

Pollution Monitoring & Intelligent Information Exchange System for Traffic Congestion

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Abstract: Today's major environmental & public issue is air pollution & traffic congestion. According to the report of World Health Organization (WHO), air pollution is significant risk factor for multiple health conditions including skin & eye infection, irritation of nose, throat & eyes. It also causes serious conditions like heart disease, lung cancer difficulty in breathing & many. Traffic congestion is also main public issue in most of metropolitan cities and that is also the reason of many problems. The main objective of project is by using various sensors, GSM module, VB & android app to design an efficient and remote system to monitoring the level of various pollutants causing pollution and to minimize the effect of these parameters without affecting the natural environment and provide live updates of traffic to avoid the traffic jams in any particular area.

Keywords: Sensors, GSM module, VB (visual basic), android App.

I. INTRODUCTION

Today's one of the major public health & environmental concern is air pollution and now a day's traffic congestion also the main issue in cities. According to the 2014 report of World Health Organization (WHO), due to air pollution in 2012 caused the deaths of around 7 million people worldwide. And according to blacksmith institute world's worst polluted places report indoor air pollution and urban air quality are listed as two of the world's worst toxic pollution problem in 2008. It also causes serious conditions like heart disease, lung cancer, pneumonia, bronchitis, difficulty in breathing & many more.

In an urban environment, traffic conditions have a large effect on the quality of the outdoor air, as vehicle emissions are a major source of urban pollution. Figures from the National Atmospheric Emissions Inventory for the INDIA indicate that road transport emissions are possible for the following percentages of total emissions in the INDIA:

- Carbon Monoxide (CO): 43%,
- Nitrogen Oxides: 32%,
- Particulates: 21%.

The pollution level at each sensor node can be provided to server by using GSM system or we can display the pollution level information on large display close to square. People generally more than one alternate path to reach some destination; if person knows the pollution information in advance he can follow safe path & simultaneously pollution can also control.

There are various components used such as GSM which means Global System for Mobile Communication is world's most popular standard for mobile telephone system. The effects of major road closures in a city centre & their consequent impact upon indoor air quality in commercial property. From roadside pollution monitoring have managed to identify discrete pollution episodes at pedestrian level.

In this project we are designing an intelligent information exchange system which will keep daily commuter updated about the route information so that a user can take the informed decision regarding the route selection which will take him to his destination with least amount of obstacles which saves time.

II. LITERATURE SURVEY

Some of the existing instruments for air pollution monitoring are Fourier transform infrared (FTIR) instruments, gas chromatographs, and mass spectrometers. These instruments provide fairly accurate and selective gas readings.

The existing monitoring system largely uses smart transducer interface module (STIM) with semiconductor gas sensors, which uses the 1451.2 standard. STIM was found to an efficient monitoring system but for the power requirements and ability to expand for large deployment.

Some of the implemented systems are:

A) In 2014, Dan Stefan Tudose, Traian Alexandru Patrascu, Andrei Voinescu, Razvan Tataroiu, Nicolae Tapus et al. [1] proposed an environmental air pollution monitoring system that measures CO₂, NO₂, CO, HC & NH₄ concentration using mobile sensors in urban environment. The acquired information about air pollution in surroundings is then stored on central on-line repository system periodically. It uses a wireless GSM modem connection for transferring data to a central computer. Also, the application can share the data publicly by displaying it on a dedicated web site.

B) In 2012, Amnesh Goel, Sukanya Ray, Prateek Agrawal, Nidhi Chandra et al. [4] proposed a wireless sensor network to monitor air pollution levels of various pollutants due to environment changes. A wireless network is comprises of large number of sensors modes.

This system proposes a method which mainly focuses on longer sustain time period of sensor network by effectively managing energy in sensor network, effectively processing of collected information and less overhead in transferring information between various sensor nodes.

C) In 2013, Wenhui Wang, Yifeng Yuan, Zhihao Ling et al. [5], in order to comply with requirements of oil and gas industry, an air quality monitoring system was proposed based on ZigBee wireless sensing technology. It uses ZigBee wireless network to send results to the monitoring centre so that, if some abnormal situations happens, a quick warning will be generated to remind staff.

D) John I Curries, Graham Capper proposed how Road Traffic is responsible to the Pollution and its Effect on the Environment. The monitoring period was chosen to cover a period of street closures and hence attempt to isolate some of the traffic related pollutants. Traffic flow information was available for the area, from which traffic emission data was used to test an integrated model for street canyon pollution.

III. BLOCK DIAGRAM

Block diagram of a project consist of following blocks

1. ARM 7
2. MQ135, MQ2, MQ7 (GAS SENSORS)
3. Noise sensor
4. Electrode sensor
5. Patti switch
6. LCD
7. Buzzer
8. GSM module
9. PC(VB)
10. Android app.

Block diagram of project module as:

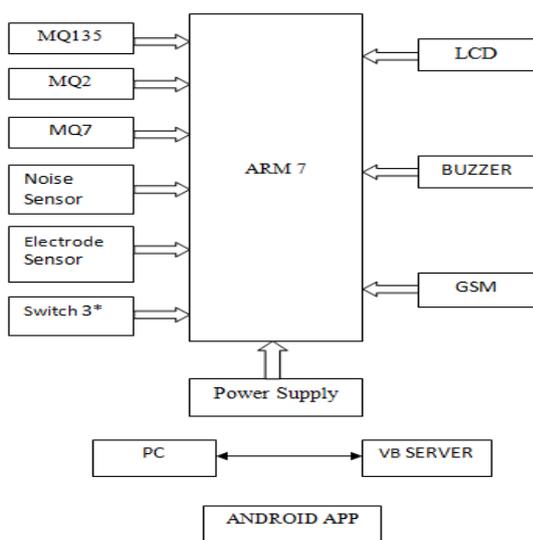


Fig. 1. Block diagram of proposed system

3.2.1 ARM 7: WHY ARM 7:

- Two UARTs
- Low power consumption

- Less area
- Low cost
- High speed

FEATURES:

- 32-bit ARM7TDMI microcontroller is having two 10-bit ADCs providing a total of 14 analog inputs, with conversion time as low as 2.44 μ s per channel.
- Two 32-bit timers/counters.
- Two UARTs, two fast I2C-bus (400 kbps) and SPI with buffering and variable data length capabilities.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz
- CPU operating voltage range of 3.0 V to 3.6 V (3.3 V \pm 10 %) with 5 V tolerant I/O pads.
- Power saving modes include Idle and Power-down.

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.

3.2.2 MQ 135 (Gas Sensor):

Sensitive material of MQ135 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ135 gas sensor has high sensitivity to Ammonia, Sulfide and Benzene steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different application.

3.2.3 MQ2

MQ2 are used in gas leakage detecting equipments in family and industry. MQ2 are suitable for detecting of LPG, I -butane, propane, methane, alcohol, Hydrogen, smoke. Wide detecting scope Fast response and High sensitivity. Stable and long life Simple drive circuit

3.2.4 MQ7 (Carbon monoxide):

Sensitive material of MQ-7 gas sensor is SnO₂, which with lower conductivity in clean air. It make 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. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-7 gas sensor has high sensitivity to Carbon Monoxide. The sensor could be used to detect different gases contains CO, it is with low cost and suitable for different application.

3.2.5 Noise Sensor:

We use noise sensor to detect the noise pollution that is if the frequency of sound is greater than a standard set point decibel value then buzzer will be on. We use condenser 5mm mike as noise sensor.

3.2.6 Electrode Sensor

We use cooper rod as a rain fall sensor with LM358 as a signal conditioning block. The LM158 series consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. The LM358 and LM2904 are available in a chip sized package (8-Bump micro SMD) using National's micro SMD package technology.

3.2.7 Switch 3*:

In one type of micro switch, internally there are two conductive springs. In our kit Patti switch is used which is act as a key only. By using of that switch we can indentify traffic congestion in any particular area is high, medium or low.

3.2.8 LCD:

The LCD display is used to display the messages to users. LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD. LCD can also used in a project to check the output of different modules interfaced with the microcontroller.

Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

3.2.9 Buzzer:

Buzzer is used in a system to indicate or to grab the attention regarding an emergency situation occurred. Buzzer act as a panic horn which indicates the need of instant attention as the condition goes haywire. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

3.2.10 Android mobile node:

Here we are developing an android APP. This is a user node which is used to upload as well as download the data from server. The user can upload information such as traffic density (high/low/medium), road closed blocked, traffic jams etc. along with time and his name and area name via SMS. The server has Visual basics software with a access Database. The VB software will update the data base sent by the user via Android APP. When someone sends an enquiry SMS he just has to type the area name & pollution level or traffic update and he will get all the information uploaded to the SERVER.

3.2.11 VB Based server:

VB is the powerful and versatile programming language for operating and controlling the pollution monitoring and

traffic congestion. Using VB software we can get the real time parameters according to information. VB window also helps us to get the information of industrial parameters. A buzzer or beeper is an audio signaling device, which may be mechanical electromechanical. The server has the all data related to air pollution and traffic condition with time and area information. The server can be used to store all the information as well as reply to the enquiry done by the user.

3.2.12 GSM MODULE:

FEATURES:

- GSM is already used worldwide.
- GSM covers virtually all parts of the world.
- The availability of subscriber identity modules, which are smart_cards that provide secure data encryption.
- Integrated with SIM holder.
- Control via AT commands.
- Supply voltage range 3.4v – 4.5v
- Low power consumption
- With the design of GSM, the signals can be effectively transferred and the actions can still be made accurate and effective.

As shown in the block diagram this node consist of hardware and some analog sensor such as CO2 and carbon monoxide. These sensor are used to check the pollution level in the corresponding traffic signal. Also we have Rain fall sensor LM 358 as a signal conditioning which will detect the rain fall in the area. All this information is to the server via GSM (SMS).It is used for send reading from controller to server. And server side GSM is receiving all data as well as for sending all data to android app from server.

IV. ADVANTAGES

- Due to use of various sensors it is easy to detect or to measure the (air, noise) pollution in the city.
- Due to use of rain fall sensor it is easy to get information about proportion of rain and effect of that rain on traffic.
- System is useful to give live traffic updates of any particular area.
- By using weekly graphical representation through VB the most polluted area & traffic area's easily identified.
- It can be easily mounted at any particular area.

V. APPLICATIONS

- This system is very promising to use in various industrial areas where air pollution level is high.
- System can be used in the traffic signal to get the latest updates of the traffic.
- System also used in near the hospitals where pollution (air, noise) & traffic problems are is most harmful to the patients.
- In Weather forecast department, so they can give information about the rainfall and effect of rainfall on traffic in particular area.

- By detecting the various gases, the information of this will send to the Environment department to take the action for pollution control.

VI. FUTURE SCOPE

- By using GPS module which is connected to the vehicles then we get information about traffic and pollution where vehicle can travel. i.e. by using GPS we can cover wide area information.
- The performance and remotely the pollution monitoring and control system can further be improved by implementing sensors for detecting dust, noise, smoke and other parameters, thereby improving the industrial and natural environment.

VII. CONCLUSION

This proposed system is to examine the effects of major road closures in a city centre and their consequent impact upon indoor air quality in a commercial property. Through this system, tracking system is becoming increasingly important in large cities and it is more secured than other systems. By this system, when we place the device in the traffic area we can track the location of the traffic, with this we can have a good control in it. In this system, if we want to detect the pollution, or we want to track the particular location to know the latest updates about the traffic due to closures of the roads, so in this situations we can implement the system in that area.

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