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Tracking of Harmful Gases and Radiation Detection using IoT

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Abstract: ***In India day by day the number of industries are increasing and growing to increase the economic factor of the country which leads to industrial disaster. Every year industrial disaster occurs which leads to death of human life. According to Indian survey 3562 and 51124 lives were undergone to fatal and non fatal industrial disasters due to improper security, environmental factors etc… To overcome form these problem this project is developed and to track the harmful gases and radiation using Internet of Things where the microcontroller as been used and respective gas detection sensors are connected to the microcontroller to detect the toxic gases and harmful radiation. This information is stored on the cloud using IoT hence triggers the alert message to the user regarding disaster and the data can be seen by multiple number users about the toxic gases and radiation is also a main advantage thus it helps the people around the industries as well as the workers through alarm.***
Keywords: Harmful Radiation, Toxic Gases, Internet of Things, Industrial disaster.

I. INTRODUCTION

Industrial disasters occur mainly due to the leakage of harmful gases. The leakage of toxic gases can cause environmental pollution. The owner of the industry mainly concentrates on the profit they do not focus upon the surrounding people and the workers. Initially, industries are located in the outskirt of the city but nowadays, the industries are located inside the city for the easy transportation of the raw materials and thus cause severe respiratory disorders due to the emission of toxic gases. Industrial disaster occurs due to the equipment and machine failure, human error and improper security, etc The world's worst industrial disaster due to gas leakage was recorded on 3 Dec 1984 in Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madya Pradesh.

Figure 1: Bhopal gas tragedy.

Figure 2: Industrial disaster due to gas leakage.

Day-to-day monitoring of leakage gases is very important and this can be done by the internet of things. A wide range of sensors is available for sensing the various harmful gases. The modern method of solving a lot of problems by applying the system with the internet of things. If the system is applied to the internet of things it permits transparency, good performance, and control.
Node MCU is used as a microcontroller that is connected with the various gas sensors which detect hazardous gases. The temperature and humidity sensors are also used to monitor environmental factors. If the leakage of the gases increases above the set value it sends the alert message to the user and the buzzer sounds continuous which indicates the danger in the system. The speed of sending data must need high in the accident area and thus the internet of things is used for transmitting and receiving data. The monitoring of toxic gas and radiation in real-time by using the internet of things can be improved the ability to detect poisonous gases and radiation.

II. LITERATURE REVIEW

This section discuss about the existing system. The Arduino is connected with the sensors and the IoT module, this system discloses multiple harmful gases and monitors the leakage gases. The output about the gas leakage can be seen in the android app[1].AVR microcontroller ATMEGA16 is used. To the microcontroller, sensors are connected to detect the gases like LPG, Butane, Propane, and other flammable gases.GSM module is used to get quick information about the leaked gases and other outputs are buzzer, LCD display[2].Arduino(UNO R3) microcontroller is connected with input as Butane senor, temperature senor, gases sensor, alcohol sensor, and power supply. The leaked gases are displayed in the LCD, the internet of things module is used for the immediate alert message[3]. It presents a wireless sensor network based on the precautions taken for the gas leakage in the environment by using the internet of things. When the leakage of gases exceeds the set point it sends an alert message to the user and it is stored on the cloud, it also draws pictorial statistics[5].This paper describes the wireless low power toxic gas detects based on ADuCM360, it monitors the toxic gases with the sensor technology and the wireless technology[5].

III. PROPOSED SYSTEM

Industries are increasing day by day, Industrial disaster occurs mainly due to leakage of harmful gases. IoT platform is the best way to store the information on the cloud.

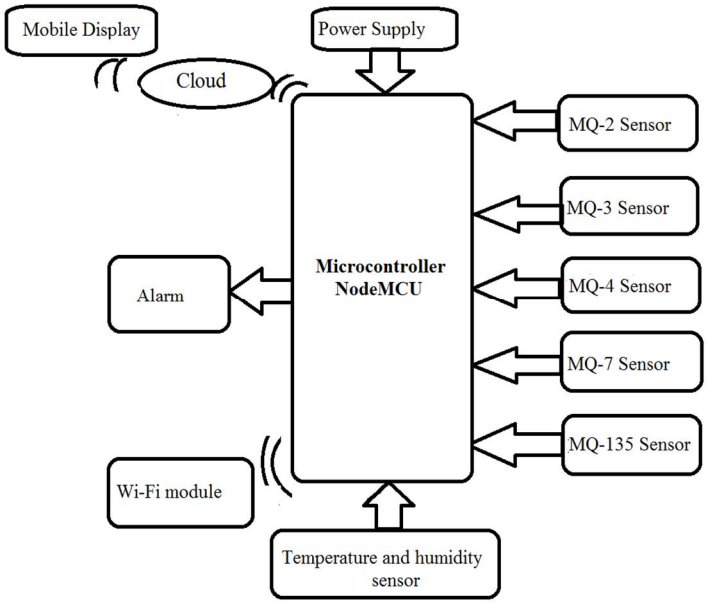

Figure 3: Block Diagram of Tracking of Harmful gases and Radiation Detection using IoT.

The tracking of harmful gases and radiation detecting device consist of three major components as shown in figure 3

A. Gas sensors i.e.,MQ-9, MQ-135, MQ-4, MQ-7 and temperature and humidity sensor.
B. Wi-Fi module.
C. Microcontroller.

The tracking of harmful gases and radiation detection using IoT is shown in the above figure 3 where the four types of gas sensor are connected to the microcontroller where microcontroller is the heart system. The connected four sensors are used to detect the different harmful gases and radiation. Then the sensor value feed to the microcontroller, the microcontroller receives the input value and compare those value with the set point and triggers the indication message to the user when the actual value exceeds the set value and also initiates the beep sound so that the user and the employees can be alerted. The temperature and humidity sensor use to measure the environmental condition of the industries which helps to reduce the pollution. Here the IoT is used as a mediator between the microcontroller and the user. Also stores the input and output value on cloud. Therefore the results are display on the Blynk app.

IV. HARDWARE DESCRIPTION

This section gives information about hardware components used

A. NodeMCU[ESP8266]

NodeMCU is an open-source to design an IoT application at low cost with a less integrated circuit. The NodeMCU of ESP8266module has an inbuilt Wi-Fi module in it. It has digital pins, analog pins, and serial communication protocols. It can be programmed easily with scripted language. The input voltage given to the nodeMCU is 5volts.,

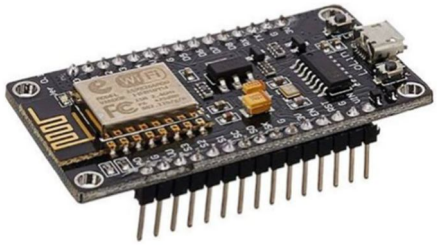

Figure 4: NodeMCU 8266

B. MQ-2 Sensor

MQ-2 gas sensor detects LPG, alcohol, propane, hydrogen, methane, and smoke.it ranges from 200 to 10000ppm, this gas sensor is a type of metal oxide semiconductor. It works on the input voltage of 5volts. The combination of gas and smoke can be detected by using this sensor.

Figure 5: MQ-2 sensor

C. MQ-3 Sensor

MQ-3 gas sensor is highly sensitive towards gases like Alcohol, Benzine, hexane, methane, LPG and carbon monoxide. MQ-3 gas sensor is stable, good resistance and quick response to the leakage gas. The alcohol content can be measure in mg/L.

Figure 6: MQ-3 sensor

D. MQ-4 Sensor

MQ-4 gas sensor detects methane gas in the range of 300 to 10000ppm, it is low cost and used for various electronic applications. The output of the MQ-4 sensor is seen as an analog voltage. The conductivity is also low in the clean air.

Figure 8: MQ-4 sensor

E. MQ-7 Sensor

MQ-7 gas sensor is highly sensitive to carbon monoxide. The leakage detection range from 20 to 20000ppm. It has a fast response time to the leakage gas. The gas sensor is directly connected to the NodeMCU.

Figure 10: MQ-7 Sensor

F. MQ-135 Sensor

MQ-135 gas sensor detects a wide range of gases such as ammonia, benze steam, and other harmful gases. When the leakage gas value is higher than the predetermined values it sends an alert message to the user when it is connected with the IoT system.

Figure 11: MQ-135 Sensor

G. DHT11

It is an ultro low-cost digital temperature and humidity sensor. The basic temperature and humidity sensor is DHT11 is an electronic sensor that measures and collects data of moisture and the temperature in the environment, the humidity means concentration of water vapour in the air, it is very simple to use, but grabbing of data requires careful timing. It is a highly stable and reliable device.

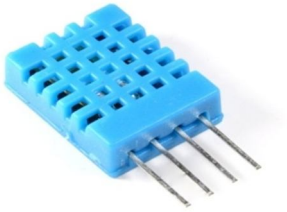

Figure 9: Humidity and Temperature sensor

V. SOFTWARE DESCRIPTION

This section gives brief description about software requirements

H. ARDUINO IDE

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor and compiler. It is mainly used for complying, editing and uploading the codes. It is open-source software that runs on Windows, Mac OS X, and Linux.

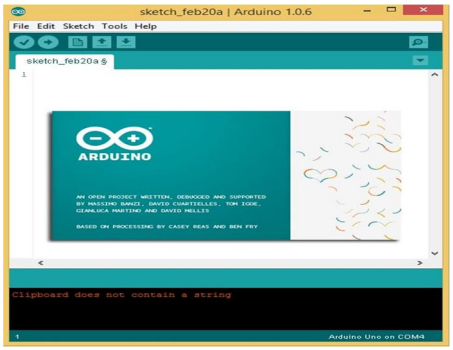

Figure 9: Arduino Software

VI. CONCLUSION

The industries are increasing day by day where sometimes leads to industrial disaster, in turn, affects human life hence the tracking of harmful gases and radiation required to continuously monitor the gas leakage hence this project is designed to detect those leakages by using a smart IoT platform which acts a bridge between a microcontroller and the user. So that the user can easily get the alert message and the respective precaution can be taken to avoid the industrial disaster. However, only certain harmful gases can be detected but it can achieve sensing of different toxic gases using more sensors and more advanced tools are used in a future scope..

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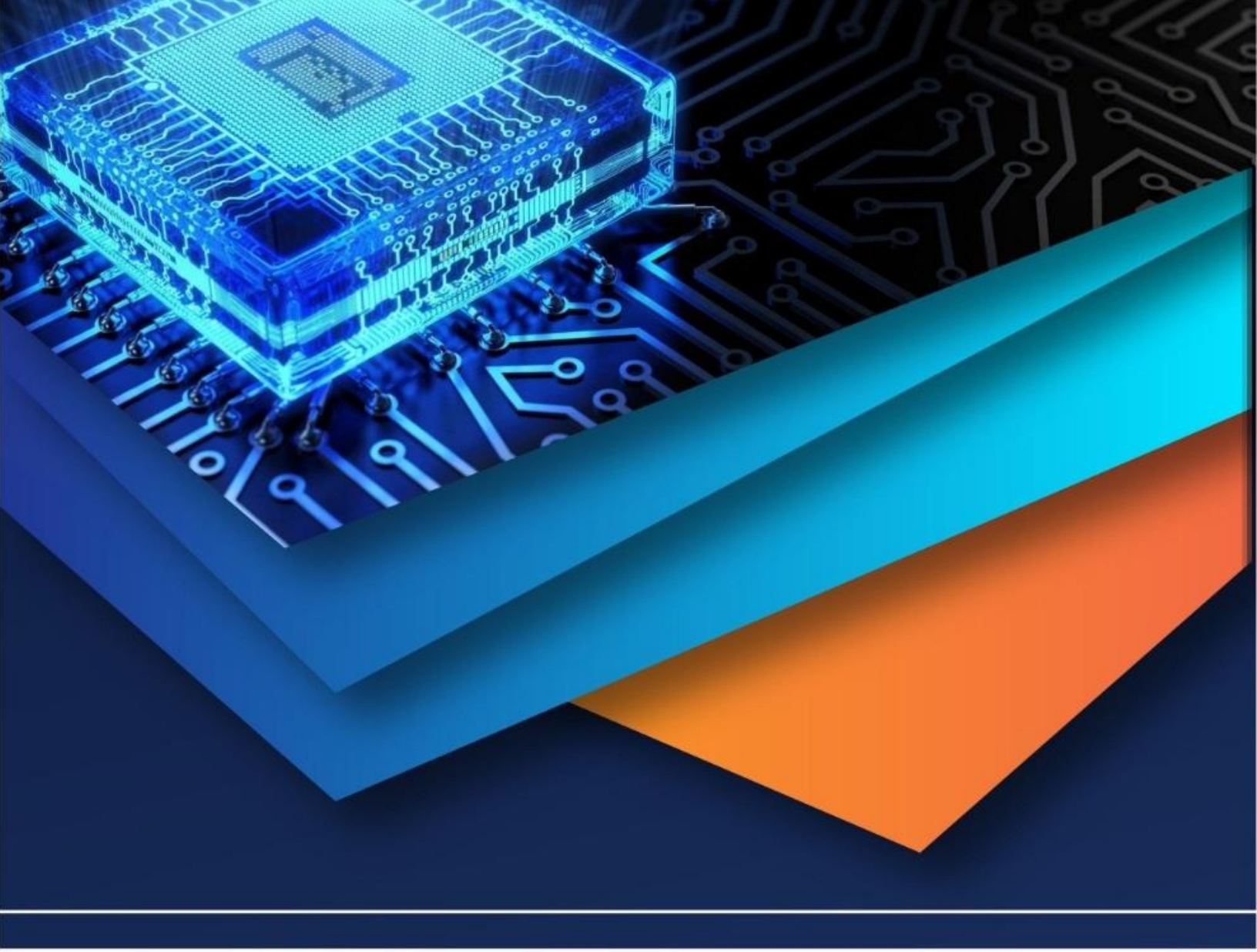

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