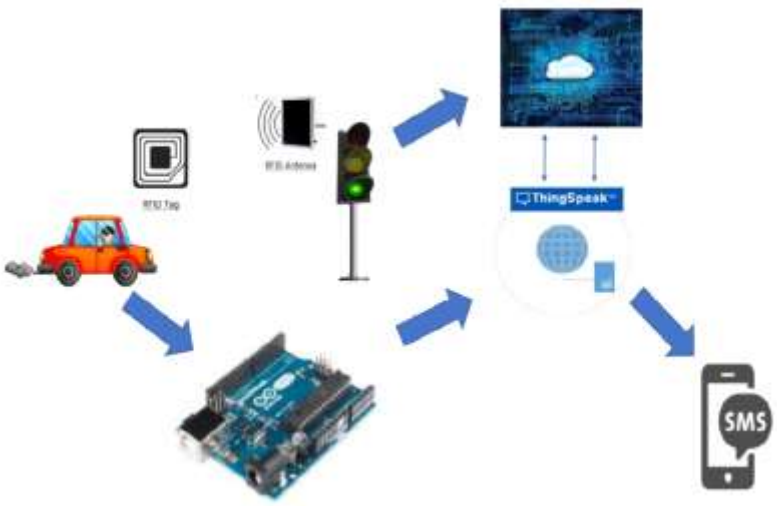

Figure 1: Architectural Model- 1

- In this system, each vehicle will consist of RFID TAG, Carbon Monoxide Sensor, Micro-controller and analog to digital converter (ADC).
- Whenever vehicle comes near the traffic light which consist of RFID reader. Reader will detect the vehicle.
- As soon as vehicle get detected the emission readings are sensed by carbon monoxide sensor in analog form.
- This analog output is given to ADC to convert it into Digital form.
- This digital data is sent to cloud (i.e. thingspeak.com) using wi-fi module.
- The data is stored and analyzed by the cloud.
- While analysis if the value exceeds the standard value then a warning message or email is sent to vehicle user.

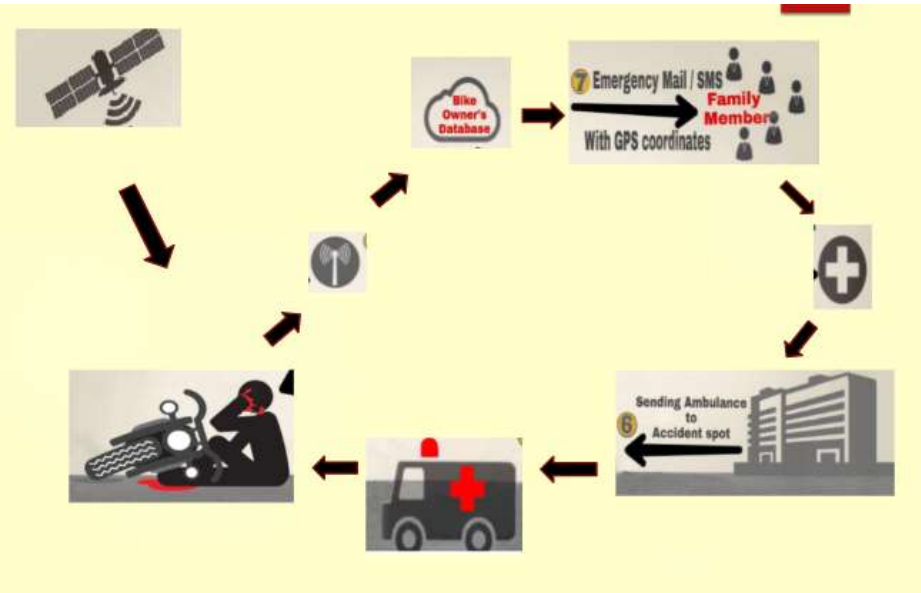

Figure 2: Architectural Model-2

- As seen in architectural model-1 system along with other components one more sensor is used (i.e. Accelerometer).
- Accelerometer (adxl335) will be fixed in a vehicle.
- When the accident will happen, the orientation of x, y axis of the will changes.
- When the value of axis changes from the threshold value that have been set for the axis, immediately message will be sent to hospital and the relative of the person about the accident along with the location of vehicle using GPS and GSM.

- **EASE OF USE**

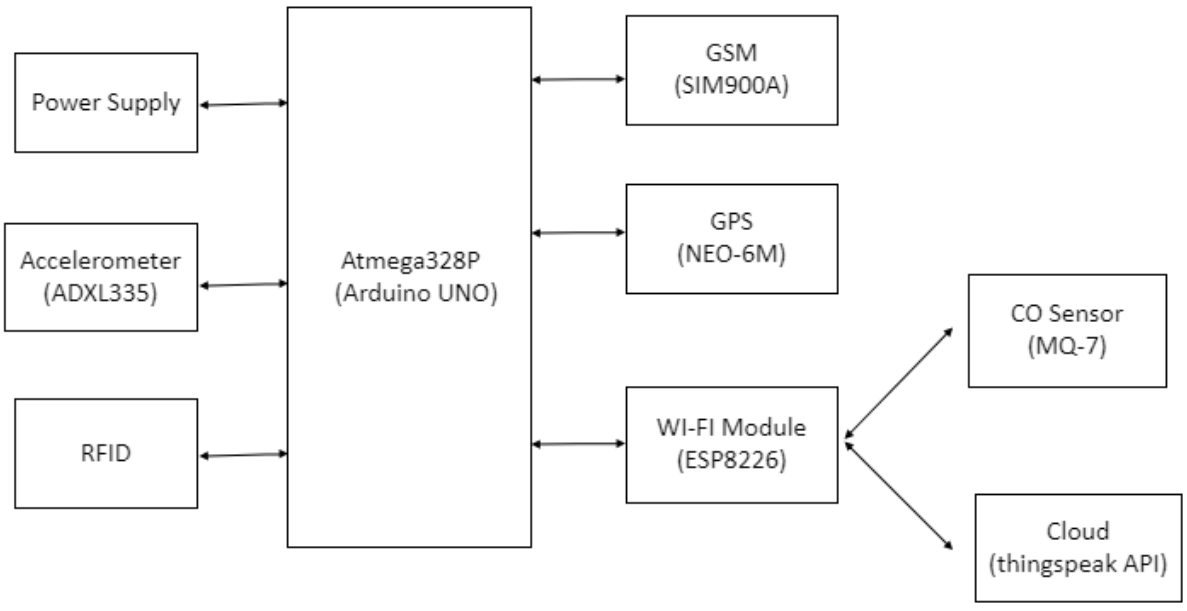

Figure 3: Block Diagram

1.Arduino UNO:

Figure 4: Arduino UNO

Arduino is platform and environment. It is collection of open source microcontrollers which contains small piece of code called Arduino boot loader. Here we are using Arduino UNO.ATmega328P is the basic component of an Arduino Uno board which is an open source microcontroller. It was developed by Arduino. Arduino controller is the heart of our system, used for interfacing all the hardware components. All the input and output devices are connected to it and it controls them. It can be connected with sensors to convert the analog sensor data to digital because it has inbuilt ADC and it can be easily coded using C language using its own Arduino IDE. It has a USB connection, a power jack, reset button. In order to connect it with Wi-Fi connection an ESP8266 module has been attached to achieve this mission.The data is continuously received from the sensor to the arduino board and then it is continuously stored on the IoT platform, which allows the consumers to visit the webpage anytime and check their emission level.

2.WI-FI Module (ESP8266):

Figure 5: WI-FI Module

ESP8266 is low cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes style commands. The ESP8285 is an ESP8266 with 1MiB of built in flash, allowing for single chip devices capable of connecting to Wi-Fi. The power supply required by this module is given through Arduino and carbon monoxide sensor is connected to it. The data of sensor is stored in it and also it will send this data on cloud.

3.Carbon Monoxide Sensor (MQ7):

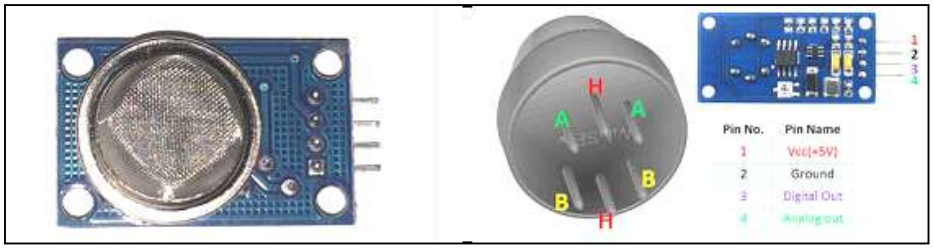

Figure 7: MQ-7

The MQ7 is a simple-to-use Carbon Monoxide (CO) sensor suitable for sensing CO concentrations in the air. It can detect CO-gas concentrations anywhere from 20 to 2000ppm. MQ7 has a high sensitivity to carbon monoxide and is stable and as well as have long-life span. Sensitive material of MQ-7 gas sensor is SnO2, which has lower conductivity in clean air. It makes 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. It has Good

sensitivity to Combustible gas in wide range .MQ7 is highly sensitive to Natural gas. It has Long life and low cost and simple drive circuit which makes it easy to use.

4.RFID TAGS:

Figure 8: RFID TAG

Radio Frequency Identification (RFID) is a silicon chip-based transponder that communicates via Radio Waves. Tags are classified into two types based on operating power supply fed to it.

A. Active RFID system

Active RFID tags have their own transmitter and power source (Mostly battery operated). They operate at 455 MHz, 2.45 GHz, or 5.8 GHz, and they typically have a read range of 60 feet to 300 feet (20 meters to 100 meters).

B. Passive RFID system

Passive RFID tags do not have a transmitter, they simply reflect energy (radio waves) back coming from the RFID reader antenna. They operate in Low frequency (~125 KHz) as well as High frequency (~13 MHz) band and have limited read range of up to ~1m.

5.EM18 RFID Reader:

Figure 9: RFID Reader

EM18 is a RFID reader which is used to read RFID tags of frequency 125 kHz. So, it can be called as a low frequency RFID reader. It gives out a serial output and has a range of about 8-12 cm. There is a built-in **antenna** and it can be connected to the PC with the help of **RS232**. After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication on respective pins. It has two RFID cards. It is Cost-effective and size is compact . Due to its lower power consumption and easy usability it is widely used.

6.Accelerometer (ADXL335):

Figure10: Accelerometer (ADXL335)

The **ADXL335** is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs.ADXL335 is accelerometer sensor which works on the principle of Piezoelectric effect. whenever we will tilt the sensor the ball is supposed to move in that direction because of Gravitational force. The walls are made of Piezoelectric elements. So, every time ball is touching the wall an electric current will be produced which will be interpreted in the form of values in any 3D space. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis.

7.GPRS SIM900A:

Figure11: GSM SIM900A

General Packet Radio Service is an extension of the GSM Network. GPRS is an integrated part of the GSM Network which provides an efficient way to transfer data with the same resources as GSM Network. This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications allowing you to benefit from small dimensions and cost-effective solutions. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. It has a Dual-Band 900/ 1800 MHz and a GPRS multi-slot class 10/8.Hence whenever the accident occurs , the reading of the accelerometer will change which would trigger the GSM to inform the concerned people.

8.GPS (NEO-6M):

Figure13: GPS(NEO-6M)

GPS is one of the trendy systems in communication. Global positioning system technology became a reality throughout the efforts of military of the American. It recognized a satellite-based navigation system consisting of a network of group of satellites orbiting the earth. We are using NEO-6M GPS Module. The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. It is a complete GPS module with an active antenna integrated, and a built-in EEPROM to save configuration parameter data. It helps users to track locations since well as objects. By using GPS technology, we can track each entity having GPS receiver.

9.Thingspeak:

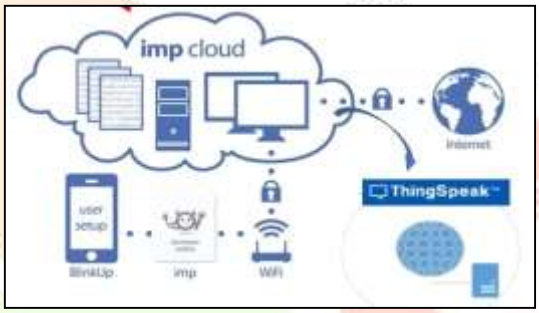

Figure12: Thingspeak

ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications and a social network of things with status updates. In our project we are using ThingSpeak to store the data regarding the emission of gases.

10.IFTTT:

Figure14: IFTTT

If This Then That, also known as IFTTT is a freeware web-based service that creates chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services. IFTTT is a web service that lets you create applets that act in response to another action. You can use the IFTTT Webhooks service to create web requests to trigger an action. The incoming

action is an HTTP request to the web server, and the outgoing action is SMS in the IFTTT app on your device .Hence in our project whenever the emission level is beyond a certain value the applet gets triggered and hence SMS and mail are sent to the concerned authorties.

- **ABBREVIATIONS:**

IOT-Internet of things

IDE-Integrated development environment

WiFi-wireless fidelity

RTC-real time clock

SoC-system on chip

TCIP-transmission control protocol Internet protocol

IFTT-if this then that

SMS-Short message service

GPS-global positioning system

RFID-radio frequency identification

PUC-pollution under control

- **CONCLUSION:**

In this project the concept of IOT is used. We mainly focused on two topics. First is to detect the CO level in the vehicles and if greater than threshold value then inform to the driver and traffic police. This will help to reduce the air pollution. Results from the project showed that the system is effective for vehicle emission detection. Hence with the help of innovative technology we are trying to solve the problem of air pollution. Second thing is vehicle accident detection. This will help to locate the position of the accident and also will give message to nearby hospital. This will help the patient to get help as early as possible and can save the rider's life. So this system is highly beneficial to the society.

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