Sensing of Harmful Gases using IOT and WSN

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Abstract: *Rapid growth in the industrial sector leads to increase in concentration of gases, so the pollution levels are increasing day by day. To create a good and pleasant environment for human beings, animals we need to control pollution. On the basis of IOT & WSN this study proposes detecting & monitoring pollution levels in the atmosphere. We are using different gas sensors to detect the concentration of gases such as MQ series gas sensors for detection of gas levels. Arduino is used to display analog values of gas sensors by using LCD. Node MCU act as IOT gateway. Node MCU will be at the receiving section where the transmission is done through LORA. Thingspeak Cloud is used for cloud connection to monitor the concentration of gas levels. This system not only detects concentration levels of gases in air but also avoid future pollution by sending warning to the polluted areas by forecasting.*

Keywords: *Arduino Uno*

Gas Sensor

Node MCU

LoRa

Thinkspeak cloud

1. Introduction

Now a day monitoring the concentration of gases every time is an important thing as the pollution levels are increasing beyond the threshold values due to increased human activities. If we don't monitor this from time to time, then we will unable to know when there is a drastic increase in the concentration of gas which leads to pollution of the environment and the lives of surrounding human beings, animals. Recently in 2020 the styrene gas leakage is occurring near Vizag, which lead to death of 12 persons and several hundreds of people are hospitalized who felt difficulty in breathing and visibility. If we monitor the concentration of gases, which were released in the industries from time to time we can save the lives of persons surrounding the area.

Although the government is giving initiatives like use solar energy, solar panels to decrease the pollution levels in

the atmosphere, it can't be done easily it may take decades to balance the concentration of gases in the atmosphere to have pleasant environment. What happens until then if the gases released into atmosphere in huge concentrations? So my project will do this job in an efficient manner by using IOT and WSN. WSN measures pollution levels, humidity, temperature and so on. WSN consists of a microcontroller, electronic circuit, a radio transceiver, battery.

IOT is simply referred to as a collection of Embedded Systems, Sensors and Software. In this project Node MCU acts as an IOT gateway to transfer sensed data. When IOT and WSN clubbed together we can get better connectivity and good sensing area. Different harmful gases like carbon dioxide, sulfur dioxide, benzene concentration etc. are monitored continuously. We can sense any kind of gases we want by using the gas sensors. It will help to monitor the concentration of gases everytime from wherever in the world by using ThingSpeak Cloud.

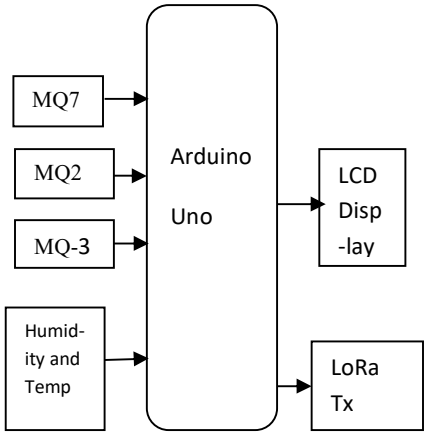
2. Objective

The main objective of the Project is to continuously detect and monitor the concentration of gases and upload to cloud so that we can see the increase or decrease in concentration levels of different gases from anywhere in the world.This should be done to save the lives of surrounding people and fauna. Key Components required are Arduino Uno, Node MCU, Thingspeak Cloud, LoRa Transmitter and Reciever, Gas Sensors. The Gas Sensors are analog and digital type. Digital gas sensors give the accurate results rather than analog sensors.In this project I am using MQ-Series gas sesnors which can detect the ceoncentration of gases like CO_2,sulphur dioxide,carbon monoxide,CFC's, alcohol etc.. The concentration of gas is in PPM (Parts Per Million). By using Arduino the values are displayed in the LCD display. Transmission is done from Arduino to LoRa Transmitter, LoRa Transmitter to LoRa Receiver, LoRa Receiver to Node MCU, Node MCU to Cloud.

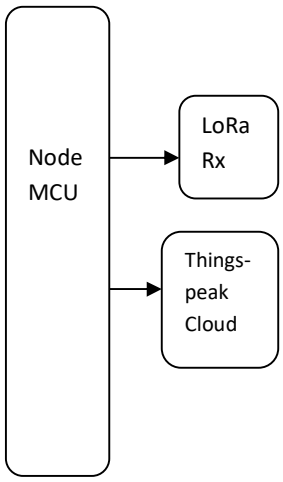
The cloud we are using is Thingspeak Cloud. This cloud monitors the concentration of each gas every time and alerts if there is an increase in the concentration of gas beyond the Threshold value.

3. Block Diagram

Block Diagram is the diagram of a system in which functions are represented by blocks connected through lines that shows connection or relationship of the blocks. This Block Diagram consists of two sections,they are Transmitter and Reciever. Transmitter section consists of Arduino, Gas Sensors , LoRa Transmitter. Reciver section consists of Node MCU, LoRA Reciever, Thingspeak Cloud.



Transmitter Section



Reciever Section

4. Operation

Arduino is a low-cost open source microcontroller which can be integrated into a variety of electronic projects. When the gas sensors are given as inputs to Arduino by using an LCD it will display the concentration of each gas from time to time. Simply displaying will not be enough to save the human lives as the person won't sit all the day to check the concentration of gases.

So through transmitting it to cloud we can able to see it from anywhere but Arduino doesn't have the capability of this thing as it doesn't have the Wi-fi .So we go for Raspberry pi or Node MCU. I choose Node MCU as it is having the inbuilt wifi configurability.

There should be transmission from Arduino to Node MCU, so we go for LoRa. The gas concentration displayed through Arduino sent to LoRa Transmitter , then the transmission goes from LoRa Transmitter to LoRa Receiver.

So we can say that Arduino exists in the transmitting section of the system and node MCU will be at the receiving part.

From LoRa Receiver it goes to NODE MCU which has inbuilt wifi configurability through which it can be uploaded to the Cloud. The Cloud we are using is Thingspeak Cloud. Cloud is used to visualize the graph of each and every gas and their concentration is displayed in the graph based upon time to time.

5. Results and Discussion

Fig.1 concentration of humidity ,temparature and different gases by gas sensors upon time

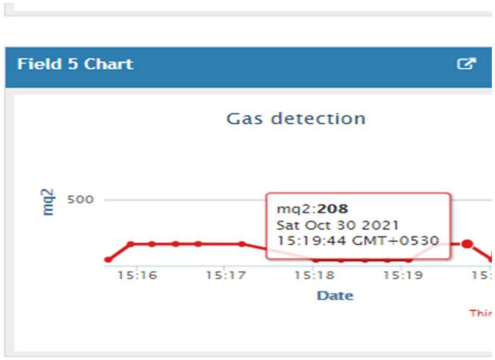


Fig.2 concentration of carbon monoxide gas by MQ-2 Gas Sensor upon time

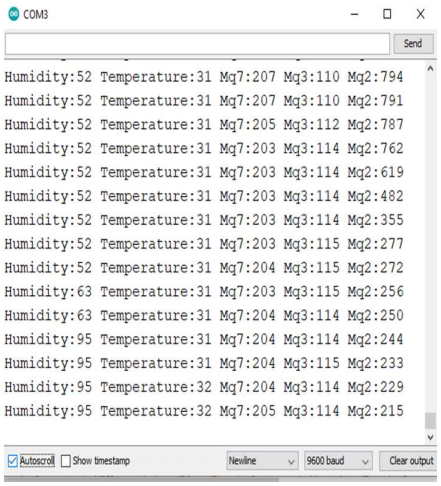


Fig. 4 Node MCU Output

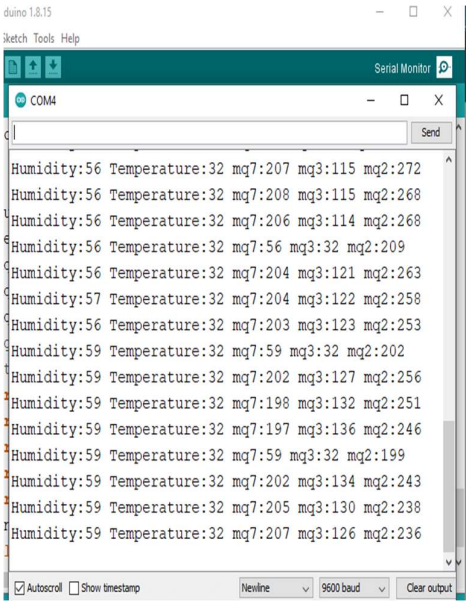


Fig.3 Arduino output

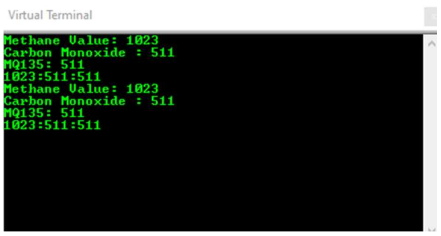


Fig.5 Simulation Results

After interfacing the Gas sensors into Arduino we will get the concentration values of each gas using gas sensors and they are displayed in the LCD. Then after that the transmitting and receiving part is taken care by lore. The values given to the Node MCU from where moves to cloud and we can see the gas concentrations from anywhere, at any time. Thus we can save the lives of people surrounding the area alerting them about the situation if there is an increase in concentration levels beyond the threshold value.The simulation results don't vary from time to time as they are not real time values .They will show fixed values.

References

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