

Microcontroller System for Hazardous Gases Detection & Controlling

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ABSTRACT

Air pollution is the most important factor and the vital environmental issue which is cannot be ignored. Due to transportation and urbanization concentration of pollutants increases. Hence due to inhaling of these pollutants may cause the damage to the human health. Air quality measure such as building air quality monitoring stations are bit expensive and also these stations are less densely deployed and provide low resolution sensing data. So this project proposed air pollution monitoring and controlling system based on the sensors network. It also integrates with global system of mobile communication. This system consist of sensors, gateways and control center manage by lab view through which data gets store in database. This system deployed to main road of city to monitor the level of carbon monoxide (CO) and sulfur dioxide (SnO₂) caused by vehicle emissions. So basically we monitor the pollution and with (ETHERNET) module and control unit we can control the pollution level on traffic signal by providing delay to traffic signal or diverting the route. Also in industrial purpose we can control the outgoing excessive gas by using SOLENOID to close the path of excel of gases Hence we probably control the pollution with sensors and control system.

Keywords— Sensor Network , ETHERNET Module ,Air Pollution Monitoring , Traffic control and Industrial gas control.

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I. INTRODUCTION

Air pollution from road traffic is effect on human health. Scientific studies in India , show that children living in areas with high road traffic volumes have more respiratory-related illness symptoms than other children. More specifically, a significant number of studies conclude that exposure to traffic pollution can aggravate asthma in children. Exposure of hazardous gases from road traffic gives rise to a number of other health issues including heart attack, coronary artery disease and increased risk of death from respiratory and cardiac conditions. Hazardous gases may worsen symptoms for people with existing heart and lung conditions. Although some evidence suggests associations with other health issues, including exacerbation of allergies and reproductive effects, further studies are required to fully understand the population health impacts.

II. BRIEF ABOUT MOTIVATION

Due to increase in the pollution in urban area major problem associate with air creates hazards effects. Hence we decided to reduce the effect of different hazardous gases and temperature. The basic motive of this arrangement is that to reduce the level of harmful gases and also reduce the temperature which basically helps the ecosystem.

So considering all the above parameters described hazards, traffic causing air pollution should be controlled. In this project, we are using gas sensor which will sense the amount of pollution at the signal and will increase the time of green Light and will let the vehicles causing pollution go and diverting the traffic and at the next we took solenoid to close the path where harmful gases gets excels .

The best way to stop pollution is to stop the excessive level of gases for at least 2 to 3 min up-to harmless the level.

III. MOTIVATION OF PRESENT WORK

In our module we have taken

- Gas Sensor
- Temperature Sensor
- Humidity Sensor
- ATMEGA 16 Micro controller
- LCD.
- SOLENOID

In our system sensor sense the gas level which is present in atmosphere which is harmful to health at a particular level set by user. In traffic we fixed our module in a respective area where traffic is rises at a critical level, basically our sensor sense the carbon monoxide level by increase in voltage from 0 to 5 volts. As a voltage level increases at critical level set by user it provides the reading on lcd and through GSM to user after that by knowing the respective area we monitor and control Gas level and traffic respectively.

Traffic controlling mostly by provide the delay to the signal or divert the traffic in the respective area. So our module has the capability of monitoring and controlling Air pollution. With the recent discovery of Micro-Electro-Mechanical Systems (MEMS) technology whereby sensors are becoming smaller and more versatile, sensor network promises many new application areas in the near future.

Initial development into SN was mainly motivated by military applications. However, sensor network are now used in many civilian application areas for commercial and industrial use, including environment and habitat monitoring, health care applications home automation, nuclear reactor controlling, fire detection and traffic control.

In our work we specializing stressed on the pollution controlling and monitoring as well. In our method we consistently provide the status of air pollution in respective area by providing SMS to the user after 10 minutes. When pollution level rises more than critical level. It suddenly provide the rises level and process will carry out about changing the traffic signal or it also provides the delay to the system.

The another application we used in industrial field where we can try to control the outgoing of gases from industry up-to certain level. As we see that industry is the tremendous source of hazardous gases which plays vital role in the air pollution so we put solenoid in the path of outgoing gases and for some time after increase the gas level.

As the path gets closed for some time it will decrease the gas level after 2 to 3 min. then we open the path after the gas level gets decreases. So this helps to decrease the pollution level.

Background History

An environmental air pollution monitoring system based on the IEEE 1451 standard for low cost requirements

The Basic Concept Of Air Pollution Detection Is To Be Used For Detection The Concentration Of Primary Like Carbon Monoxide, Carbon- Dioxide, Sulfur- Dioxide, Nitrogen Dioxide which Are The Directly Or Indirectly effect On Environment And Bio-diversity.

Remote monitoring system with wireless sensors module for room environment

The Basic Concept of Remote Monitoring system is to detect the pollution for room environment from anywhere in a particular range by detecting the unwanted gases present in the room it can also help us to prevent the upcoming loss of property and the negligence.

An Air Quality Monitoring System For Urban Areas based on the technology of Sensor Network

The Basic Concept of An Air Quality Monitoring for Urban Areas is used to measure the quality of air in the infected area by using sensors. So it detect the pollutant air from the environment where it highly effect on human like Asthma ,Lung Disorder etc.

IV. BLOCK DIAGRAM

Block diagram for civil application

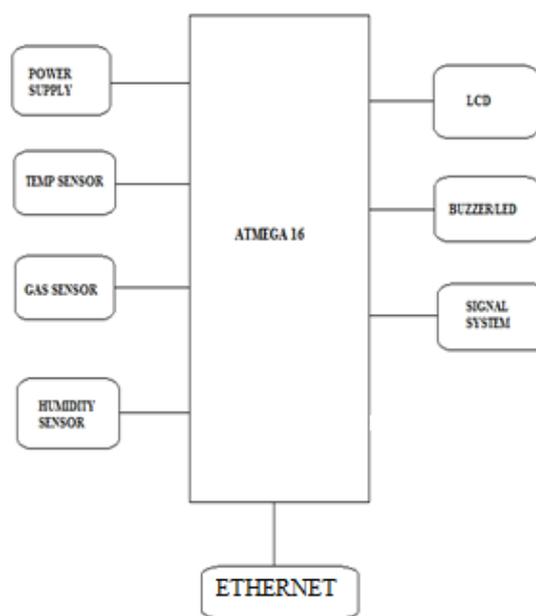


Fig 1. Block diagram forcivil application.

- a) **Temperature sensor:** The purpose of temperature sensor is to sense the temperature from the atmosphere and provide to the micro controller as input.
- b) **Gas sensor:**The gas sensors take the gas as input and provide the sufficient value which is associate with the range of gas given by user, as the gas level increases and when it reached to critical value it provides the data to micro controller and after that by providing the instructions to micro controller the gas level gets minimize.
- c) **Humidity sensor:** The humidity sensor sense the humidity in the atmosphere and up-to certain level it gets provide the value of humidity in air. And value is provided towards micro controller for next processing.

- d) **Micro controller:** It is the decisive part of whole arrangement plays the role of interface between input terminals and output terminals. Micro controller takes the data from respective sensors then provide it to the output terminals by taken every instruction into consideration. So basically this component of module acts as mother component.
- e) **LCD:** It acts as output terminal of the module has 16*2 specified bits, when gas level gets increase it displays on the LCD also it continuously provides the data from input modules.
- f) **Signal and System:** It basically acts as the controller of the signals, when particular gas level increases it alert module and after that it diverts the signal or provides the delay unless and until the traffic gets clear.
- g) **Solenoid:** The basic work of the solenoid to cut the artery of incoming hazardous gases from industrial plant.
- h) **ESP module:** The basic ESP creates separate internet wi-fi in surrounding area.
- i) **LED:** The LED blinks when gas level reaches to the critical level and also these LED are mounted on the signal and system components.
- j) **Buzzer:** When the gas level increases buzzer will blow.

Block diagram for industrial application

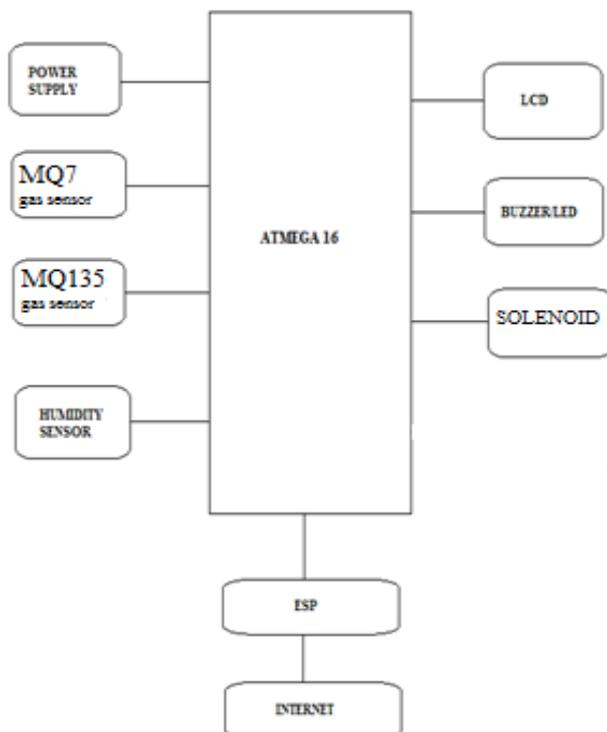


Fig 2. Block diagram for industrial application.

V. INDUSTRIAL APPLICATION WORKING

In industrial purpose we can use this module as follows:

- 1) When hazardous gases exceed from the industry due to which it creates the air pollution in the surrounding area.
- 2) Hence to reduce that amount of air pollution we use to block the exit path for some time with the help of DC motor and SOLENOID.
- 3) When the gases level increases up to critical level it sense by gas sensor after that Red led gets blinks followed by buzzer which is helpful for provide the danger alarm for industry shows that gases level gets increases up to dangerous limit if after alarm if no action taken by industrial authorities then after 1 min DC motor starts rotating due to that solenoid block the path of gases automatically.
- 4) This process is on for 5 min unless and until the level of gases gets reduced.
- 5) After that DC motor starts rotating in reversed direction and SOLENOID gets clear the path.

VI. COMPONENT SPECIFICATION

Micro controller At Mega 16 :

Micro controller is the main block in this system . It gives control to sensors, ETHERNET, LCD, LED and buzzer. It has inbuilt ADC which is a strong advantage

Features:-

- High-performance, Low-power AVR® 8-bit Micro controller
- 512 Bytes EEPROM
- Two 8-bit Timer/Counters with Separate Prescaler and Compare Modes
- One 16-bit Timer/Counter with Separate Prescaler Compare Mode, and
- 8-channel, 10-bit ADC
- I/O and Packages
- 32 Programmable I/O Lines
- 40-pin PDIP, 44-lead TQFP, and 44-pad MLF
- Operating Voltages
- 4.5 - 5.5V for ATmega16

Sensors

Gas Sensor

Sensitive material of MQ 7 & MQ135 gas sensor is CO, SnO₂, which with lower conductivity in clean air. When the target volatile gas exist. When the concentration of gas rises it is because sensors conductivity is high. MQ7, MQ135 gas sensor has high sensitivity to Carbon monoxide, Ammonia, Sulfide and Benz steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different application.

ESP module

It is the portable WI-FI creator which creates wi- fi network near the area.

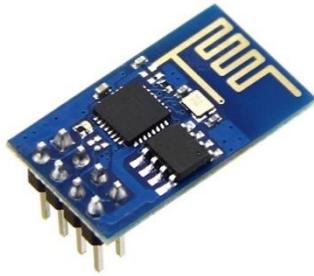


Fig 6. ESP Module

Buzzer

It will blow when module reaches to the critical level.

VII. FLOWCHART

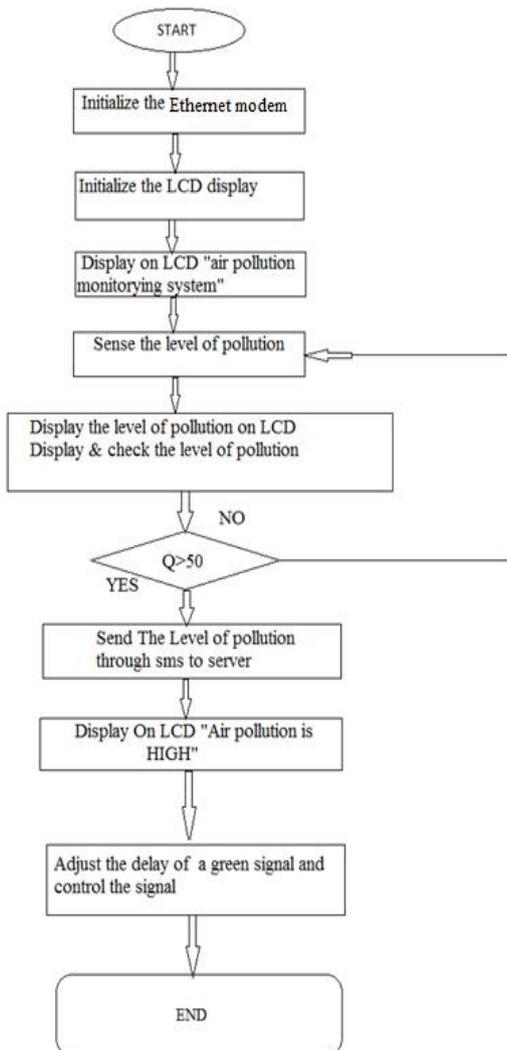


Fig 7. Flowchart

VIII. RESULT

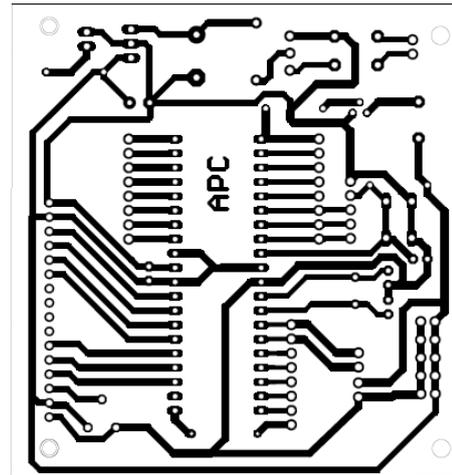


Fig 6. Layout

Thus in our module we selected different gas sensors like MQ7, MQ135, temperature sensor (LM35), and humidity sensor, that are detect the pollution in respective civil and industrial area and controls the pollution by signal system and display the result on the LCD display and by using solenoid we control pollution in industries respectively.

IX. SUMMARY

Hazardous gas Monitoring System provides real-time information about the level of air pollution in these regions, & provides alerts in cases of drastic change in quality of air. This information can be used by the peoples to take prompt actions such as evacuating people or sending emergency response team. The system utilizes remote controlled rover to collect pollutant gases such as CO, NO2, and SO2. The pollution data from sensor array is provide to a central server that makes this data provides on the Internet. The system extract hazardous gas levels and their conformance to local air quality standards. The usage of the semiconductor sensors adds several advantages to the system such as low cost, quick response, low maintenance, ability to produce continuous measurements, etc.

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