Air Quality Detection and Display System

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Abstract: Air pollution monitoring is extremely important as air pollution has a direct impact on human health and environment. In this paper we introduce a wireless sensor network system for participatory air pollution monitoring. The traditional air quality monitoring system, controlled by the Pollution Control Department, is extremely expensive. Analytical measuring equipment is costly, time and power consuming. In contrast to traditional air pollution monitoring stations, we present the design, implementation, and evaluation of low power, low cost WSN based Air Pollution Monitoring System which provides real time monitoring of polluted materials at proper locations by using distributed (real time) air pollution monitoring systems

Index Terms **– MQ7 Co detector, MQ 135 Air quality sensor, Wireless Sensor Network and ATmega 16 Controller.**

I. INTRODUCTION

Air pollution is one of the most important factors affecting the quality of life and the health of the increasingly urban population of industrial societies. In many cities, the air is polluted by emissions from sources such as cars and trucks, power plants, and manufacturing processes. When gases and particles from those activities accumulate in the air in high enough concentrations, they can be harmful for human health, an environment. Often, terrain and meteorological conditions complicate air quality issues in the area. Although the national trend is toward better outdoor air quality, there are some urban areas in which no improvement has taken place. Concentrations of outdoor air pollutants vary from day-to-day and even during the course of a day.

For health protection, the public needs timely information about air quality and other factors (e.g., weather conditions) that affect it. An access to air quality forecasts allows residents to reduce their exposure when the pollutant concentrations are high. This is important particularly to people who are sensitive to certain pollutants' harmful effects. For example, people with asthma may be sensitive to ground-level ozone and sulphur dioxide. The major motivation behind our study and the development of the system is to help the government to devise an indexing system to categories air pollution in India. The project is to build an air pollution monitoring system, so a detection system for multiple information of environment is designed in this project.

This project is built for low cost, quick response, low maintenance, ability to produce continuous measurements. The main goal of this project is to monitor the air pollution, hazardous gases and increase awareness about pollution by using air pollution monitoring system. Present state of the air quality control in almost all industrial centers in our country is based on taking samples one or few times a day, which means that there is no information about time distribution of polluted materials intensity during day. This is the main disadvantage of such system. In the area, there are two methods to use to monitor air pollution at present. The one is passive sampling (non automatic), and the other is continuous online monitoring (automatic). The advantage of the passive sampling method lies in that the monitor equipment is simple and inexpensive, but it can only get on-site monitoring parameters in a certain period, cannot provide real-time values. Meanwhile, the results of monitoring effect by the man factor largely and it will seriously damage the health of the monitoring man in the site of high concentration of harmful substances.

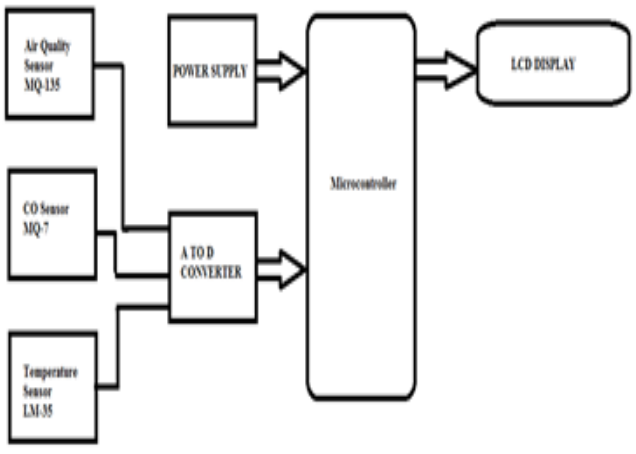

Fig 1 Block Diagram of System

II. METHODOLOGY

- The basic principle of working of the proposed project is the sensing of data from the sensor.
- Convert the analog data into the digital form.
- Process the digital data and display it on LCD.

2.1 Aims and Objectives

- To create a tool which will monitor the quality of air of our environment.
- Content of different gases present in air or area around us.
- Display the data on LCD.

III. HARDWARE REQUIREMENT

3.1 Arduino MQ-7 Semiconductor Sensor for 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 more 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.

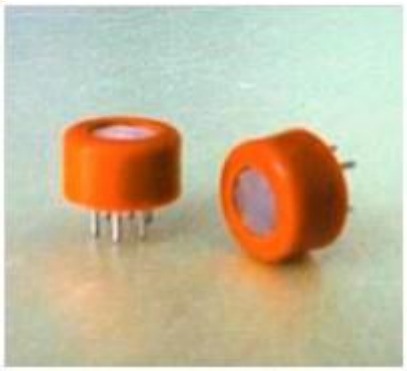

Fig 2 MQ-7

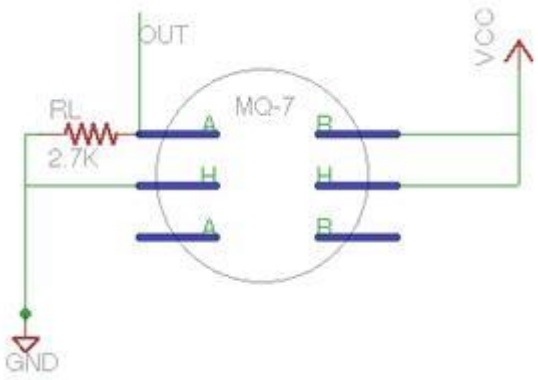

Fig 3 MQ 7 Pin diagram

3.2 MQ-135

Wide detecting scope, Fast response and High sensitivity, Stable and long life and Simple drive circuit. Structure and configuration of MQ-135 gas sensor is shown as Fig. 1 (Configuration A or B), sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-135 have 6 pin ,4 of them are used to fetch signals, and other 2 are used for providing heating current.

Fig 4 MQ 135 Sensor

3.3 16*2 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

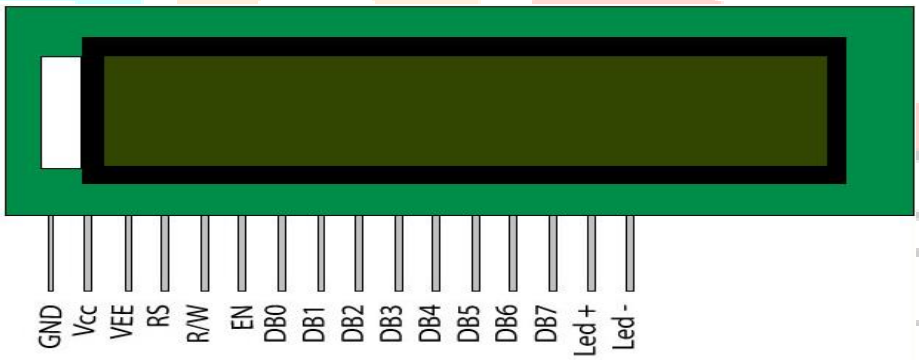

Fig 5 16*2 LCD Pin Diagram

3.4 ATmega16 microcontroller

ATmega16 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. Atmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about RISC and CISC Architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. Atmega16 can work on a maximum frequency of 16MHz.ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes.

The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD.ATmega16 has various in-built peripherals like USART, ADC, Analog Comparator, SPI, JTAG etc. Each I/O pin has an alternative task related to in-built peripherals. The following table shows the pin description of ATmega16.

3.5 Analog to Digital convertor (ADC 0808)

ADC0808 is an 8 bit analog to digital converter with eight input analog channels, i.e., it can take eight different analog inputs. The input which is to be converted to digital form can be selected by using three address lines. The voltage reference can be set using the Vref+ and Vref- pins. The step size is decided based on set reference value. Step size is the change in analog input to cause a unit change in the output of ADC. The default step size is 19.53mV corresponding to 5V reference voltage. ADC0808 needs an external clock to operate unlike ADC0804 which has an internal clock. The ADC needs some specific control signals for its operations like start conversion and bring data to output pins. When the conversion is complete the EOC pins goes low to indicate the end of conversion and data ready to be picked up.

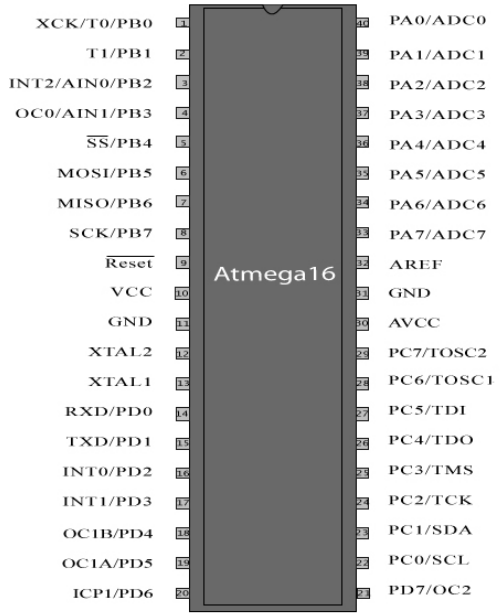

Fig 6 ATMega 16 Pin Diagram

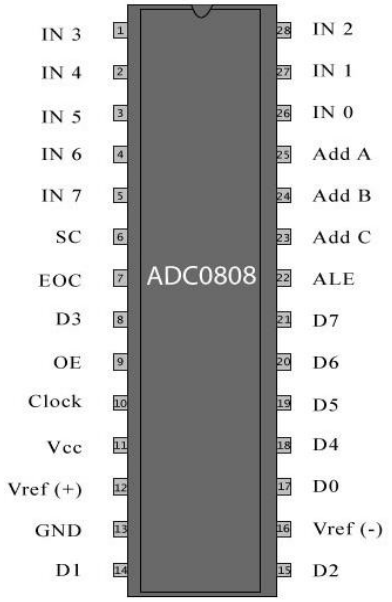

Fig 7 ATMega ADC 0808

IV. RESULT

Hence we can detect quality of air in environment by using Sensors MQ7 & MQ 135 they detects level of Carbon Monoxide, Benzene, ammonia, etc. in air and that result display on LCD 16*2 using controller ATmega 16.

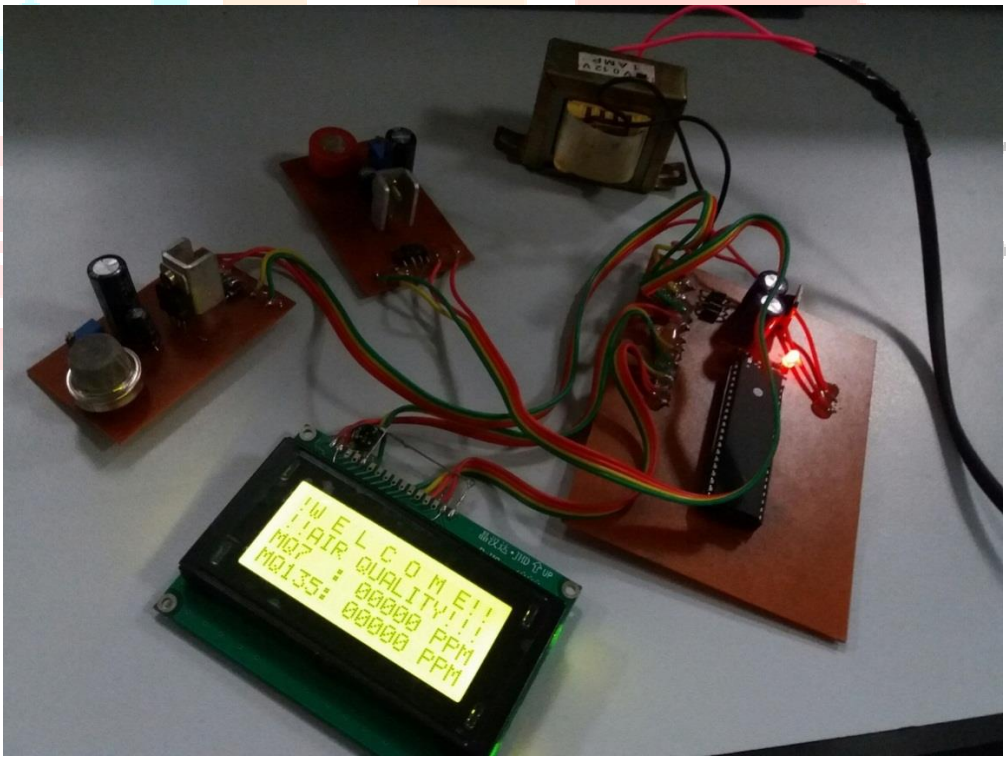

Fig 8 System Output display

V. CONCLUSION

The main goal of this project is to monitor the air pollution, hazardous gases and increase awareness about pollution by using air pollution monitoring system. Present state of the air quality control in almost all industrial centers in our country is based on taking samples one or few times a day, which means that there is no information about time distribution of polluted materials intensity during day. This is the main disadvantage of such system.

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