IOT BASED AIR POLLUTION MONITORING SYSTEM

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Abstract:
we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air Quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.
Previously we have built the LPG detector using MQ6 sensor and Smoke detector using MQ2 sensor but this time we have used MQ135 sensor which is the best choice for monitoring Air Quality as it can detects most harmful gases and can measure their amount accurately. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile. We can install this system anywhere and can also trigger some device when pollution goes beyond some level, like we can switch on the Exhaust fan or can send alert SMS/mail to the user.
Index Terms: Arduino, Gas sensor, Buzzer.

Problem statement
To know about which area contains more pollution and escape from that particular place easily.

Aim
To prevent, control and abate pollution of streams, wells, land and air to protect the environment from any degradation by effective monitoring and implementation of pollution.

1. INTRODUCTION

Here to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol ,benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.
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1.2 Purpose of this project

Air pollution occurs when harmful substances including particulates and biological molecules are introduced into Earth's atmosphere. It may cause diseases, allergies or death in humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Human activity and natural processes can both generate air pollution.

2. EXISTING SYSTEM.

The commercial meters available in the market are Fluke CO-220 carbon monoxide meter for CO, Amprobe CO2 meter for CO2, ForbixSemicon LPG gas leakage sensor alarm for LPG leakage detection. The researchers in this field have proposed various air quality monitoring systems based on WSN, GSM and GIS. Now each technology has limited uses according to the intended function, as Zigbee is meant for users with Zigbee trans-receiver, Bluetooth.

3. PROPOSED SYSTEM

In this project we are going to make an IOT Based Air Pollution Monitoring System in which we will monitor the Air Quality over a web server using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.

4. REQUIREMENTS

4.1 Hardware Requirement:-

- MQ135 Gas sensor
- Arduino Uno
- Wi-Fi module ESP8266
- 16X2 LCD
- Breadboard
- 10K potentiometer
- 1K ohm resistors
- 220 ohm resistor
- Buzzer

4.2 Software Requirement

- ARDUINO 1.6.13 software
- embeded c language

4.1.1. Arduino Uno (R3)

The Uno is a great choice for your first Arduino. It's got everything you need to get started, and nothing you don't. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, a reset button and more. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

4.1.2. ESP8266 WiFi Module

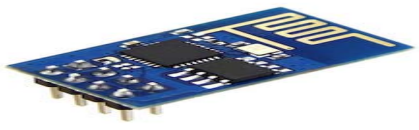

Fig: 4.1.2.1 Wifi Module(ESP866)

This is a serial module with a built-in TCP/IP stack, so you can use it standalone but you will be likely limited. You need a FTDI to connect this module to your computer, and start communicating with it. FTDI is a common name for USB-to-TTL (or serial) converter, FTDI being the company making and selling these products.

4.1.3 Wiring

I got a *ESP-01* version of this module, which has 8 pins: VCC, GND, CH_PD, TX, RX, RST, GPIO0, and GPIO1. Wiring the module is not complicated and should be the same for all versions of this module:

- VCC needs **3.3V.**
- CH_PD has to be pulled-up (meaning it has to be connected to 3.3V as well).
- GND is connected to FTDI's GND pin.
- RX is connected to FTDI's TX pin, because you want to create a loop: RX ->TX =>RX ->TX.
- TX is connected to FTDI's.
- Other pins are left floating.

5. SYSTEM DESIGN

The term design describes a final system and the process by which it is developed. It refers to the technical specifications that will be applied in implementations the candidate system. The design may be defined as the process of applying various techniques and principles for the purpose of defining a device, a process or a system in sufficient details to permit its physical realization. The designer's goal is how the output is to be produced and in what format samples of the output and input are also presented. Second input data and database files have to be designed to meet the requirements of the proposed output. The processing phases are handled through the program Construction and Testing.

Finally, details related to justification of the system and an estimate of the impact of the candidate system on the user and the organization are documented and evaluated by management as a step toward implementation. The importance of software design can be stated in a single word Quality". Design provides us with representations of software that can be assessed for quality. Design is the only way that we can accurately translate a customer's requirements into a finished software product or system without design we risk building an unstable system, that might fail it small changes are made or may be difficult to test, or on who's quality can't be tested. So it is an essential phase in the development of a software.

7. PROJECT DESCRIPTION:

MQ135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2 and some other gases, so it is perfect gas sensor for our Air Quality Monitoring System. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million). MQ135 gas sensor gives the output in form of voltage levels and we need to convert it into PPM. So for converting the output in PPM, here we have used a library for MQ135 sensor, it is explained in detail in "Code Explanation" section below.

Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. When it exceeds the limit of 1000 PPM, then it starts cause Headaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond 2000 PPM then it can cause increased heart rate and many other diseases.

When the value will be less than 1000 PPM, then the LCD and webpage will display "Fresh Air". Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display "Poor Air, Open Windows". If it will increase 2000 then the buzzer will keep beeping and the LCD and webpage will display

"Danger! Move to fresh Air".

8. RESULTS

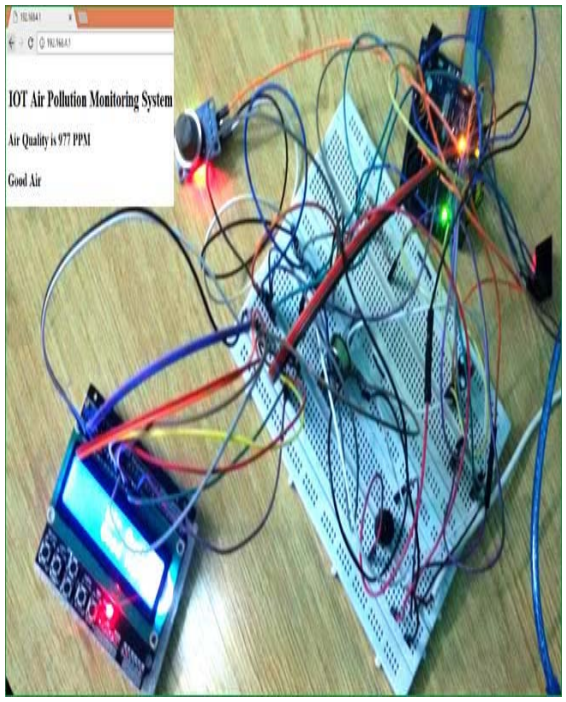

Fig:8.1. Air Pollution Monitoring System

The code has been computed successfully. It is user friendly, and had required options, which can be utilized by the user to perform the desired operations

The code need to be dumped in the Arduino IDE software. The goals that are achieved by the code.

- Less number of human involvement
- Efficient management of water usage
- Cost effective
- Easy construction of the sensors on the tank
- Reduced errors due to human intervention
- Portable and flexible for further enhancement

References

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