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Prediction of Numerous Gases in the Industrial Limits Using Real Time Monitoring System

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Abstract

With the rapid increase in technology, as new industries develop, as new technologies emerges, the exposure of chemicals in the environment is greatly increasing the risk of the people's life in the society. Despite their benefits, chemicals may, especially when misused, cause adverse effects on human health and environmental integrity. And whenever there is some eruption in the chemical tanks due to any Natural Hazards or Human mistakes there is a greater risk in people's life in the society, e.g., Bhopal gas Strategy. So the main aim of our project is to detect the presence of mixed numerous gas densities in an area where there is a possibility of eruption of Gas Tanks in the Industrial or in any real time scenario without human intervention. This can be done by designing a real time monitoring system with numerous gaseous detection, with the help of MQ-135 gas sensor, where there is a possibility of integrity of gases to the environment.

Keywords: *Arduino ATmega 328p, MQ-135 gas sensor.*

INTRODUCTION

In this 21st century, prediction of gases holds great importance and have uses in several areas ranging from keeping track of agricultural field weather conditions to industrial conditions monitoring. Weather monitoring would help in keeping track of different climatic behaviors including temperature, humidity and light intensity. Weather Monitoring System can be either wired or wireless one.

In case of wireless communication, the connectivity will be more convenient and user friendly and weather monitoring would not require physical presence of the person at the location. Wireless communication is the transfer of information over a distance without the use of wires. The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio communications).Embedded technology is the cheapest and the most convenient technology now being used for wireless communication. The wireless weather monitoring system basically requires few basic modules such as Wi-Fi module, sensors and Arduino module.

Our wireless prediction of gas System is an automated version of manually measuring temperature and sending the information to a distant database wirelessly via sms. Our system has got almost all things automated so that we get an advantage of this concept i.e., the real time direct measurement of the parameters (here no2 and co2) using thingspeak. Maintaining backup of sent data is easy and can be done within a few seconds.

This model uses a MQ135 sensor, Wi-Fi module (ESP8266), LCD JHD 162A and ATMEGA-32 microcontroller (AVR trainer Board). This IoT based project having four sections, firstly CO2 and NO2 Sensor MQ135 senses the CO2 and NO2 Data. Secondly Arduino Uno extracts the MQ135 sensor's data as suitable number in percentage and Celsius scale, and sends it to Wi-Fi Module. Thirdly Wi-Fi Module ESP8266 sends the data to Thing Speak's Sever. And finally Thing Speak analyses the data and shows it in a Graph form.

EXISTING MODEL

With the rapid development of economy, chemical industrial park construction and production activity are increasingly frequent, leading to increasing probability of environmental pollution accidents, especially air pollution accident. Affected by meteorological and geographical conditions, air pollution will be highly clustered in a short time after happening, causing great harm or even extreme destruction to both human and environment. So it is particularly important to set up a real-time air pollution monitoring system.

Using laboratory analysis, conventional air automatic monitoring system has relatively complex equipment technology, large bulk,

unstable operation and high cost. High cost and large bulk make it impossible for large-scale installation. This system can only be installed in key monitoring locations of some key enterprises, thus system data is unavailable to predict overall pollution situation.

To overcome defects of traditional monitoring system and detection methods and reduce test cost, this paper proposes a method combining IoT technology with environment monitoring. By replacing monitoring equipment in traditional empirical analysis with sensor network in IOC technology, through which inexpensive sensors can be laid out flexibly in the whole area to monitor Omni directionally to provide data support for prediction.

BLOCK DIAGRAM

According to IOT architecture, the system is mainly composed of perception layer, network layer and application layer. The system's integral design architecture is shown in figure 1. In practical application, current weather conditions (temperature, humidity, wind direction, wind speed, etc.) and geographical conditions have significant effect on air pollution degree and polluting source diffusion. In the process of system implementation, therefore, a full consideration should be taken to the influence of environmental factors on monitoring and prediction effect.

WORKING PRINCIPLE:

Air pollution monitoring and forecasting system designed in this paper proposed a good solution to the complexity of air pollution. The use of a large number of sensors ensures monitoring.

Accuracy reduces monitoring cost and makes monitoring data in monitoring area more systematic and perfect. A large number of field data provided by front-end sensor network makes big data analysis in background application layer more direct and effective, providing a real and effective decision-making basis for emergency response after pollution accident happens. We add five meteorological factors to the model of air pollution forecast including daily mean temperature, air pressure, visibility, average wind speed and total precipitation.

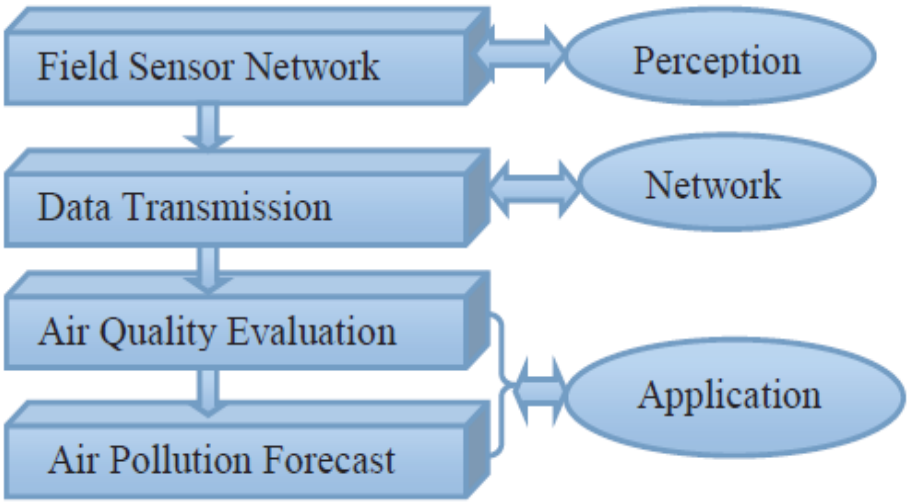

Fig 1: Block diagram of existing model

PROPOSED MODEL:

Our wireless gas detecting System is an automated version of manually measuring temperature and sending the information to a distant database wirelessly via sms. Our system has got almost all things automated so that we get an advantage of this concept i.e., the real time direct measurement of the parameters (here temperature and humidity) using thingspeak.

Maintaining backup of sent data is easy and can be done within a few seconds. This model uses a MQ-135 sensor, Wi-Fi module (ESP8266), and ATMEGA-328 microcontroller (AVR trainer Board). This IoT based project having four sections, firstly Humidity and Temperature Sensor MQ-135 senses the CO2 & NO2 Data. Secondly Arduino Uno extracts the MQ-135 sensor's data as suitable number in percentage and Celsius scale, and sends it to Wi-Fi Module. Thirdly Wi-Fi Module ESP8266 sends the data to Thing speak's Sever. And finally ThingS peak analyses the data and shows it in a Graph form as fields.

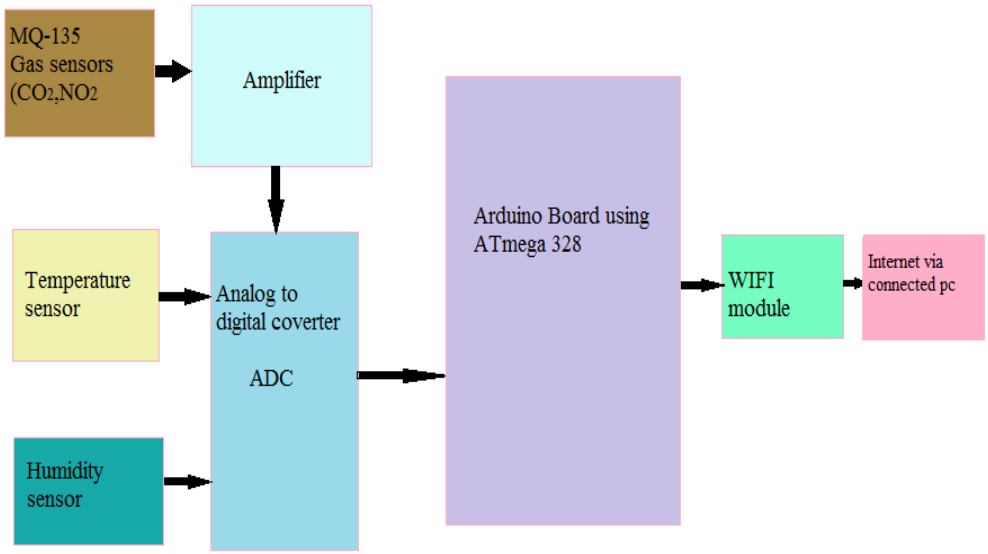

Fig 2: System model

Working Principle:

The device works by taking readings from various sensors at different pins in Arduino microcontroller. For this purpose we've used an Arduino compatible Wi-Fi shield stacked upon our Arduino microcontroller which adds up extra functionality to our Arduino board. It increases the scope of this project. The various sensors are attached to the microcontroller each of them taking 5V input from Arduino. All the sensors are connected using a breadboard. For temperature sensor to prevent any damage or unstable behavior a 10kΩ resistor is attached in parallel to the mixed gas sensor on the breadboard. We've used MQ-135 temperature sensor to get the CO2 & NO2 gases readings connected to digital pin 7 on board for input signals.

It gives us continuous reading of surrounding environment in the range of two to three seconds. The other part of the system is wireless connectivity. We've attached a Wi-Fi shield over the Arduino to connect it to the local internet connection providers and connect. Its job is to transmit the data to a website linked to it and visualize the data over there for every minute or thirty seconds. Since it is a shield

and not a breakout board we don't have to make particular connections for each of IRQ, VBAT and CS. It makes our circuit less wired and neat. It has its own Mac address and transmit to the web server.

There are many benefits of using this shield over other Wi-Fi circuit modules present there in market as it can accept DNS where others require IP address as well as good circuit components and inbuilt antenna. It also has great libraries and support all around the world. The website for this project is an open source IoT (Internet of Things) website named Thingspeak by a community of Math works. So it provides further facility to add code in Matlab and various function to get knowledge from the information obtained from the readings on the server. The website provides its DNS.

On the Thing speak website, the first step is to register for the account. After registration, create a channel which will be for your device. A channel is made for taking all the information you want to display update send or receive. It is used for interaction between Arduino and your channel. While creating the channel, specify or check the number of fields for data you want to visualize or post on the server.

Thingspeak website provide API write key and API read key for each of its own purpose. In order to send or update information regarding our device in live feed we will use API write key and specify in our code while making requests to the website.

OVERALL FUNCTIONING:

Connections for this ThingSpeak detection of CO2 & NO2 gases Project are very simple. Here a Liquid Crystal Display is used for displaying CO2 & NO2, which is directly connected to Arduino in 4-bit mode. Pins of LCD namely RS, EN, D4, D5, D6 and D7 are connected to Arduino digital pin number 14, 15, 16, 17, 18 and 19. This LCD is optional.MQ-135 Sensor Module is connected to digital pin 12 of Arduino. Wi-Fi module ESP8266's Vcc and GND pins are directly connected to 3.3V and GND of Arduino and CH_PD is also connected with 3.3V.

Tx and Rx pins of ESP8266 are directly connected to pin 2 and 3 of Arduino. Software Serial Library is also used here to allow serial communication on pin 2 and 3 of Arduino.

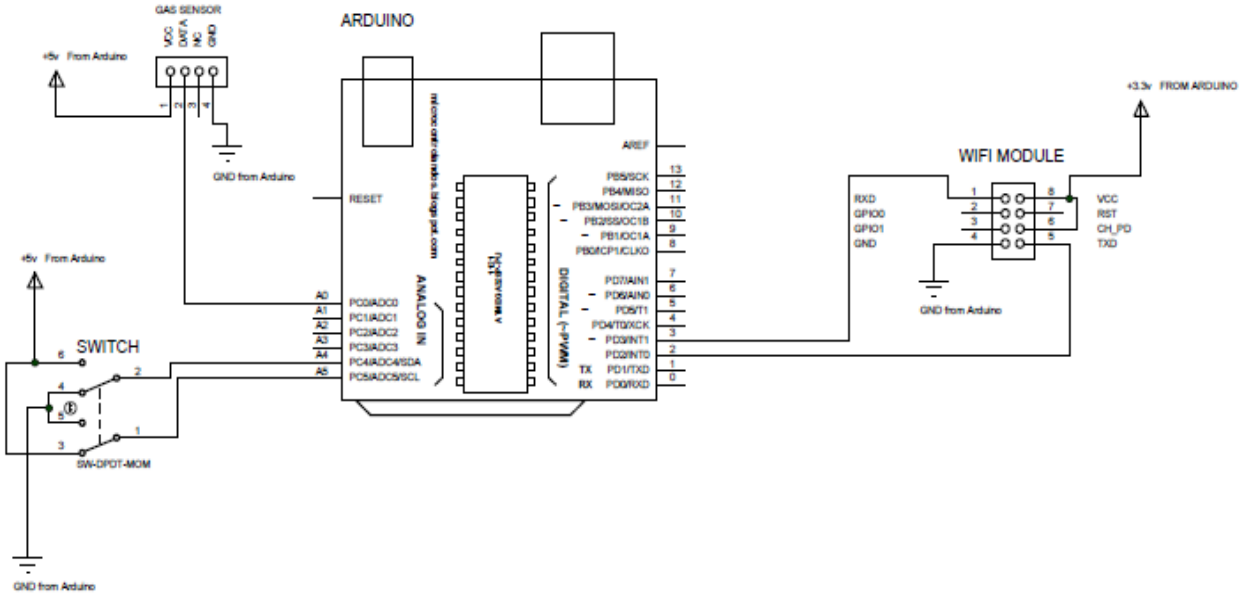

Fig 3: Total hardware interfacing circuit diagram

RESULTS:

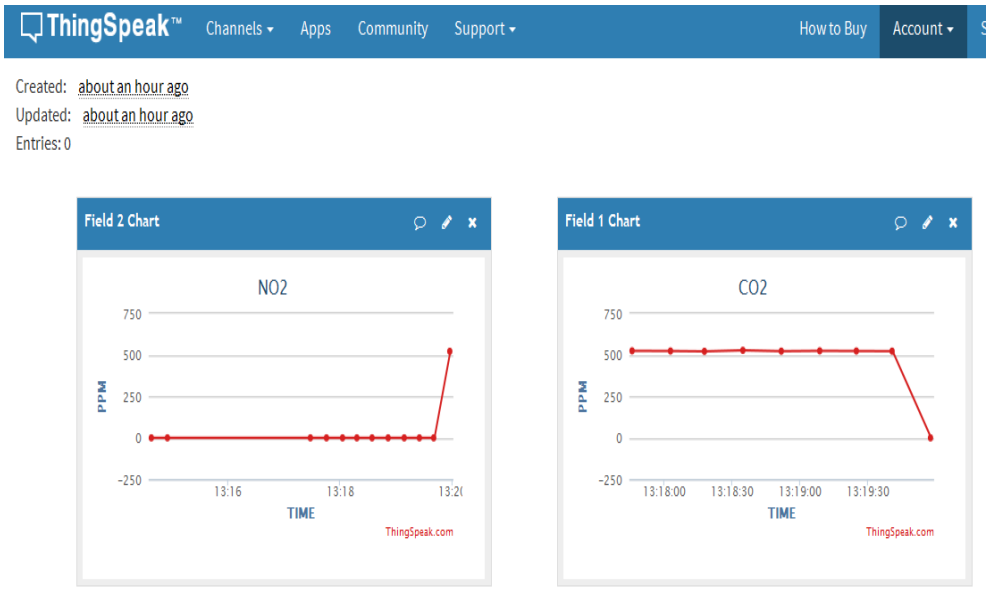

Fig4: Detection of CO2 & NO2 using Thingspeak in normal Environment

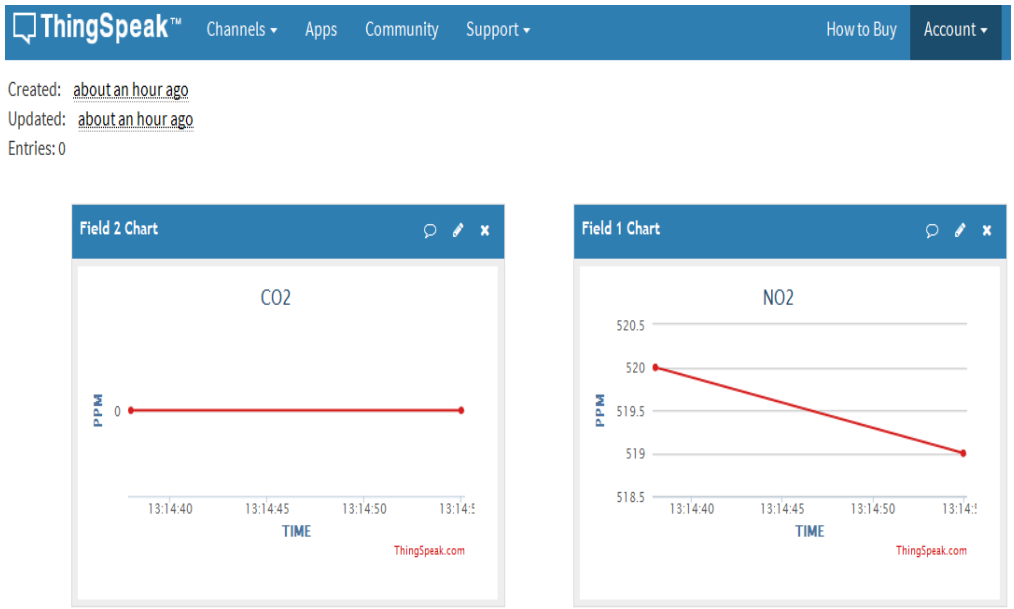

Fig5: Detection of NO2 gas using Thingspeak in normal Environment

Fig6: Detection of CO2 & NO2 using Thingspeak in Industrial limits

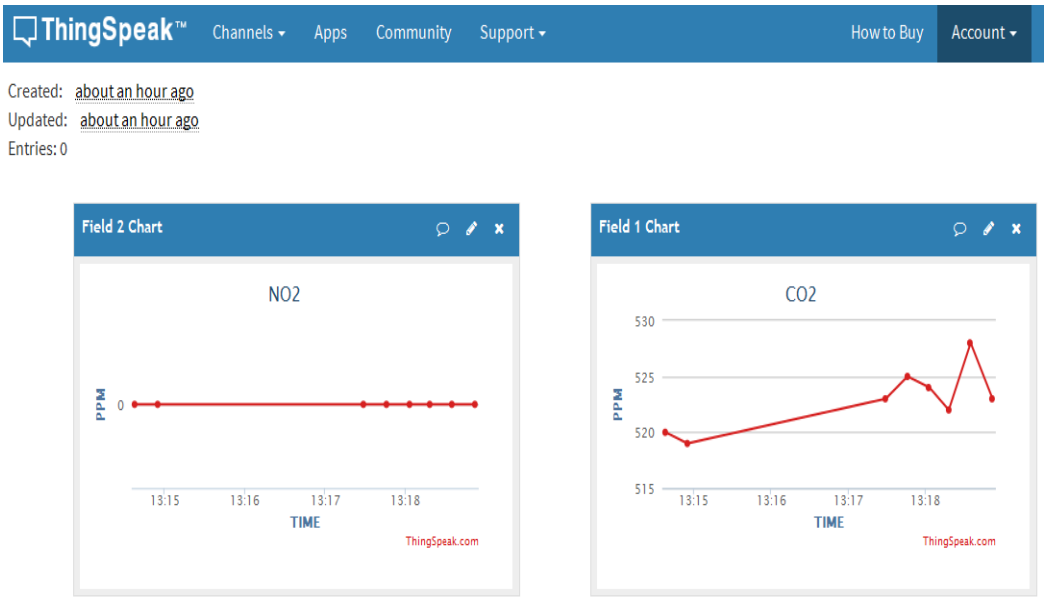

Fig7: Detection of CO2 & NO2 using Thing speak in Industrial limits

CONCLUSION:

As with the increase in technology and rapid growth of industrial areas in the environment we need to detect the gas densities in the highly pollutant areas in order to predict sudden outburst of gas tanks either due to Manmade mistakes, like Bhopal Gas tragedy or due to natural disasters such as Tsunami's or earth quakes happened in Japan. So in our project we have designed a lively prediction analysis in order to store and compare the previous gas densities with the present mixture in the environment as a daily procedure so as to ensure no natural or other disaster takes place. With the help of our project we can get an alert message whenever the gas fusion is ready to take place. As a part of future requirement we will extend this model in order not only to alert the system but also to take the necessary precautions robotically as early as possible.

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