

# Vehicular pollution monitoring using IoT

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**Abstract** - The quality of air in all over world degrading using large amount of vehicles [e.g. motor, buses, cars etc.] Due to air pollution from vehicle pollution increases rapidly which causes diseases and trigger, asthma attacks, cancer etc. So monitoring and controlling air quality is most important for healthy life. So we have designed a system which monitors vehicle's pollution. For that we are using IoT technique. IoT(Internet of Things) is an emerging technology in IT and Embedded system. We have used our system in vehicles. When a pollution gets detected system warns to Regional transport office(RTO). By using mailing technique with vehicle's owner details and location send to given mail address which is unique for every vehicle and senders mail address is based on vehicle number plate.

**Key Words:** IoT, Raspberry Pi 3, Arduino, GPS, Gas sensor, Temperature sensor, Mail etc.

## 1. INTRODUCTION

In India pollution is the one of the dangerous thing in society. The government is trying to control it but day by day it is going out of control. The Delhi government brought odd even number plate scheme but it does not work well. So we aimed our project to monitor vehicle pollution, by using IoT. IoT is one of the most dominating technology of 21<sup>st</sup> century. IoT means the devices connect with each other using wireless network or internet. In today's era internet has reached everywhere and it has become part of human life. According to a research 20 billion devices have connected with each other using IoT. In our system internet is doing major role along with raspberry pi 3. Raspberry pi 3 is a system on chip device which has developed for IoT application It is a credit card size device. It has 1.2GHz ARM cortex processor. It has 64 bit processor. It has inbuilt 1GB RAM and expandable SD card to install Linux operating system.

The system and Raspberry is connected to the internet using Wi-Fi modules and it helps to system to mail the GPS location to RTO. If pollution has been detected then RTO will warn to user /owner to maintain the vehicle. If user do not maintain the vehicle, then RTO can block his vehicle using IoT.

## 2. LITERATURE SURVEY

**Vehicle pollution monitoring and controlling using IoT, December -2015**

**BRS.PRASANNA KUMAR<sup>1</sup>, MADDIRALA SRI RAMA SEKCHAR<sup>2</sup>, MYLA LOVA KIRAN VERMA<sup>3</sup>**

This paper gives us , a novel solution is presented to monitor and control the pollution at the traffic signaling lights. A simple wireless embedded chip is inserted in the personal vehicles to control the ignition on and off remotely. Depends upon the pollution level measured from sensors at the traffic signaling,the operator will send command to the wireless traffic pollution control system. Also a simple radio frequency based embedded chip is inserted in the personal vehicles to control the ignition on the of remotely via control system at the traffic lights is the best way to reduce the air pollution.

**Vehicle Pollution Monitoring Using IoT, 13<sup>th</sup>-14<sup>th</sup> march 2017**

**USHA.S<sup>1</sup>, NAZIYA SULTAN.A<sup>2</sup>, PRIYANKA.M<sup>3</sup>, Dr.SUMATHI.S<sup>4</sup>**

In this paper ,according to recent technology development in this miniaturization of electronics and wireless communication technology have led to the emergence of environmental pollution sensor network wireless air pollution monitoring system provides real-time information about the level of air pollution. In this regions , as well as provides alerts in case of drastic change in quality of air.

This information can then be used by the authorities to take prompt actions such as evacuating people or sending emergency response team. It uses an Air Quality Index to categorize the various levels of air pollution. The system also uses the AQI to evaluate the level of health concern for a specific area.

**Development of IoT based vehicular pollution monitoring system, September 2015**

**RAMAGIRI RUSHIKESH ,CHANDRA MOHAN REDDY SIVAPPAGARI**

This paper gives us, Wireless sensors are used in most of the in real time applications for collecting physical information. The impossible measurements in typical ways have currently become attainable using the wireless technology. In this technology, the measurement of air quality is one of the difficult areas for the researchers. The main source of atmosphere pollution happens due to vehicles. The high

inflow of vehicles in urban areas causing more air pollution and decreasing air quality that leads to severe health diseases.

The measured data is also shared to vehicle owner, traffic department and agencies of national environment. This system is a low cost and provides good results in controlling the air pollution especially in the urban areas.

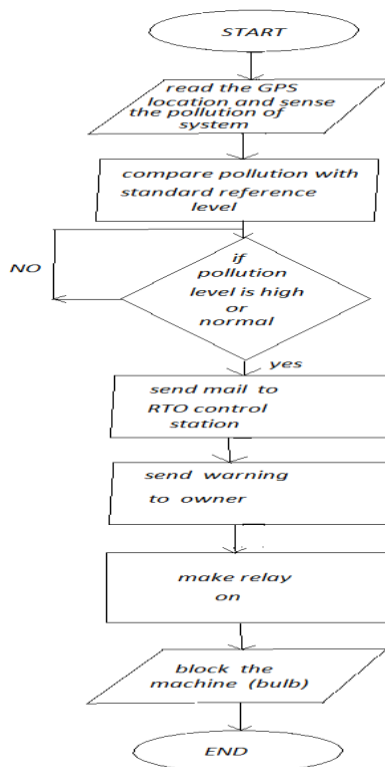
**2.1. LITERATURE SURVEY SUMMARY**

Sr. no.	Title	Author	Remarks
1	Vehicle pollution monitoring and controlling using IoT,2015	BRS. PRASANNA KUMAR <sup>1</sup> , MADDIRALA SRI RAMA SEK HAR <sup>2</sup> , MYLA LOVA KIRAN VERMA <sup>3</sup>	IoT based pollution control system will allow the operator to monitor and control the pollution from anywhere and anytime.
2	Vehicular pollution monitoring using IoT,2017	USHAS <sup>1</sup> , NAZIYA SULTAN.A <sup>2</sup> , PRIYANKA .M <sup>3</sup> , Dr.SUMATHI.S <sup>4</sup>	The system also uses the AQI to evaluate the level of health concern for a specific area.
3	Develop-ment of IoT based vehicular pollution monitoring system.	RAMAGIRI RUSHIKESH, CHANDRA MOHAN REDDY SIVAPPAGARI	The performance of the system is also verified using IoT technology.

**3. OBJECTIVE**

The objective of this project is to monitoring and detect polluted vehicle with its range of pollution which helps to control pollution and reduce global warming by using IoT, GPS and temperature sensor.

**4. FLOW CHART:**



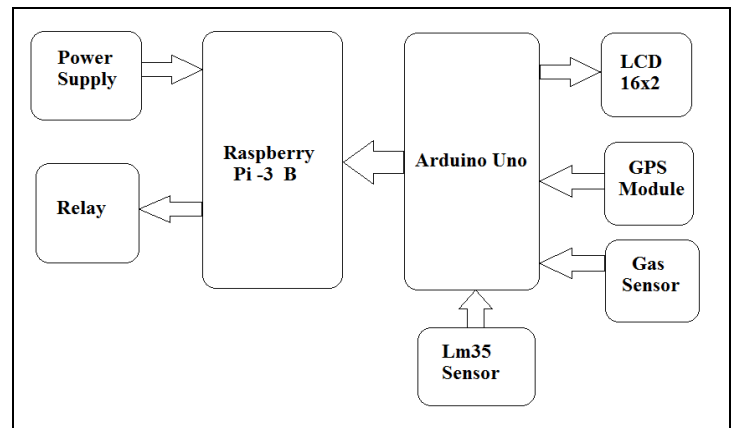
**Fig -4.1: FLOW CHART**

**4.1. Flow chart description:-**

When we started the system, first we read the GPS location in the form of latitude and longitude. After that using gas sensor MQ135 sense the pollution ranges of the system. This pollution ranges compared with standard reference level. If pollution level is higher than standard value then send mail to RTO control station else pollution level is normal then continuously compare pollution with standard reference level until our pollution ranges changes.

After that send warning to owner if the owner will not response the mail then RTO or the control station will make relay on and block the machine. Here we have used bulb as a machine.

**5. BLOCK DIAGRAM**



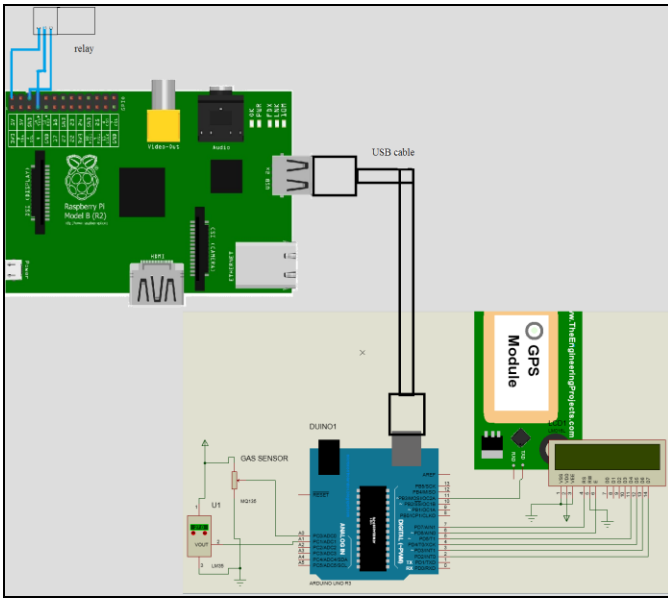
**Fig-5.1. : BLOCK DIAGRAM**

**5.1 BLOCK DIAGRAM DESCRIPTION:-**

Above fig. shows that the vehicle pollution monitoring using IoT. This system is based on Raspberry Pi and Arduino. Here we are sending Gas sensors value to the raspberry Pi board using serial communication on python. Here Arduino Uno is continuously sending sensor data to the python script and python is comparing the value. If value crosses the set range or it will go on danger value the python script will mail to the given mail address from vehicle's mail address in the python script.

We have used SMTP library to send a mail and along with mail raspberry Pi will send GPS location in latitude and longitude format to given mail address with attachment. In that attachment we have send vehicle and owners details to RTO will get mail. At first he will warn to owner to solve vehicle problem, if owner will not solve problem then RTO can block the vehicles using relay which is connected between vehicle battery supply and machine engine and starter. Here LCD IS used to show the vehicle machine temperature which has sensor using LM35 temperature sensor.

## 6. CIRCUIT DIAGRAM



**Fig-6.1:** CIRCUIT DIAGRAM

### 6.1. CIRCUIT DIAGRAM DESCRIPTION:-

In this circuit diagram we have connected gas sensor and temperature sensor to the Arduino board .the last four data pins of the LCD display are connected to the digital pins of the Arduino board. The transmitter of the GPS is connected to the Arduino board.

The Ethernet port of the raspberry pi is connected to the port of the Arduino board via USB cable. The sensor values are serially transmitted to the raspberry pi.

## 7. HARDWARE DESCRIPTION

### 7.1.MQ 135 SENSOR:-

We have used MQ135 analog sensor to detect toxic gases like ammonia nitrogen ,oxygen ,alcohols, aromatic compounds , sulphide and smoke generated by vehicles. It has potential to detect different harmful gasses. The Arduino supports 10 –bit ADC. So we get analog voltage 0 to 1023v. Gas sensor MQ135 has wide detecting scope .It has fast response and high sensitivity, Stable and long life, simple drive circuit.

### 7.2.LM 35 SENSOR:-

We have used temperature sensor to monitor temperature of machine. We are getting the output on the LCD. The LM35 series are precision integrated –circuit temperature devices with an output voltage linearly –proportional to the centigrade temperature.

Temperature sensor operates from 4v to 30 v and suitable for remote appliances. It is calibrated directly in Celsius (centigrade).

### 7.3. LCD:-

16X2 LCD we have used. The output of the temperature sensor is given on the LCD display. The LCD is to display the location which is computed by the GPS received.

### 7.4. RASPBERRY PI:-

Raspberry pi-3 is a credit card sized PC one of the most successful computers the UK has ever made. The raspberry pi comes with operating systems you can use, which you could manually install yourself. It has 40 GPIO pins. There are a set of connections that have varies functions but their Main one is to allow you to connect to the raspberry pi with an electric circuit.

A little so card is used as the Raspberry its hard drive. This is where the OS will live once you have put it on there. It has Ethernet port. The input of the raspberry pi is given to the Arduino board. The raspberry pi is used for mailing purpose. It has inbuilt Wi-Fi through which we are giving continuous internet supply to our system. It has HDMI port. This is an HDMI port ,the kind you will find on the back of the most modern TVs and computer monitors.

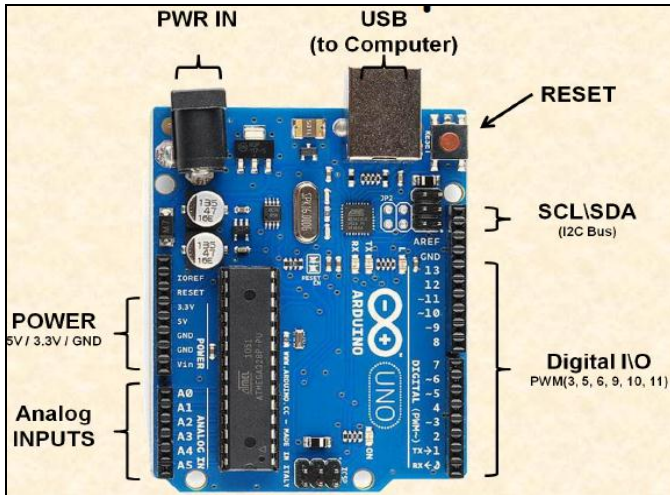
Use a standard HDMI cable to connect your raspberry pi to your chosen screen , to see whatever its doing .you will definitely need to plug it in to set up the pi.



**FIG-7.4.1:** RASPBERRY PI-3

### 7.5. ARDUINO:-

It is a open source hardware. The arduino contains programming languages such as c and c++.



**Fig 7.5.1 : ARDUINO UNO**

We are using Arduino Uno board which is SoC device like a Raspberry Pi but we use ATmega328P AVR. It has total 28 pins, from which 14 pins are digital pins, 6 pins are analog input. It contains one transmitter pin and one receiver pin and this pins are digital pins. It has 16MHz crystal oscillator frequency. Arduino board is powered by using the USB cable from your computer.

All you need do is connect the USB cable to the USB connection.

This is flexible combined with the fact that the Arduino software is free ,the hardware boards are pretty cheap ,and both the software and hardware are easy to learn has led to a large community of users who have contributed code and released instructions for a huge variety of Arduino -based projects.

One port is connected to the raspberry pi via USB cable.

Arduino boards are able to read analog or digital input signals from different sensors and tern it into an output such as an activating a motor, turning LED on or off , connect to the cloud and many other action.

**7.6. GPS:-**



**Fig 7.6.1: GPS**

GPS stands for global positioning system. IT is used for the purpose of detecting the location of a vehicle. It is a network of 30 satellites orbiting the earth at an altitude of 20,000 km. Whenever you are on the planet, at least four satellites are visible at any time. Each one transmits information about it's position and the current time at regular intervals.

Each GPS satellite transmit radio signals that enable the GPS receivers in your vehicle to estimate the satellites location ,as well as the distance between it and your vehicles. A receiver needs signals from three GPS satellites to pinpoint your vehicles position. The receivers then use these measurements to calculate where your vehicles are located on earth and convert the calculations into geodetic latitude and longitude

**7.7 RELAY:-**

It is a electromagnetic device. It uses for switching purpose. It has three terminals normally open, normally closed and common, To these pins we connect a load.

A relay is an electrical switch that uses an electromagnet to move the switch from the on to off position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power. It comes in different voltages like 5v, 12v etc.

**8. SOFTWARE DESCRIPTION**

**8.1. ARDUINO SOFTWARE:-**

Arduino is tool for making computers that can sense and control more of the physical world than your desktop computers. Its open source physical computing platform based on a simple microcontroller board and a development environment for writing software for the board.

The boards can be assembled by hand or purchased preassembled the open –source IDE can be downloaded for free. The Arduino programming language is an implementation of wiring. A similar physical computing platform, which is based on the processing multimedia programming environment. This IDE software used in the Arduino.

**8.2. RASPBERRY PI SOFTWARE (PYTHON)**

The Raspberry Pi have many operating systems which you can use, which you could manually install yourself if you want. There's a much easier way to install these OS .that's via the New Out Of Box Software ,or NOOBS. It holds all the latest versions of the Raspberry Pi operating systems and you can grab it from the download page at: [raspberrypi.org/downloads](http://raspberrypi.org/downloads).

We prefer to use the full version of NOOBS, as it comes with Raspbian already downloaded, making the process slightly

faster than with NOOBS. However, all the other operating systems will be downloaded as they install, on both versions of NOOBS.

### 9. RESULTS

This is vehicular pollution monitoring using IoT system. This is initial state. on LCD display pollution ranges of the system and latitude ,longitude is displayed.

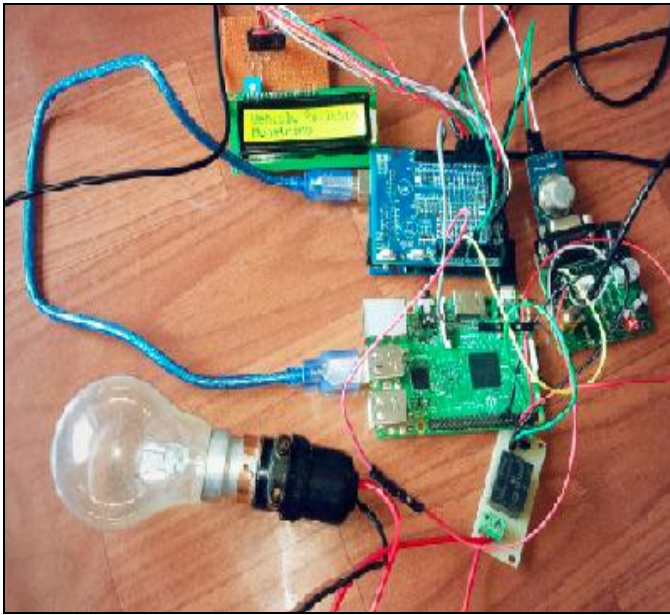


Fig -9.1: PROJECT DEMO

We got the mail and location of the polluted vehicle in the Form of latitude and longitude.

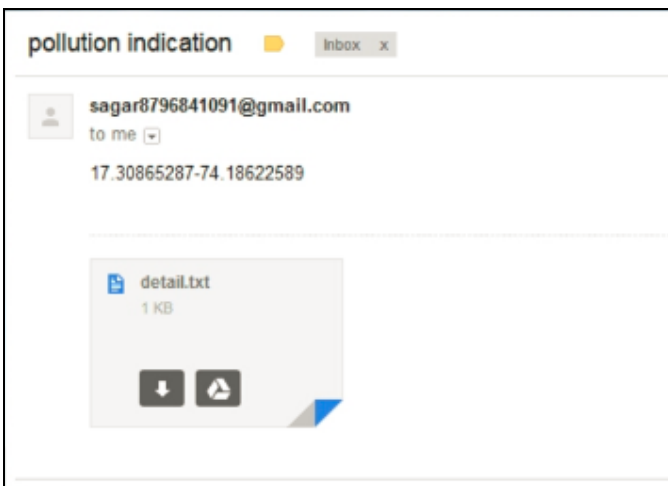


Fig -9.2: POLLUTION INDICATION MAIL

This is the attachment of mail which includes the polluted vehicle information like owner name, vehicle's plate number and the got the on the mail id which we have given in the coding.

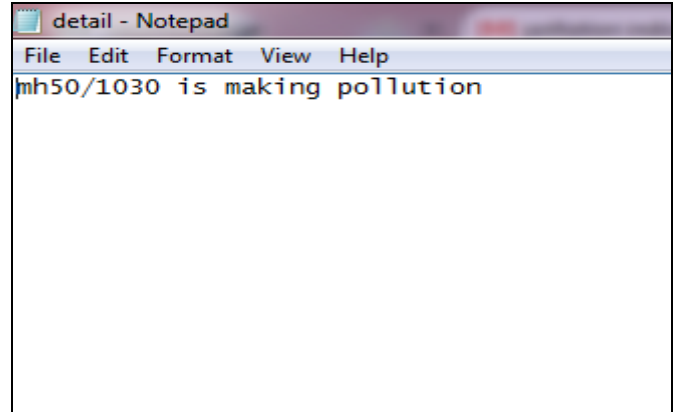


Fig 9.3 – MAIL ATTACHMENT

This is output of the system. When owner doesn't respond our message then the relay will be on by the control station or RTO and machine will be blocked.

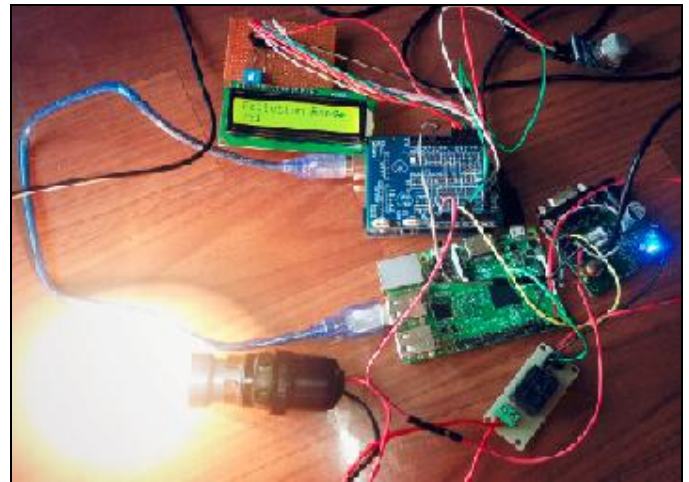


Fig -9.4: MACHINE BLOCK

### 10. CONCLUSION

The proposed system of monitoring the pollution will reduce the air pollution. This paper gives the technique for vehicular pollution monitoring using IoT. This paper helps to study the existing systems and development for IoT.

### 11. FUTURE SCOPE

In this project can add more sensors for accident detection also inbuilt this system to upcoming vehicle.

### ACKNOWLEDGEMENT

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BRS. PRASANNA KUMAR<sup>1</sup>, MADDIRALA SRI RAMA SEKHAR<sup>2</sup>, MYLA LOVA KIRAN VERMA<sup>3</sup>

[2] Vehicle pollution monitoring using IoT, 13<sup>th</sup>-14<sup>th</sup> march 2017

USHA.S<sup>1</sup>, NAZIYA SULTAN.A<sup>2</sup>, PRIYANKA.M<sup>3</sup>, Dr. SUMATHI .S<sup>4</sup>

[3] Development of IoT based vehicular pollution monitoring system, September 2015

RAMAGIRI RUSHIKESH ,CHANDRA MOHAN REDDY SIVAPPAGARI

[4] IoT Based air and sound pollution monitoring system

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