

# Cloud Integrated Route Optimization based on Pollution Intensity

Chahat Agarwal

U.G.Student

Department of CSE, Rajalakshmi Engineering  
College, Chennai  
chahatagarwal@ymail.com

Ashwin.P

U.G.Student

Department of CSE, Rajalakshmi Engineering  
College, Chennai  
ashwinpadmakumar@gmail.com

Mukesh Raj.L

U.G.Student

Department of CSE, Rajalakshmi Engineering  
College, Chennai  
lmukeshraj@outlook.com

S.Udhayakumar

Associate Professor

Department of CSE, Rajalakshmi Engineering  
College, Chennai  
udhayakumar.s@rajalakshmi.edu.in

## Abstract:

Air Pollution and population health is one of the most important environmental and public health issues. Economic development, urbanization, energy consumption, transportation/motorization and rapid population growth are major driving forces of air pollution in large cities (especially in megacities). Since people in the current world are more dependent on handheld systems, our project provides a service to detect the pollution level at each locality and later alert/intimate the user where user desires to go. The alert intimation can be in the form of electrical devices(LED) or by using a mobile application. Further by the accumulation of several data's collected from different places, the polluted area could be plotted using a Maps.

**Keywords:** Crowd-Sourcing, Maps, Bluetooth, LED, Intimation

## 1.INTRODUCTION:

Pollution is the presence in or introduction into the environment of a substance which has harmful or poisonous effects. Poor air quality increases respiratory ailments like asthma and bronchitis which heightens the risk of life-threatening diseases like cancer, and burdens our health care system with substantial medical costs. Amendments to the Clean Air Act, passed in 1970 and in 1977, have been utilized to control air pollution. They encompass different strategies which have met with varying success. Progress to date has been significant but it has been effected in those areas most amenable to control. Since the pollution is something which is difficult to eliminate completely it is better to detect the

presence of pollution remotely by producing an alert about the problem as it occurs. This makes you aware of a situation before you arrive to the location, and enables you to remedy the issue quickly.

The device could be embedded in major polluted areas and live datas can be accumulated.

## II.SYSTEM ARCHITECTURE

It comprises of two units

1. Monitoring Unit
2. Intimation Unit

### Monitoring unit:

The monitoring unit is designed using a Arduino/Raspberry Pi board. The board incorporates different types of gas sensors like MQ 2, MQ 7 in order to sense different types of gas which acts as input to the Arduino Board .

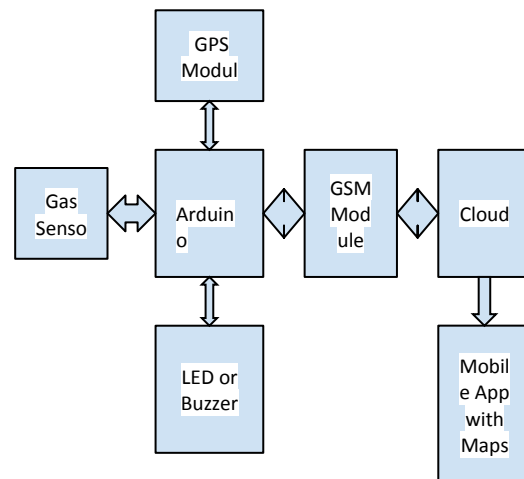


FIG 1.1 Architecture

Along with it the latitude and longitude value is sent to the cloud via the GPS Module. Cloud is used in order to monitor/analyze the data which is sent from arduino via internet through GSM Module.

### 1) GPS: Global Positioning System

GPS is often used by civilians as a navigation system. On the ground, any GPS Receiver contains a computer that "triangulates" its own position by getting bearings from at least three satellites. The result is provided in the form of a geographic position - longitude and latitude - to, for most receivers, within an accuracy of 5-10 meters. Software applications can then use those coordinates to provide driving or walking instructions.

In this project we use GPS for the same purpose. It is being used to provide the current position of the polluted place on request from the TRACKING UNIT. These obtained latitude and longitude and then transfer it.

### 2) Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino Boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino Programming Language (based on Wiring), and the Arduino Software(IDE), based on Processing. It is possible to integrate arduino with different components like GPS module, WiFi module, LED's, Buzzers etc.

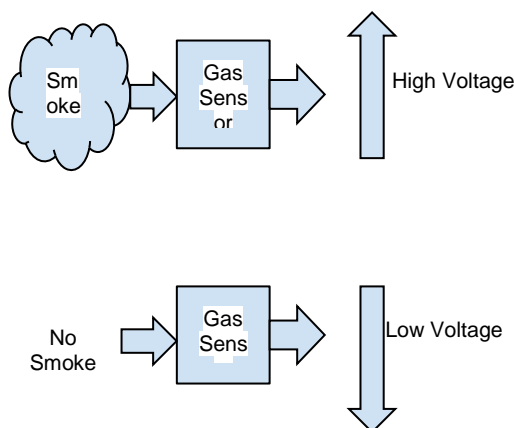


Fig 1.2 Working of Sensors

### 3) Gas Sensors

Gas sensors are the components which are integrated with the arduino board in order to sense the gases present in the environment. There are

different sensors for different types of gases. Some sensors are:

- (i)MQ 7 - used to sense Carbon Monoxide(CO)
- (ii)MQ 2 - used to sense General Combustible Gases.
- (iii)MQ 5 - used to sense LPG, Natural Gas, Coal Gas.

### 4) Cloud

Cloud is used for the analysis and storage purpose. In our project, the database is provided by the cloud itself. The concentration values which are given as input is stored into the cloud. Cloud on prerequisite holds the critical value of all the gases. The input value which is transferred to the cloud and the critical value stored on the cloud is compared and if the input value is more than the critical value of the respective gas then it prepares an intimation to alert to the user.

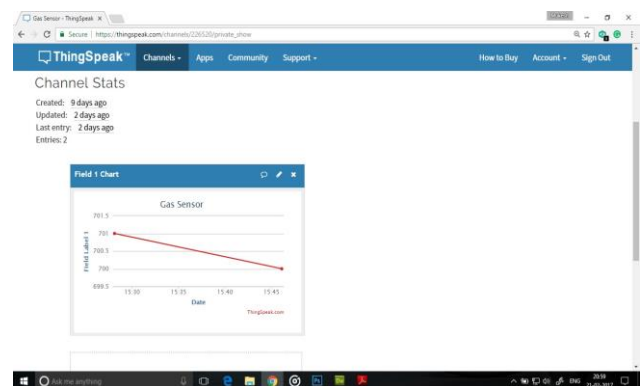


FIG 1.3 Analysis Graph from Thingspeak Database

### Intimating Unit

Intimation Unit is done using two ways:

- 1.Electrical Devices(LED)
- 2.Mobile Application(Google Maps)

A mobile application is created which takes the longitude and latitude values as the input and locates the place in the map from the by getting the data after analysing from the Cloud. Electrical Device like LED is used in the remote areas where there internet connectivity is not available i.e; before sending the data to cloud we can analyze and intimate the user when no internet connectivity present.

### 1)Database:

Database is used for storing the obtained input values, the analysed values and the location name along with its latitude and longitude values where the pollution is beyond the critical level. The location coordinates of the place is obtained by incorporating a GPS module with the monitoring system. The database is provided by the cloud itself.

### 2)User Interface:

#### a)Mobile Application:

User Interface is based on the mobile application. The values which are analysed in the cloud are checked for its critical value. If the pollution is above the critical value then a intimation is notified to the user by plotting the particular polluted area in a map. By this the user gets to know about the pollution level of his/her destination before even reaching there.

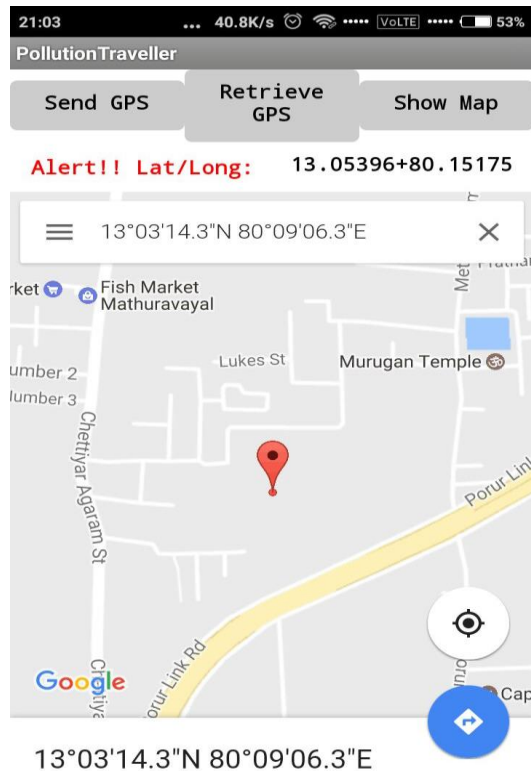


FIG 1.4 Mobile GPS

Figure 1.4 represents a mobile GPS where we use a mobile as a substitute to the GPS module. Here the mobile is used to send the location to the of the polluted area to the database.

Figure 1.5 represents the situation where the user is travelling from one place to another and he/she gets an alert on the pollution level of the travelling path.

#### b)LED:

LED is used as an alert system and works even when Internet Connectivity not present. LED can be integrated with the monitoring system. LED glows when the pollution level is higher than the critical value.

### III. MODUS OPERANDI

This project deals with two stages of mobile tracking process

- A. Primary stage
- B. Secondary stage

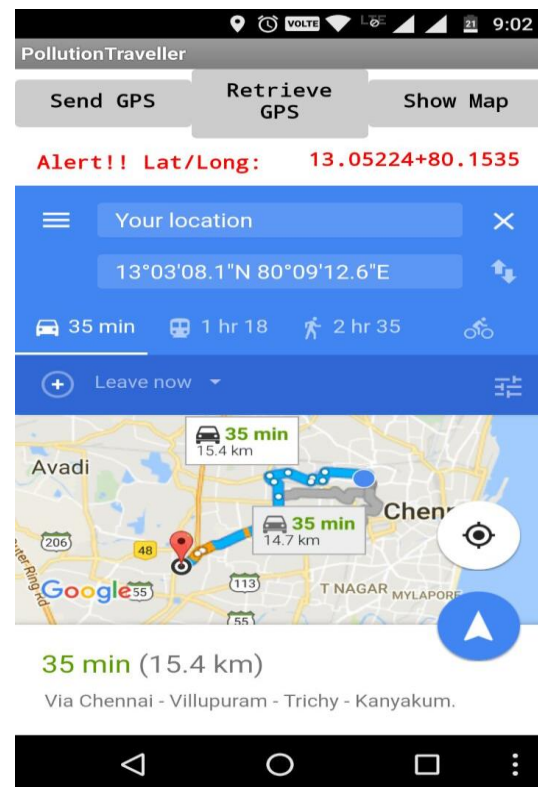


FIG 1.5 User's Mobile

### PRIMARY STAGE

#### Internet Connectivity Present:

The pollutant gas acts as an input to the monitoring device(Arduino/Pi). The sensor which is incorporated with the device senses the gas and sends the concentration value(in parts per million) of the gas to the cloud. The cloud consists of the critical value for each and every gas. The concentration value of the gas is checked with the critical value of that respective gas. If the sensed concentration value is more than the critical value, then the alert is given to the user. The database holds the record of the concentration of all the gases which is present in the environment.

#### Internet Connectivity Absent:

In the absence of internet connectivity a LED can be incorporated with the monitoring system. When the concentration of the gas is sensed, the comparison of the critical concentration with the sensed concentration is performed within the device itself. If the pollution is above the critical level, then the alert is given by making the LED bulb glow. This technique is more useful in the places where there is no availability of internet connection. This is the most simple and cheap technique.

## SECONDARY STAGE

When the pollutant gas levels are more than the critical value in a particular place then the alert is given to the user by plotting the polluted location on the map. The user gets the notification when he/she is travelling to the particular place or when he/she searches the route of the destination using the maps.

### Working Model Image

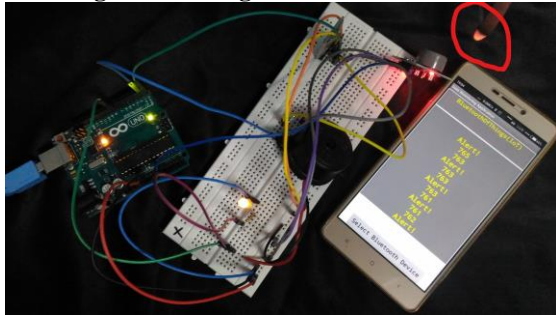


Fig.1.6 Complete Model

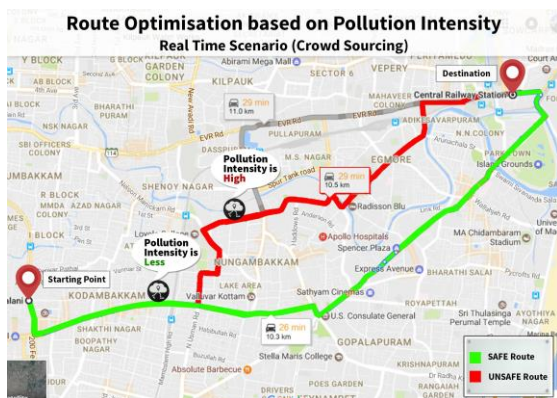
### Future Enhancement:

#### 1)Wristband (Bluetooth)

Wrist Band is one of the major device which is developing in the current world. The device could be designed in the form of a wrist band . The wristband is connected to the mobile phone using the bluetooth. All the sensing and analysis is performed by the device embedded inside the wristband and the alert is sent to the user via bluetooth so as to take first step to safeguard ourselves.(No Internet Connectivity required)

#### 2)Crowdsourcing (Route Optimization)

Crowdsourcing is the process of obtaining an information or input from different places via internet. In future, the Google map could obtain the pollution level of different places and embed within the map as a common information.



## DENOUNCEMENT(Conclusion)

The project focuses on intimating the people about the environment in which they sustain. Even

though pollution control measures are introduced by the government it is always better to have a self prevention policy. The monitoring system monitors about the environment conditions of the place and if the pollution level is higher, then it alerts the user. Alertness given to the user helps them to make necessary arrangements to prevent themselves. It is always said “Prevention is better than cure”. Hence the proposed project gives an efficient solution for the prevention of people from pollution.

## IV. REFERENCES:

- <https://thingspeak.com/>
- <https://developers.google.com/maps/>
- <https://www.arduino.cc/>