IOT BASED AIR POLLUTION MONITORING SYSTEM

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Abstract :Air pollution has emerged as one of the significant problems nowadays due to the increase in the number of vehicles and during the time spent in industrialization and urbanization. This expansion of contamination levels has destructive consequences for prosperity. This project explains the display and implementation of an air pollution detection system. The innovation captured here is a practical implementation of the idea of the Internet of Things. This detailed work is an exploration of the consumption possibilities of this innovation in this world where natural well-being turns into real risk. The work is updated using the Node Mcu microcontroller board. In this project, I will create an IoT-based air pollution detection monitoring system, in which I will monitor the air quality using a BME280 sensor, and it will trigger an alarm when the air quality drops to a certain level, which means the amount of harmful gases. present in the air as CO2. It will show air quality in PPM (parts per million) such as "Fresh Air", "Bad Air", "Hazardous Air"

Keywords: Gas sensor, Node mcu, DHT11, Wifi module

1 INTRODUCTION

The project is an IoT (Internet of Things) implementation of an air pollution monitoring system using a Node MCU. Air pollution is a growing problem and it is necessary to monitor air quality for a better future and a healthy life for all. IoT is popular every day and standards are on the way. Collecting information on air quality is therefore easier. Analyzing monitoring data allows us to assess how bad air pollution is every day.

According to a recent survey, the capital of Bangladesh, Dhaka, is the third most polluted city in the list. Because of this increase in the number of vehicles, contamination develops rapidly and affects the well-being of groups of people. This air contamination makes disease and damage a safe, neurological, regenerative and respiratory framework.

As the review shows, we have 50,000 to 100,000 unexpected losses due to air contamination alone [2]. Accordingly, there is a requirement to control and monitor air quality. The IoT is a system of physical devices, vehicles, home appliances, and other things with implanted hardware, programming, sensors, and availability that allow these items to connect and trade information. IoT allows articles to be noticed or controlled. In this paper, I design and pilot a model that IoT controls air contamination. The design of the air quality monitoring program depends on the specific monitoring objectives established for air quality management in the selected area of interest. Define output, design a network and optimize building materials, inform the public about air quality and raise awareness, develop warning systems to prevent adverse emission episodes, facilitate resource allocation and identification, provide data for research investigations develop/validate management tools (such as models), develop and test analytical tools and support legislation on air quality limit values and guidelines. in planning, implementing and reporting on the monitoring program. This highlights the need for users and potential users of data to be involved in survey planning, not only to ensure that surveys meet their needs, but also to justify the use of resources. Air is one of the most basic and important elements for human survival. Clean and healthy air is the key to a good and healthy life. However, it has now become the most threatened factor in urban life. Air pollution has now become the most concerned and most affected problem for us. Various air pollutants have known or suspected harmful effects on human health and the air. In most areas, these toxins are mainly combustion products from space heating, energy production or motor vehicle operation. Pollutants from these sources can be a problem not only in the immediate vicinity of these sources, but can travel long distances. In general, if someone is young and in good health, moderate air pollution is unlikely to have any serious short-term effects. However, higher levels and long-term exposure to air pollution can lead to more severe symptoms and conditions affecting human health. This not only affects the respiratory and inflammatory systems, but can also lead to more serious conditions such as heart disease and cancer. People with lung or heart disease will be more vulnerable to the effects of air pollution. Air pollution has also been recognized by doctors as one of the world's top 10 killers, responsible for around 29,000 premature deaths in the UK and 430,000 worldwide in one year. Air pollution can have both short- and long-term health effects, and many people are concerned about the pollution of the air they breathe.

2. PROBLEM STATEMENT

The monitoring and protection of high air in urban areas with the increasing number of businesses, enterprises and residents has become a critical issue. As the population grows, so does travel, energy and fuel consumption. In the country, we are fully aware that a lot of garbage is thrown away. The air is heavily polluted, which more seriously threatens all kinds of living creatures in the world.

2.1LITERATURE WORK

Monika Singh et al. in August 2019, he proposed an air pollution monitoring system. This system uses an Arduino microcontroller coupled with an MQ135 and MQ6 gas sensor that senses different types of gases present in the environment. It was then connected to a Wi-Fi module that connects to the internet and the LCD is used to display the output to the user and a buzzer when the ppm exceeds a certain threshold. Their applications were industrial perimeter monitoring, indoor air quality monitoring, location selection of reference monitoring stations, making data available to users

Yamunathangam et al. in November 2018 used IoT by measuring gas concentration using various sensors which were observed through arduino serial monitor. This data is collected in Thing speak channels using an ethernet shield which is available for further processing. These analyzed results were viewed through matter-of-fact speech in a graphical format. The mean pollution level was then calculated using Matlab analysis and the timed results were displayed via an Android application. Furthermore, based on the location, the air quality index value was obtained through an Android application. Along with this, the health effects have also been displayed in this app so that users can be aware of the pollution levels.

Poonam Pal et al. in October 2017 he developed an air monitoring system using an Arduino microcontroller. They used an MQ135 gas sensor to sense different types of hazardous gases and an arduino to control the whole process. The MQ135 gas sensor provides output in the form of voltage levels and needs to be converted to PPM. A Wi-Fi module was used to connect the entire process to the Internet, and an LCD was used for visual output. When the value is below 1000 PPM, the LCD and web page will display "Fresh Air" and when the PPM exceeds the limit, the buzzer will beep and the LCD and web page will display "Bad Air, Open Windows". If it increases by 2000, the buzzer will keep beeping and the LCD and web page will show “Danger! Move to fresh air.”

Nitin Sadashiv Desai et al. in 2017, he proposed a system that consists of a beagle bone connected to air pollution measurement sensors such as carbon dioxide [CO2], carbon monoxide [CO], and a noise sensor.

Harsh Gupta et al. in 2019, they introduced an IOT-based air pollution monitoring system consisting of sensors for continuous monitoring of temperature, humidity, carbon monoxide, smoke, LPG, PM2.5 and PM10 in the atmosphere. Their work developed one-way communication between Thing Speak, an open source cloud platform, and an Android application. A Raspberry Pi was used as a gateway for the hardware system interface. Once the Firebase API was included in the Android or iOS app, Firebase features like Analytics, Authentication, Storage, Reporting, Hosting, Crash Reporting, Realtime Database, etc. were used. Graphs were rendered in Thing Speak according to the received sensor data and the same were visualized in the Android application in tabular format.

3 METHODOLOGY

In this section, we presented the Existing Methodology and explained the detailed working procedures of the proposed Methodology. The required hardware tools for device design are described in the following paragraphs.

3.1 Existing methodology

The main focus of the IOT Air & Sound Monitoring System is that air and noise pollution is a growing problem days. For a better future and a healthy life for all, it is necessary to monitor air quality and keep it under control.

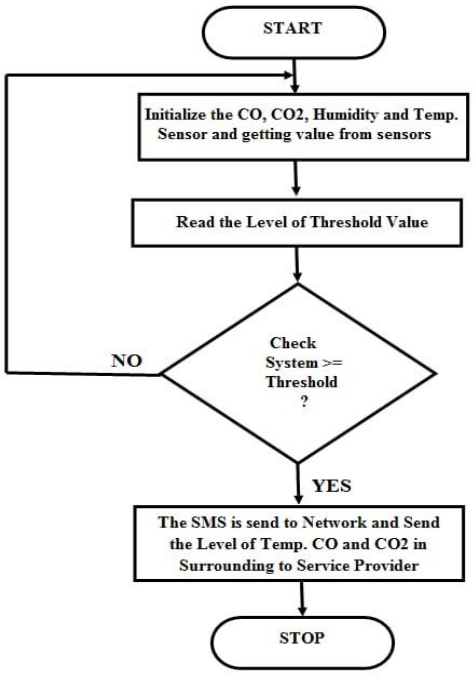
flexibility and low cost of the Internet of Things (IoT). popular every day. With urbanization and the increase in the number of vehicles on the roads and weather conditions greatly affected. Harmful effects of pollution include mild allergic reactions such as throat, eye and nose irritation, as well as some serious problems such as bronchitis, heart disease, pneumonia, lung and asthma exacerbations. Monitoring provides measurements of air pollutants and sound pollution concentration, which can then be analysed, interpreted and presented. This information can then be used in many ways. Analysis of monitoring data allows to assess how bad air pollution and noise are from day to day.

PROPOSED METHODOLOGY

The paper aims to design an air pollution monitoring system that can be installed at a specific location and improve the system over previously developed systems, overcoming the former disadvantages by developing a public Android application. Anyone can use this app to get up-to-date information about pollution in their region. It uses an Arduino integrated with individual gas sensors such as carbon monoxide, ammonia along with particulate matter, humidity and smoke that measure the concentration of each gas separately. The collected data is uploaded to the cloud at regular time intervals using the thing speak platform. An Ethernet shield is used to connect the Arduino and the cloud. A pictorial or graphic representation of the values can be displayed in Thing speak Users can install an Android application through which they get the latest updates and up-to-date graphic content [6]. The average concentration of each gas is analyzed using matlab.

3.1 Architecture of Proposed Methodology

The Internet of Things (IoT) is primarily concerned with connecting smart devices to the Internet by combining the advantages of the OSI layered architecture. In this work, we propose an array of MQ135 mote air quality gas sensors that are used to measure the concentration of air pollutants in the air. MQ135 gas sensors connect to a small fixed platform equipped with others [7]. We mainly used Node MCUs, which are open source development boards with ESP8266-12E chips. The MQ135 gas sensor is used to collect gas concentration measurements. This sensor data would be captured and sent to the MCU node for IoT (Internet of Things) based data collection.



3.2.1 Node MCU ESP2866

Node MCU V3 is an open-source firmware and development kit that plays a vital role in designing your own IoT product with a few lines of Lua script. Multiple GPIO pins on the board allow the board to be connected to other peripherals and are capable of generating PWM, I2C, SPI and UART serial communications.

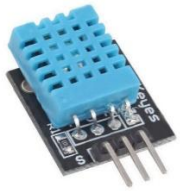
3.2.2 Gas Sensor MQ135

The MQ-135 gas sensor can be implemented to detect smoke and other harmful gases. It has the potential to detect various harmful gases including NH3, NOx, alcohol, benzene, smoke and CO2. The MQ135 gas sensor has high sensitivity to ammonia, sulphide and benzene vapor, also sensitive to smoke and other harmful gases. This module uses the MQ-135 air quality detector and hazardous gas detector chip. Components such as the LM393 analog comparator chip on this module make it easy to integrate this module into a project that can detect hazardous gases. The module requires a 5V supply and provides a digital logic output (1 or 0) and an analog level output (0-4V). The digital logic output is LOW (0) when no gas is detected, but goes HIGH (1) when the hazardous gas concentration in the environment reaches a set threshold value set by a potentiometer on the module. The analog level output provides an output voltage ranging from 0 to 4 V based on the hazardous gas concentration in the environment; 0V for lowest concentration, 4V for maximum concentration.

DHT11 Sensor

The DHT11 is a commonly used temperature and humidity sensor that comes with a dedicated NTC for temperature measurement and an 8-bit microcontroller for outputting temperature and humidity values as serial data. The DHT11 is a commonly used temperature and humidity sensor. The sensor comes with a dedicated NTC for temperature measurement and an 8-bit microcontroller for outputting temperature and humidity values as serial data. The sensor is also factory calibrated and therefore easily interfaced with other microcontrollers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking for measurements in this range, then this sensor could be the right choice for you.



4 CONCLUSION

Ambient air monitoring system using Arduino microcontroller, IoT technology is designed to improve air quality. With the use of IoT technology, the process of monitoring various aspects of the environment is improved, such as the air quality monitoring problem proposed in this paper. Here the use of MQ135 gives the feeling of a different type of dangerous gas and Arduino is the heart of this project. The Arduino module that controls the whole process connects the whole process to the LCD and a serial monitor is used for the visual output. The future scope is that the device we have can be made in a compact way by reducing the size of the device for further implementation or modifications that can be detection of the amount of vehicle pollution that can be determined. In the future, the range can be increased according to the bandwidth for high frequencies. More research can be done to guide people in the right direction for their well-being. That is, the use of this device in the application it has the added advantage that everything can be used in GSM mobile phones for their daily updates by increasing their range. The proposed wireless air pollution monitoring system provides real-time information on air pollution levels and also provides alerts in cases of drastic changes in air quality. The authorities can then use this information to take quick action, such as evacuating people or dispatching a rescue team. It uses an air quality index to categorize different levels of air pollution.

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