

HOSTILE GAS MONITORING SYSTEM USING IoT

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Abstract - People can be unfavorably impacted by openness to air poisons in encompassing air. Thus, wellbeing based norms and goals for certain contaminations in the air are set by every nation recognition and estimation of substance of the climate are turning out to be progressively significant. Cautious preparation of estimations is fundamental. One of the central point that impact the representatives of information gathered is the area of checking stations the preparation and setting up of observing stations are intricate and brings about an immense expender. An IoT-based continuous air contamination checking framework is proposed to screen the contamination levels of different pollutants. The geographical region is named industrial, Residential, and traffic zones this article proposes an IoT framework that could be sent at any area and store the deliberate qualities in a cloud data set, perform contamination examination, and show the contamination level at some random area.

Key Words: Arduino Board, Nodemcu ESP8266, Thingspeak Server, Internet of Things (IoT).

1. INTRODUCTION

These days the air is extremely polluted. Lately, vehicle outflows, synthetic substances from manufacturing plants, smoke, and residue are all over. That is the cause for why now air is exceptionally polluted. Air pollution likewise increases the risk of respiratory diseases, coronary illness, stroke, and cellular breakdown in the lungs, and all the more seriously influences individuals who are now sick. Kids, the older, and individuals in low-pay areas experience unbalanced wellbeing impacts from air contamination. Air contamination might contain a great deal of perilous substances like ozone, particulate matter sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Air contamination is the most exceedingly terrible ecological issue and it causes a large number of unfavorable impacts on human wellbeing, water bodies, and climate. The principle wellspring of air contamination in all significant urban areas is because of vehicles and the subsequent significant source stays the ventures. Continued exposure to conditions with poor air quality is a significant general wellbeing worry in industrial and non-industrial nations. It is assessed that the toxins answerable for poor air quality reason almost 2.5 million unexpected losses each year around the world. This

research makes human figure out which content of the air is harmful. With module nodemcu esp8266, we can screen the air contamination from a distance, since there is a Wi-Fi in nodemcu esp8266. This makes the environment can be checked without fail.

1.1 Literature review

Paper 1: "Implementation of IoT-Based Air Quality Monitoring System for Investigating Particulate Matter (PM₁₀) in Subway Tunnels"

Authors: Jun ho, byungwan jo, jung hoon kim, lan choi:

Description: Basically this paper is related to South Korea. In this paper the author highlighted there daily basis event. The problem he discussing in the paper is they are using subway tunnels to connect different places or locations. And this topic has more weight because more than 8 million passengers per day are using to travel different locations according to the author. So he wants to measure the air quality in the subway to know the quality of air. He used a iot device named as SMART AIR to get the output for examine the quality of the air in the subway tunnels.

Paper 2: "IOT Based Air Quality Monitoring System"

Authors: Ch.V.Saikumar, M.Reji, P.C.Kishoreraja Department of ECE, Saveetha School of Engineering Saveetha University, Chennai, India.

Description: The principle objective of this project is to screen the air distinction in modern and metropolitan regions. The proposed diagram incorporates a bunch of gas sensors (CO, and NO₂) that are situated on masses and design of an IOT (Web of things) and a predominant server to help both short-range real-time occurrence the executives. In this Arduino stage is utilized to convey the information essentially and rapidly. WSN (Wireless sensor network) acts as the trans collector. This gives a continuous low rate observing framework over the utilization of low rate, uninformed rate, and little control remote correspondence innovation. The projected observing framework can be moved to or shared by various applications. Through IOT we can ready to envision the qualities from the globe.

Paper 3: "IoT based Real-time Air Quality Monitoring and Control System to Improve the Health and Safety of Industrial Workers"

Authors: T.Veeramanikandasamy, Gokul Raj.S, A.Balamurugan, A.P.Ramesh, Y.A.Syed Khadar

Description: The paper is related to the iot - internet of things project i.e. measuring quality of air, in this paper the author specified that its use at industrial area. So the iot device is used in industrial area for the purpose of employees and the property of the industrial company. When the sensor detects the harmful gas or poor quality in atmosphere it makes a alarm which helps employees or management to take corresponding measures. They added a sensor which deals with particles and dust. When it triggers the more amount of dust than usual amount it sends an alert so they can avoid the damage from causing. At last the author used thingspeak platform to represent the data.

Paper 4: "IOT Based Monitoring System in Smart Agriculture"

Authors: S.R. Prathibha, Anupama Hongal, M.P.Jhothi

Description: This paper presents a low-power ongoing air quality checking framework based on the LoRa remote Correspondence innovation. The proposed framework can be spread out in an enormous number inthe checking region to frame sensor organization. The device consists a single chip microcontroller, a few air contamination sensors (NO₂, SO₂, O₃, CO, PM₁, PM₁₀, PM_{2.5}), Long Range (LoRa) - Modem, a sun powered PV-battery part and graphical UI (GUI). As correspondence module LoRa sends the data to the noticing unit and a short time later the data would be saved in the cloud. The reach tests at an outside region show that LoRa can reach to roughly 2Km. The tx power installed in this device records lower power than other technologies. A simple to utilize GUI was planned in the framework. In based on LoRa innovation, GUI, and Sun oriented PV-Air quality detecting and checking battery part the framework has a few moderate elements like minimal expense, significant distance, high inclusion, and long gadget battery duration, simple to work.

Paper 5: "Indoor Air Quality Monitoring Systems Based on Internet of Things: A Systematic Review"

Authors: Jagriti Saini, Maitreyee, Dutta and Gonçalo Marques

Description: In this paper the author discussed about the indoor air quality monitoring system based on internet of things. The author mainly focused on the pollution data across the world. Initially he concentrated on the theme of the paper i.e. air quality monitoring system and gave a information about it. Later he discussed about the risk factors caused by poor air quality. He mentioned about the

two types of potential technologies that present a solid platform for the development of monitoring system. And at last he concentrated on the global data.

2. Problem Statement:

They are various kinds of pollutions occurring all over the world but among them, one of the important pollution which relate to life is the air pollution. Though the air pollution is the most important, and the rate of air pollution is increasing drastically but there is no proper development project to make it control. The growth rate of nations, cities and localities has been faster, and the difference between locations doesn't made a difference as the growth of air pollution is cause in all around the world. The air pollution level in rural area is far better than urban as most of the industries are located at rural areas. The situation at countryside is good for now but can't hope to last long as increase in industrialization. Most of the pollution causing in cities so by controlling the amount of emission of air pollution, can make a big difference. But the problem is finding the locations where the maximum amount of emission of air pollutants. As reports, the solution for pollution can be easily solved, if we know the root cause of the pollution. This project is designed to find those locations where the major air pollution is causing.

2.1. Proposed system

The below diagram is the architecture of our proposed project, which indicates the connectivity of sensors and components. The gas sensor known as Mq135 sensor, Wi-Fi module known as ESP8266 module are connected to the Arduino board, the information of the sensors is shown in the web application named Thingspeak. Web application gives access to the continuous information monitoring of sensors to the user and can able to see the past data at that particular location. In this project, the advancements are made by mainly focusing on three points namely air quality values, able to monitor continuously, and easily accessible. Firstly, the air quality values are represented graphical structure so the variations can be easily noted. Secondly, the device inputs a power continuously so the device doesn't turn off automatically. And the thingspeak platform which makes users easily access by its simple user interface.

Advantages:

1. The information gathered from air quality observing assists us with evaluating impacts brought about by helpless air quality on general wellbeing
2. Air quality information assists us with deciding whether a region is satisfying the air quality guidelines formulated by CPCB, WHO or OSHA.

3. The information gathered from air quality checking would fundamentally assist us with distinguishing contaminated regions, the degree of contamination and air quality level.
4. Air quality checking would assist with concluding whether air tainting control programs figured out in a space are working capably or not.
5. Simple and easy to handle.
6. Sensors have long life and less expense.
7. Nature of air can be checked indoor as well as open air.

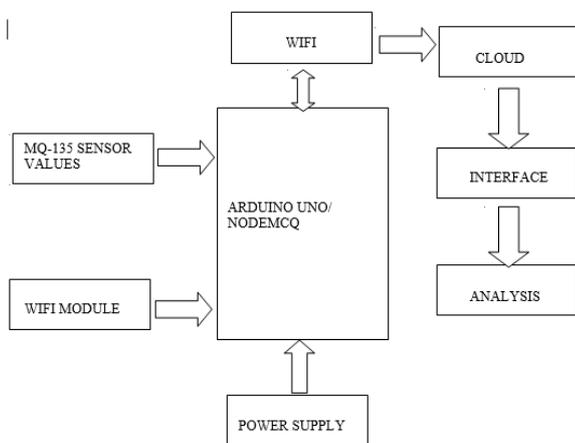


Fig 1. Block diagram of proposed system

Hardware Requirements

- Arduino UNO
- MQ135 sensor
- ESP8266 Wi-Fi module
- Power supply
- Bread Board
- Conductors
- Resistors
- Connecting wires

Software Requirements

- ARDUINO IDE
- Embedded C language
- Thingspeak web application

3. Components and Modules

Arduino UNO

Arduino is an open-source stage used for building IoT projects. Arduino includes both a real programmable circuit board (often insinuated as a microcontroller) and a piece of programming, or IDE (integrated development environment) that abruptly spikes popular for your PC, used to form and move PC code to the real board. As shown in Fig. 2

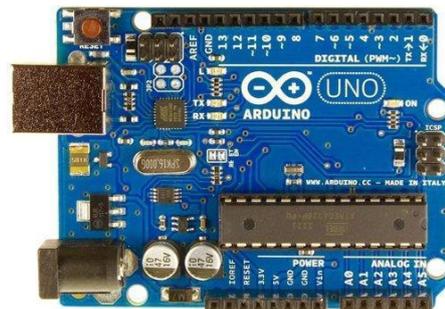


Fig 2. Arduino Uno.

MQ135 sensor

The gas sensor consists of a radiator within an electro-synthetic sensor, which detects the gases at room temperature. Delicate material of MQ135 gas sensor is SnO₂, which with lower conductivity in clean air. At the point when target contamination gas exists, the sensor's conductivity gets higher alongside the gas focus rising. Clients can change the difference in conductivity over to relate yield sign of gas focus through a basic circuit. MQ135 gas sensor has high affectability to smelling salts gas, sulfide, benzene series steam, likewise can screen smoke and other harmful gases well. It can identify sorts of harmful gases and is a sort of minimal expense sensor for sorts of utilizations.



Fig 3. Mq135 sensor

MQ135 SENSOR FEATURES

- Wide range of gas recognizing ability.
- Quick reaction and High affectability
- Highly durable.

- Consumes only +5v for working.
- Recognizes the NH3, NOx, liquor, Benzene, smoke, CO2.
- Advanced yield voltage: 0V or 5V (TTL Logic)
- Preheat length 20 seconds
- Can be utilized as a Digital or simple sensor.
- The Sensitivity of Digital pin can be differed utilizing the potentiometer.

Pin Description

- The VDD power supply 5V DC
- GND, used to interface the module to framework ground
- Advanced OUT, You can likewise utilize this sensor to get computerized yield from this pin, by setting an edge esteem utilizing the potentiometer
- Simple OUT, This pin yields 0-5V simple voltage in view of the power of the gas.

Wi-Fi Module (ESP8266)

NodeMCU is an open source stage based on ESP8266 which can interface articles and let information move utilizing the Wi-Fi convention. Also, by giving the absolute most significant elements of microcontrollers like GPIO, PWM, ADC, and so on. Air quality snap is appropriate for identifying smelling ammonia (NH3), nitrogen oxides (NOx) benzene,smoke, CO2 and other hurtful or toxic gases that effect air charcter.

Sensor layer in gas sensor made up of tin dioxide(sno2). which has lower conductivity in fresh air than polluted air.

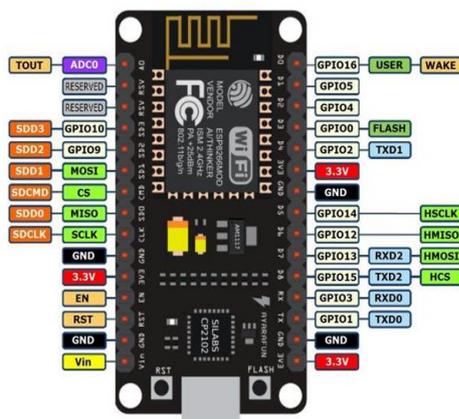


Fig 4. ESP8266 Wi-Fi module

BREAD BOARD

A breadboard is a solder less gadget for transitory model with hardware and test circuit plans. Most electronic parts in electronic circuits can be interconnected by installing their leads or terminals into the openings and subsequently making relationship through wires where reasonable.

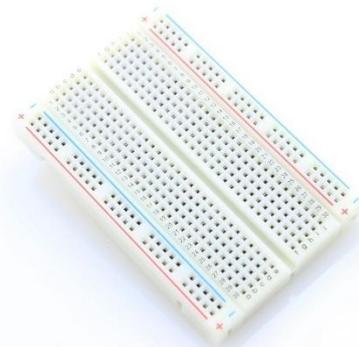


Fig 5 .Bread Board

LCD DISPLAY

The term LCD stands for liquid crystal display. It is one sort of electronic presentation module utilized in a broad scope of uses like different circuits and gadgets like cell phones, number crunchers, PCs, Televisions, and so on these presentations are principally liked for multi-section light-radiating diodes and seven divisions. The primary advantages of utilizing this module are cheap; basically programmable, activity, and there are no restrictions for showing custom characters, uncommon and even liveliness, and many more.



Fig 6: 16*2 Lcd Display

Arduino IDE

Arduino IDE is the official open-source programming software that makes compiling of code simple, so a typical man can understand the learning procedure. This software is compatible with all operating systems, including MAC, Windows, and Linux. It usually contains a text editor that is utilized to write a code, a hidden console, and a toolbar with some buttons. The programs that are written with this software are referred to as sketches. C or Cpp languages are mostly used for coding in this software.

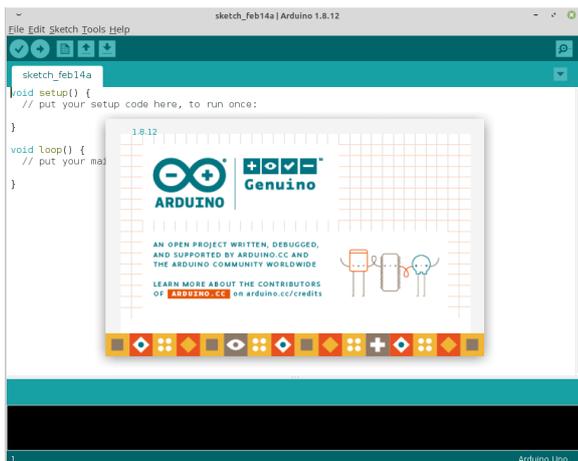


Fig 7. Arduino IDE

ThingSpeak Web Application:

ThingSpeak is an IoT examination stage administration that permits you to total, picture and break down live information streams in the cloud. With the capacity to execute MATLAB code in ThingSpeak you can perform online analysis and handling of the information as it comes in. ThingSpeak is regularly utilized for prototyping and evidence of idea IoT frameworks that require examination.

ThingSpeak Key Features:

ThingSpeak permits you to total, visualize and analyze live information streams in the cloud. A portion of the critical capacities of ThingSpeak including the capacity to:

- Effectively design gadgets to send information to ThingSpeak utilizing well known IoT conventions.
- Visualize your sensor information continuously.
- Able to access by outside sources.
- Utilize the force of MATLAB to sort out your IoT information.
- Run your IoT examination consequently founded on timetables or occasions.
- Model and develop IoT frameworks without setting servers or creating web programming.
- Naturally follow up on your information and convey utilizing outsider administrations like Twilio or Twitter.

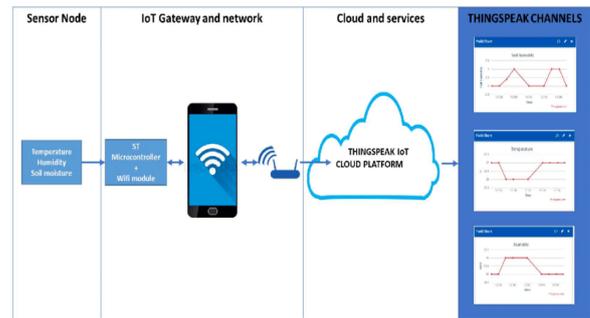


Fig 8. ThingSpeak architecture

4. Experimental setup

In the equipment part we are utilizing Lcd, power supply, Jumper wires, MQ135 air quality sensor, and Hub MCU this sensor is utilized to identify CO2, CO, Alkali as well as smolder. Followed by Hub MCU likewise called as ESP8266 wifi chip why we are utilizing implies we want to push this information to the cloud in light of the fact that Arduino doesn't have wifi limit so we utilize this chip and interface this wifi to our portable area of interest 5V Power supply is one of the most widely recognized power supply being used today. LCD is an industry-standard LCD Show gadget for interacting with installed frameworks. Here we are utilizing 16X2 Setup 4-bit compose mode in this undertaking. We use electromagnet inside the Signal In the product part we are utilizing a stage called Things Talk. There is a MATLAB Choice additionally accessible. The setup contains Microcontroller that is Atmega 328 then sensors is Mq135, ESP8366 Wi-Fi module and the potentiometer in order to control the flow of current. This hardware gives a base for live-streaming of air quality of species location and sends the collected data to the Thingspeak web application using ESP8266 Wi-Fi module sensors are interfaced with the microcontroller board (Arduino UNO) and are given power supply. Values from the sensors are perused by the microcontroller and this microcontroller presents the sensor information on the cloud server. The output received from sensor and represented in a graphical manner to analyze the air quality of the location.

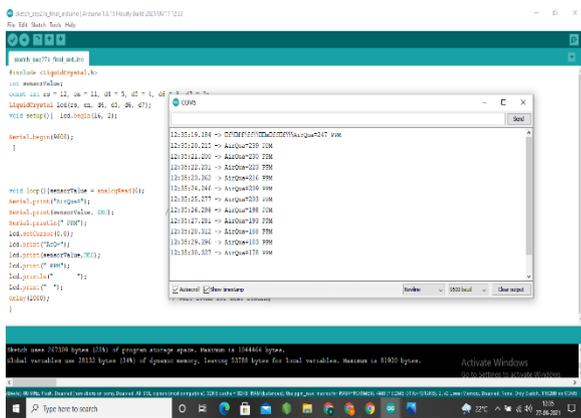


Fig 9. Output in Arduino Ide

4.1. Experimental results

The equipment speaks with sensor that is in connection with the Arduino board. The controller receives the input from the sensors and transfers the data to the cloud platform named Thingspeak, where a user’s can able to see the air quality of the surrounding. Through this device the quality of air can be monitor continuously. The following are the results seen in Thingspeak web application. It indicates the data of sensor levels accurately. By this information, it turns out to be simple for a common man can able to view the data of that location. We programmed to send Sensor parameters to Thingspeak platform frequently. The user interface of Thingspeak server is shown below.

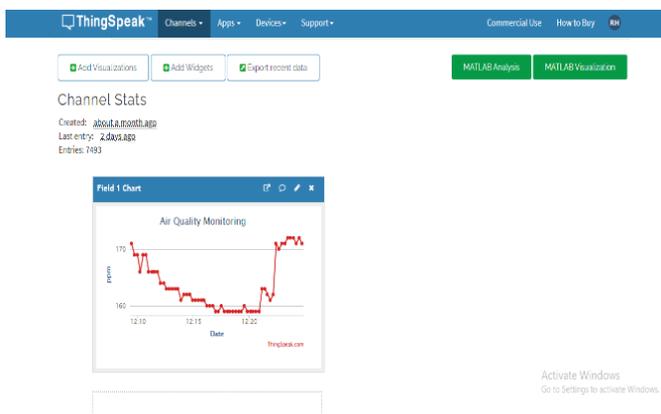


Fig 10. Thingspeak interface

5. Conclusion

Our implemented system assists in monitoring the air quality using IoT technology. Monitoring the specified area using the IOT technology might attract some younger generations and some might show interest and may invest their time for environment purpose. With the help of Thingspeak, people can able to notify the poor air quality localities. Since, most of the monitoring is completed remotely; it helps to organizes who work for environment welfare.

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