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Toxic gas sensor and temperature monitoring in industries using Internet of things (IOT)

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Abstract- — In working environment, the toxic gas leakage accidents are the main reason for workers health and also causes death. The Toxic gas can be detected and monitored by recent technologies using Internet of things. This project is mainly used to reduce the industrial accidents and hazardous. This process is monitored by Internet of things. Arduino Micro controller board is connected with gas sensor, Flame sensor and Temperature senor. The alert message is display by LCD through Arduino. The alert signal arises when the gas level increases above the normal gas level. This can be done by internet receiver channel. The sensor will receive the information about the gas level and it is stored in internet. This will used for analyzing and processing the safety regulations in industrial environment.

Keywords – Gas senor, Alarm, LCD, Internet of Things, Arduino Micro-controller Board.

I. INTRODUCTION

The accidents that occurs in industries is mainly due to leakages of gases. The environmental pollution is the main cause of the pollutants that were releasing by the industries and this also causes the side effects to human beings. It affects not only the humans but also the animals health. The most harmful gases are nitrogen-oxides, hydrocarbons, and carbon monoxide. These gases are the most important causes for number of air pollutants in the atmosphere. This type of hazardous pollutants are mostly released by chemical based industries. Nowadays, the industries are only keeping an eye for profits and development of their reputed industry, but they were not conscious about the atmospheric affects and the health of workers in industries.
The proposed hardware system consists of two sensors , the gas sensor and radiation sensor. These

mainly used to collect data using IOT module. This module can be highly extendable as possible, because the receiving and transmitting data range is very large.

II. LITRATURE REVIEW

2.1 : Detecting The Dangerous Area Of Toxic Gases With Wireless Sensor Networks (2020)
Y.Chen followed the methodology by using IoT, predictive analysis ,wireless networks. And the advantages of this paper was, to detect the values of gases that are continuously detected by the sensors. The disadvantages of this paper was, low accuracy,Network connection failure.

2.2: Gas Leakage Detection And Alerting System Using Arduino Uno (2020)
Syeda Bushra Shahewaz and their team followed the methodology by using IoT, Micro controller, Gas sensors wireless networks predictive analysis.And the advantages of this paper was, overcome the accidents.The disadvantages of this paper was, low accuracy, high cost.

2.3 :An End-To-End Early Warning System Based On Wireless Sensor Networks For Gas Leakage Detection In Industrial Facilities (2019)
Haythem Ahmad Beny Salameh followed the methodology by using wireless sensor networks, IoT and the advantages of this paper was, high accuracy,cost efficient. The disadvantage of this paper was it is not suitable for corporate world and network users.

2.4 : Gas Leakage Detection And Alert System Using Iot(2019)
Sayali Joshi ,Uma karanje and their team followed by the methodology by using IoT,Micro controller, sensors wireless networks. And the advantages of this paper was, more than threshold it will predict that there is leakage situation. The disadvantages of this paper was software failure, hardware failure.

III. EXISTING SYSTEM

The existing system is based on WSN cluster based networks for the gas leakage monitoring purpose. The design layers of

existing system are RF transceiver module, Gas sensors, processor, GSM module. WSN based on the CH nodes operate in single hop and multi hop modes.

The RF modules provides to the ZigBee XBee series with sensor nodes to each cluster. The range of receiver node is 92 and 100 dBm. The XBee pro systems also provided the software intelligent networking usage.

The gas senor(MQ-6) connected to the tunable resister(Rt). It consists of a low power consumption with high sensitivity.

This sensor sense to the isobutane, LPG, propane levels are increased to abnormal range of gases.
The processor module considered the XPic Micro controller 18F4620 in the connectivity of sensor nodes and also the ADC converter to efficient size of memory. The range of data up-to 12 bits for a operations of read and write, call stack and addressing indexes.

The Lithium-ion batteries provided to the system for a high density ranges of battery life. The tricolor LED have been connected to the processor. The power supply modules used to the dc-to-dc converter for the purpose of switch modes and also error amplification parameters. The level of circuit voltage is 5V.

An RS232 interface is used in GSM module. The cellular network is provides to the embedded SMTP, FTP, and stack as TCP and UDP with suitable IP.The range of the data delivery system is 22*22*3 mm with lightweight of 3.2g.

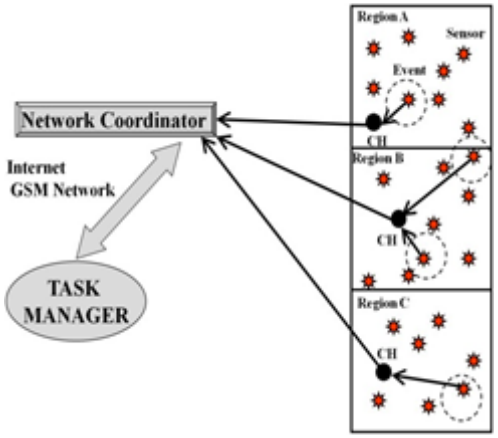

Figure 1. Three regions of WSN with GSM

The above figure shows that the three regions of WSN with GSM system of the existing system.

IV. PROPOSED SYSTEM

A. System Overview

In our proposed work, we implement the movable capability in the device. We can control the movement of the device manually from anywhere by using wireless remote control.
We can monitor the output of the system through the display which present in that device and also can be monitoring by safety control board through the website. We can also control and monitor the system from anywhere by using the IoT.

B. System Components

a) Power supply module : We consider a well regulated power supply of +5v and the current capability of output is 100mA. It consists of a transformer, rectifier, filter and regulator. The step-up transformer with 1:3 ratio. The rectifier section of input is 180 degree to 360 degree. The filter consists of a inductor, capacitor or resister. It controls a time varing signal of the rise time and fall time. The filter output is 110 volts. The use of regulator is maintains the constant level of dc voltage(110v).

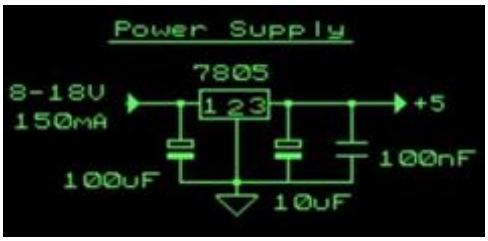

Figure 2 . Power supply circuit

b) Sensors :
MQ-4 sensor : This sensor is mainly used to detect the concentration level of Methane in industries. It is a metal oxide semiconductor of gas sensor.
MQ-135 sensor : It is a air quality sensor used to monitor, measure and detect a toxic range of some specific type of gases like carbon dioxide, benzene, ammonia, alcohol, etc.
DHT-11 sensor : It is a Digital Humidity and Temperature sensor and ultra low cost digital sensor. It is used to measure a range of temperature and the humidity level present in surroundings.
Flame sensor : It is used to detect the fire or flame occurrence in the air.

c) Arduino Micro controller : The microchip AT328P is having a 5v operating voltage and 7-20v of input voltage. It is

consists of 14 digital I/O pins and 6 analog pins. We can connected to the sensors and modules with Arduino for the communication and data delivery system. It measures the sensor readings and further displayed the values of LCD and IoT module.

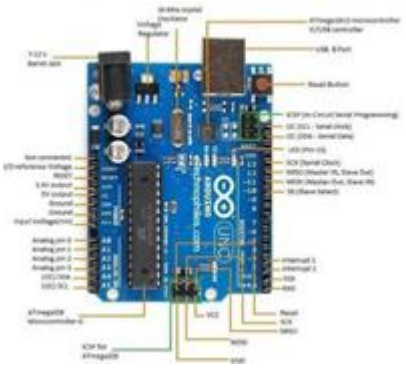

Figure 3.Pin configuration of Arduino

d) LCD : We can consider the LCD with Arduino for the purpose of displaying the values of senors.

e) IoT module : To collect information about the condition of ecology and to find any faults in gadgets, we use light sensor, temperature sensors and level sensors. Home personal computer continuously screens the sensors and controlling the gadgets. Here the client can able to modify settings and can view working and useful of gadgets. The gases are constantly monitoring by the sensors. And it transfers the data to the server and Stores it. If gas level exceeds it's level from the normal range, an alert signal will sent to monitoring team and also to the mobile station of workers (if required).

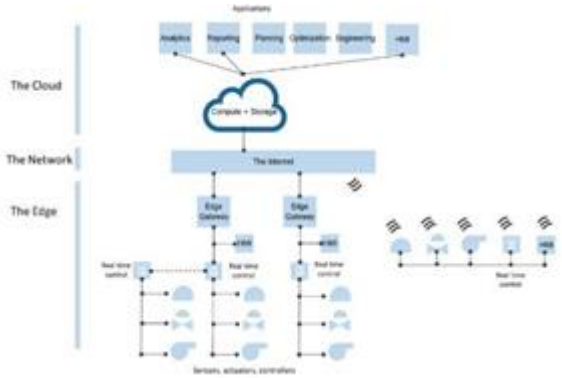

Figure 4. IoT using various systems

C) Block Diagram

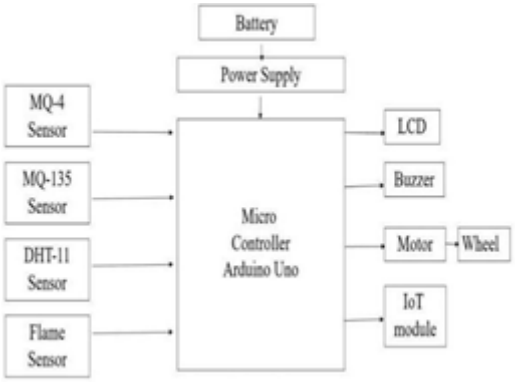

Figure 5. Block diagram of proposed system

The above figure shows that the block diagram of the proposed system. The power supply is connected to the Arduino for the motor. The sensors(MQ-4 sensor, MQ-135 sensor, DHT-11 sensor, Flame sensor) are connected to the Arduino Uno. The values of the sensors are displayed by the LCD. The motor is connected to the wheel for the movement of the device. IoT module is connected to the Arduino Uno for the control of the device.

D) Flow Chart

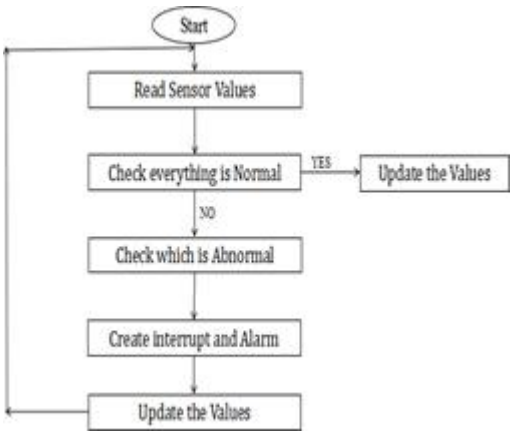

Figure 6. Flow chart of proposed system

The above figure shows that the flow chart of the proposed system. The system always note the sensor values and updated the changes through Internet. If the sensor values are abnormal condition, the buzzer will be ON. If the sensor values are normal, only the values are updated through the internet.

E) Methodology

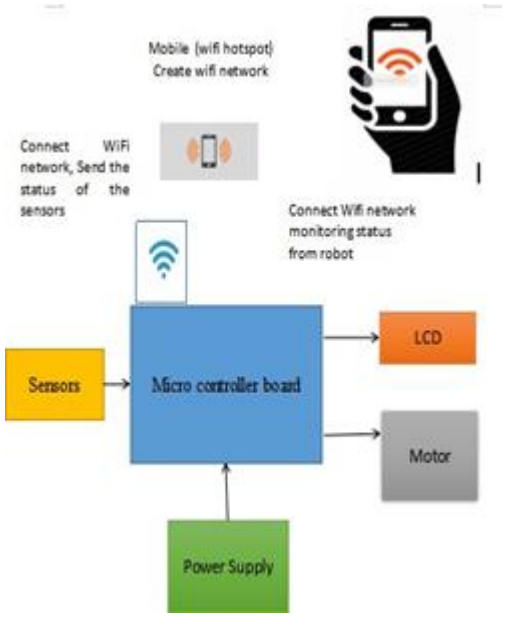

Figure 7. Architecture of methodology

In methodology of the system is the sensors on the robot are used to measure the concentration of the toxic gas within the surroundings. A uniform concentration under the normal conditions, any decrease/ difference in the concentration of the gas indicates a level in LCD. When such abnormal is detected, the buzzer is sounded and the displaying the data on the LCD screen present. The motion of the robot is guided by the IoT.

V. IMPLEMENTATION AND RESULTS

Display has been reenacted by using the ThingView Software to screen the toxic gas, temperature, humidity and the fire location utilizing distinctive sensors. The adjustment in carbon dioxide, methane and the abnormal level of humidity, temperature and fire will be recognized by separate sensors and can be resolved. The buzzer will be alert through the sound and the LCD will be displayed the level of sensor values are notified when harmful gases levels have been raised from normal level to harmful level. The values of gases that are continuously detected by the sensors having a temperature sensor is a added minimum requirement besides gas sensor.

Figure 8. Experimental setup of hardware

VI. CONCLUSION

In conclusion, the implementation of IoT-based toxic gas detection and monitoring systems can significantly improve workplace safety in industries where hazardous gases are present. The real-time monitoring and analysis of gas levels enable early detection of potential hazards and proactive measures to be taken to mitigate risks. Additionally, the remote monitoring capabilities of IoT-based systems allow for multiple sites to be monitored from a centralized location, increasing efficiency and reducing costs. However, careful consideration must be given to sensor selection and IoT platform integration to ensure the effectiveness of the system. Overall, the use of IoT-based systems for toxic gas detection and monitoring offers significant advantages over traditional systems and has the potential to reduce the risk of hazardous gas incidents, improve workplace safety, and protect the environment.

VII. FUTURE SCOPE

The scope of this project is to design and develop an IoT based gas detection and monitoring system that can accurately detect toxic gases, provide real-time alerts, and enable quick response

to prevent exposure to toxic gases. The project will involve the integration of various sensors, communication protocols, and data analytic tools to create a robust and scalable system.

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