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Environment change alert system using IoT

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Abstract— Pollution is an undesirable change in our daily life. It has negative effects on human health, wildlife, and plants. The Environment change alert system is used to detect the harmful gases and noise present in the environment. By using IoT Technology, authorities will continue monitoring a particular area and alert this area / try to Control the situation. This will allow authorities to check the live status of the Environmental conditions in different areas and to control it. The high decibel sound and toxic gases present in the environment which directly affects the human's health. It is very challenging to control the polluting area.
To overcome these issues this system is implemented. The noise is detected by using various sensors in the system. It detects air polluting gases, measurement of sound level and temperature these parameters are monitored by using IoT technology. This technology gives the live status of a particular area to the user. User can access this information through server /mobile anytime, anywhere.

Keywords— pollution control, air and sound quality, temperature. Real-time status, Internet of Things(IoT), Sensors.

I. INTRODUCTION

Pollution affects human health in many ways. Noise pollution affects health and behaviour. The unwanted sound (noise) can damage physiological health, high-stress level, sleep disturbances, hearing loss, and other harmful effects. Air pollution has negative impacts on the quality of water, soil and many ways. It also causes the greenhouse effect and side effects on ozone layer thickness. The thickness will depend on the ambient pollutant levels presented in both cities and rural areas. It reflects negative relation non-methane hydrocarbon and nitrogen oxide in the air. There are many sources of air and sound pollution such as vehicles, high decibels sound, industrial wastage, carbon sources.
The purpose of this project is to measure the contents of gases present in air by using sensors such as **MQ2, MQ7** which detect CO (carbon monoxide), CO_2 (carbon dioxide), methane, i-butene and alcohol gas which cause air pollution. And MIC sensor used to measure high decibels sound. Firstly taking the readings of all sensors in two different environmental situations. This project is used to design and develop real-time smart monitor alert system for a particular area to observe environmental changes.

II. LITERATURE REVIEW

In paper [1], previously existing system such as LPG detector which monitors air pollution and will triggering alarm was used. This information is displayed on LCD as well as on a webpage. This system detects the most harmful gases present in air and measures the amount of pollution accurately.
In paper [2], authors have proposed an Environmental Air Pollution Monitoring System for monitoring the concentrations of major air polluting gases. It is tested by complying in this research, real-time monitoring of three gases are simulated in a normal environment and successfully tested in different areas.
In paper [3], detection of various gases like CO, $CO_2$and LPG gas leakage sensor, alarm for LPG detection is discussed. The commercial meters such as carbon monoxide meter is available in the market. Now every technology has limitations according to their functions. Zigbee is meant for users with Zigbee trans-receiver, Bluetooth allows us to monitor and check live air quality as well as sound pollution in an area through IoT.

III. SYSTEM ARCHITECTURE

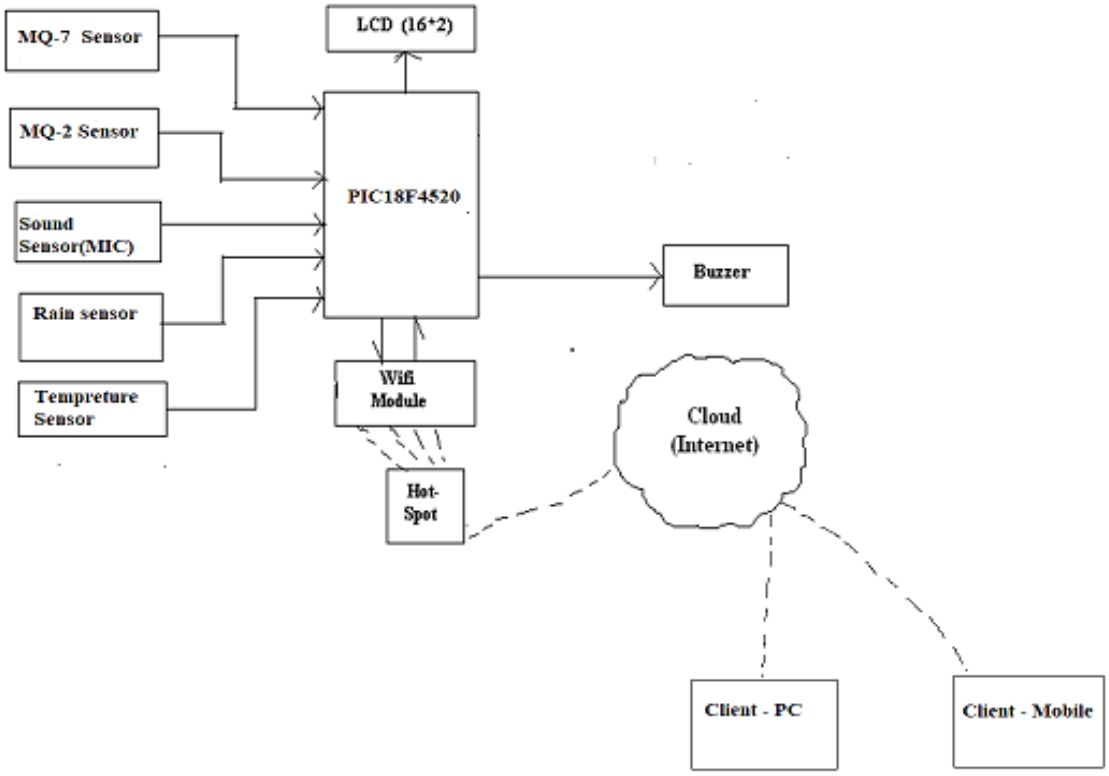

fig.1 Block Diagram

IV. BLOCK DIAGRAM DESCRIPTION

The system architecture is as shown in fig.1 above. It consists of a microcontroller (PIC18f4520) and several gas sensors such as MQ2, MQ7, and sound sensor MIC is used.
MQ2, MQ7 sensor detects various gases present in environment like CO, CO_2 and it will provide an analog value which is given to the ADC port of the Microcontroller. It will processes this data and then converted into a digital value with the form of voltages by using analog to digital converter (ADC) and also the same for the sound sensor. This digital value transmitted over application also displayed on LCD. The System uses network devices and the Internet of Things (IoT). Controller requires a 5v power supply and 3.3v supply to Wi-Fi module. ESP8266IC is used to establish a connection between the controller and Smartphone/PC.
The end user can be a PC client or Mobile phone. Communication is established between the Wi-Fi module and internet through the AT-Command system and user as side displaying information in ASCII format. This information also displaying on the webpage, any user can access this information continuously through the webpage.

V. METHODOLOGY

The proposed project is an expansion of smart monitor and measurement

- To analyze and research, the data required for the project will be collected and the option which is open for implementation will be explored.
- In the next phase, the selection of the component has been done .For example microcontroller, sensor, etc.
- The simulation will be done by using the simulation tool 'Proteus.'
- The components will be mounted on the PCB.
- The building and testing of the proposed system has been done.
- Then the output of the system which gives information about the environmental parameter.
- The communication between the user and the information is done with the WI-FI Module.

VI. SYSTEM COMPONENTS

1] MQ7 SENSOR:
This sensor detects carbon monoxide material of the MQ7 gas sensor is Sno2. It makes detection method of cycle high and low temperature. It detects CO when low temperature (at 1.5v) and high temperature (at 5.0v). It cleans the other gases absorbed under low temperature.

Working Principle:
The MQ7 gas sensor is composed of the micro AL203 ceramic tube; Tin dioxide (Sno2) sensitive layer, measuring electrode and heater are fixed into a crust made of plastic and stainless steel net. When the sensor is shifted from clean air to carbon monoxide (CO), the output signal measurement is made within one/two complete heating periods (2.5minutes from high to low voltage).

Specification:
1. Circuit voltage-5v ± 0.1
2. Heating voltage(High)-5v ± 0.1
3. Heating voltage(Low)-1.4v ± 0.1
4. Load resistance-Adjustable
5. Heating resistance-33Ω ± 5%

2] MQ2 SENSOR:
The MQ2 gas sensor has an electromechanical sensor. The device that can be detects the presence of gases in an area. A gas detector can sound an alarm to operators in the area where the leak is occurring. This type of device is important because many gases that can be harmful.

Working principle:
The MQ2 gas sensor has an electromechanical sensor, which changes its resistance to different concentration of varied gases. The sensor is connected in series with a variable resistor to form a voltage circuit and the variable resistor is used to change sensitivity. When one of the gases like LPG, Propane, methane, i-butane, alcohol, hydrogen and smoke. This voltage value used to find the resistance of the sensor by knowing the reference voltage.

Specification:
1. Working voltage-4.9(min)-5.1(max)
2. Heating consumption-0.5mw(min)-800mw(max)
3. Load resistance-Adjustable
4. Heater resistance-53Ω
5. Surface sensing resistance-3kΩ(min)-30k(max)

3] Sound Sensor(MIC):
The sound sensor is a small board that combines a microphone and some processing circuitry. It provides audio output as well as a binary indication of the presence of sound and analog representation of its amplitude based on power amplifier and electric microphone.

Specification:
1. Operating voltage-1.5(min) 10(max)
2. Decreasing voltage- -3Db
3. Sensitivity- -45(min) to -39(max) in dB
4. S/N ratio- min 58Db
5. Output impedance-2.2kΩ
6. Current consumption-300µA

4] ESP8266 Wi-Fi Module:
Wi-Fi module transmits the data to the server. This is a serial communication module build-in TCP/IP protocol. Communication between the Wi-Fi module and IoT get established by Using AT Commands. The data will be received by the client (PC, Mobile)
1. ESP8266 requires 3.3v
2.802.11 b/g/n protocol
3. Wi-Fi Direct (P2P), soft-AP
4. Integrated TCP/IP protocol stack

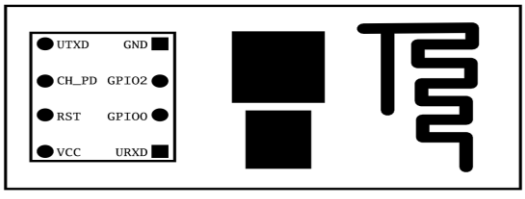

Fig 1.2 Wi-Fi Modules

VII. OBSERVATIONS AND RESULTS

When CO and CO_2come in the contact with MQ2 and MQ7 sensors the chemical reaction will happen inside the sensor and the semiconductor layer is formed so that currently starts to flow through a sensor. The output voltage of the sensor is compared with the reference/ideal voltage of that sensor.
The testing of MQ7, MQ2, MIC and temperature sensor is done with the help of PIC microcontroller. By considering readings under two conditions; the 1st condition in normal environment and 2nd in noisy Environment
Under normal environment observed and took a few readings with the reference of ideal values of the sensors in PPM. And for the noisy environment, we created a polluted area for CO, CO_2 gas by using lightening joss sticks (Agarbatti) and a high Sound was also generated. The sensors output was observed to be similar to the ideal output. With the polluted environment, noise was detected from the variation in sensor outputs.
The following table shows Observed readings of the sensors:

VIII. OBSERVATION TABLE

Table 1.

Sr. No	Sensors	Ideal Ranges	Observed values in Normal Environment	Observed values in Noisy Environment
1	MQ2 - CO2	385ppm-10,000ppm	350ppm	490ppm
2	MQ7 - CO	100ppm-2000ppm	70ppm	162ppm
3	MIC	65dB	30dB	66dB
4	LM35		34^{o}c	35^{o}c

IX. CONCLUSION

In this paper, the proposed system is the air and sound pollution monitoring system. This system can be easily installed in different areas. Sensors output will gives the different pollution levels according to the situation. In the different time intervals in a day we will get different pollution levels of the area. Aim of this project is to monitor the environmental condition. The system gives the live alert of environmental change.

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