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IOT-Based Indoor Air Quality Monitoring System

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ABSTRACT

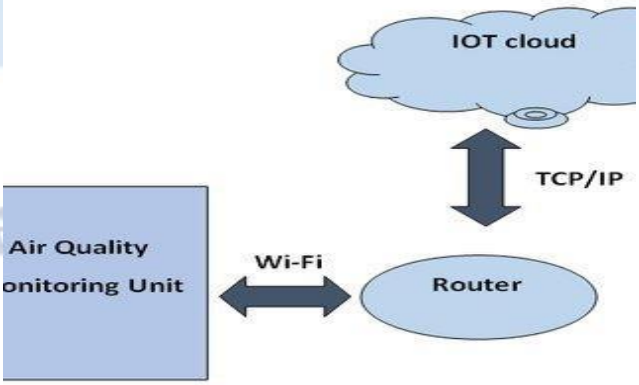
Maintaining good indoor air quality (IAQ) is crucial for the well-being of occupants in various indoor environments, such as homes, offices, and public spaces. This project introduces an "IoT-Based Indoor Air Quality Monitoring System" utilizing sensors, Internet of Things (IoT) technology, and a web-based dashboard for continuous monitoring and analysis of air quality parameters. The system aims to provide real-time insights into indoor air quality, enabling timely interventions to create healthier and safer living and working environments.

Keywords: Arduino, Gas sensor, Buzzer, Real-Time data transmission to Thing Speak, Alert System

1. INTRODUCTION

Air pollution, both indoors and outdoors, isa major environmental health problem affecting people around the world. The level of air pollution is increasing rapidly due to factors such as industries, urbanization, increasing population, vehicle use, etc.

As the world's population becomes more urban, cities are under pressure to maintain a livable life .The harmful effects of contamination include mild allergic reactions such as There are many pollutants in the indoor air. For years, there has been debate over which indoor air quality index is most appropriate. inflammation of the throat, eyes and nose, as well as se-rious problems such as bronchitis, heart disease, pneumonia, lung disease and exacerbation of asthma. Indoor air pollution results in substantially harmful effects on human health. When the level of the containments increases beyond the permissible levels in the environment can affect various organs of the human body.



2. LITERATURE REVIEW

Indoor air quality (IAQ) has become increasingly important due to its impact on health, productivity, and overall well-being. Traditional monitoring

systems often have limitations, such as being stationary, expensive, or lacking real-time data access

IoT-based IAQ monitoring systems offer immense potential for improving indoor environments and promoting health and well-being. Continuous research and development efforts are addressing existing challenges, paving the way for wider adoption and advancements in this field.

The literature review on IoT-based indoor air quality monitoring systems highlights the importance of monitoring and improving indoor air quality for the well-being of building occupants. The review discusses the essential elements, design criteria, challenges, and open research issues associated with the implementation of IAQ monitoring systems using IoT technology. The integration of cloud computing and the selection of suitable hardware and software architectures are also emphasized. Carbon dioxide (CO2) is probably the most commonly used indicator for measuring carbon dioxide produced by human breathing and carbon dioxide emitted by devices such as gas stoves and boilers Carbon dioxide is a good indicator of indoor air quality in the workplace, where residents and their activities are the main

source of pollution. Outdoor air contains about 400 ppm and breathing produces CO2, so indoor CO2 concentrations are always at least 400ppm An indoor CO2 concentration of 1150 ppm can provide adequate air quality; 1400 ppm can maintain good indoor air quality in most cases and 1600 ppm indicates poor air quality. CO2 is the most appropriate indicator in a room where ventilation requirements are related to the presence of a person. Indoor air quality (IAQ) monitoring systems based on the Internet of Things (IoT) have gained significant attention in recent years. These systems aim to improve the overall health, comfort, and well-being of building occupants by monitoring and analyzing indoor air quality data

3.EXISTING SYSTEM

Pallavi Asthana and Sumita Mishra contributed to the design of an IoT-based real-time bolt-based indoor air quality monitoring system. In their job, they design a bolt-based Internet of Things (IoT) system to monitor basic pollutants such as carbon dioxide, carbon monoxide, and particulate matter in the indoor environment of a university campus in real time.

IoT systems provide pollution level information directly to smart devices in real-time. In this work, the author also proposed measures to improve air quality to improve student health. This can have a positive impact on their academic performance. This task is implemented using a microcontroller board for Android, iOS, and Arduino.

Two sensors, such as a temperature and humidity sensor and two gas sensors, are also used to filter changes. In this project, authors used an IoT-based air pollution monitoring system to monitor air quality through a web server that uses the Internet. An alarm is triggered when the air quality drops to a certain level. This means that there are plenty of harmful gases in the air such as CO2, smoke, alcohol, benzene, NH and NOx. PPM displays air quality on LCD and web pages for easy monitoring of air pollution. The system uses MQ135 and MQ6 sensors to monitor air quality. This is because it can detect the most harmful gases and accurately measure their amount.

IOT GATEWAY: It aims to combine the use of the Internet of Things with cloud technology to drive services in real time and quickly. The proposed system is installed in certain.

COMPONENTS:

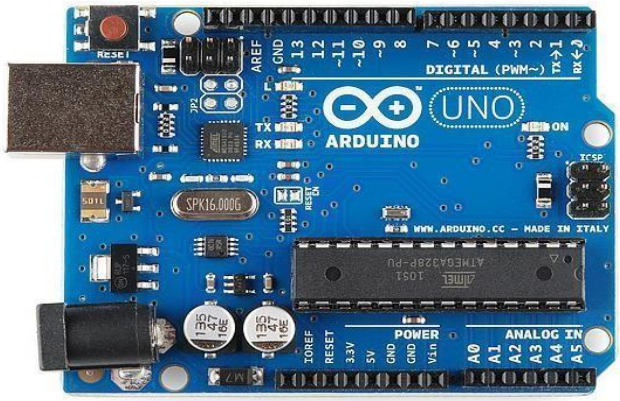
Air Quality Sensors:
Integrates sensors for measuring temperature, humidity, CO2 levels, and VOC concentrations.

Microcontroller Unit:
Utilizes a microcontroller for data processing and communication with sensors.

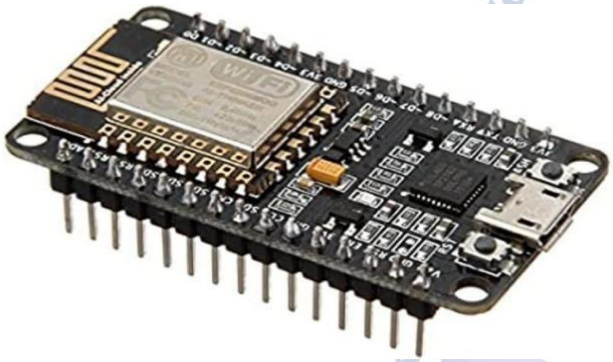
- Gas sensors
- Arduino circuit
- MCU
- Connection wires

GAS SENSOR: The air quality index (AQI) of observed pollutants and displays the Level of each pollutant observed and the air quality index for that particular location.

ARDUINO:



MCU(Micro controller Unit):



LCD IC2:

The graph in figure 3 shows an exponential function for each gas. The x axis starts in 10 PPM and ends in 1000 PPM and the y axes starts in 0.1 and ends in 10 which it is basic-ally the measured resistance from the analog output of the sensor over the resistance zero (Rs/Ro), provided by data sheet The main hardware modules include the MPU9250, a s how the system overview of pro- posed system. It used Node MCU platform as the main microcontroller. It has an inbuilt ESP8266 Wi-Fi module. This is very easy to interface with sensors and also cost effective. MQ135 sensor was interfaced with Node MCU and sensor data were uploaded in to the IoT server through a Wi-Fi route.

ER Model diagram of Air Quality Monitoring system:

4.TESTING &RESULTS

The Indoor environment ppm of CO2 level collected for 3 consecutive days. The air quality measuring unit was placed on the office floor During the data pre- processing phase, data filtering techniques are used to remove periodic trends from the data for specific frequencies. A filter is a function that transforms one time series into another. By choosing the right filter, you can clarify or remove certain patterns in the original time series in the new series. For example, a low-pass filter removes high-frequency components and estimates slow-moving tendencies.

5. CONCLUSION:

The purpose of this project is to design and develop an air quality monitoring system based on the Internet of Things. Air quality is a major issue facing people today. Factors such as industry, urbanization, population growth, and vehicle use pollute the indoor and outdoor air to a considerable extent. Inhaling polluted air affects people's health and causes many illnesses. In this project, we sensed the amount of carbon dioxide and some other gases by spraying perfumes

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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