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# IOT BASED AIR MONITORING SYSTEM

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The MQ135 sensor is used to measure air quality, and the MQ7 sensor is used to measure carbon monoxide(CO).Measuring air quality is a critical component in raising public awareness about the importance of ensuring a healthier future for future generations.For example, if carbon monoxide levels exceed 100 parts per million, humans become dizzy and nauseous, and they may die within minutes.This research enables humans to determine which aspects of the air are polluted. We can monitor air pollution remotely with the Node mcu esp8266 module because it has a Wi-Fi connection. As a result, the air quality can be monitored at all times. India has already taken steps to prohibit the use of 'Single-Stroke' and 'Two-Stroke' engine-based motorcycles, which emit high levels of pollution. We're trying to implement the same system using IoT platforms like Things peak or Cayenne so that everyone is aware of the environmental damage we're causing. New Delhi has already been dubbed the world's most polluted city, with air quality levels exceeding 300 parts per million. New Delhi is already known as the most polluted city in the world, with air quality levels exceeding 300ppm. We have corrected the other papers where they have wrongly calibrated the sensor and wrongly projected the PPM values. We have also used the easiest platform like Thing speak and set the dashboard to public so that everyone can come to know the air quality at the location where the system is installed.

**Key Words:** IoT, MQ135, MQ2, MQ9, Thingspeak

## Introduction

The air is becoming increasingly polluted because of industrial emissions of toxic gases, vehicle emissions, and increased concentrations of harmful gases and particulate matter in the atmosphere. Because of factors such as industries, urbanisation, population growth, and vehicle

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use, pollution levels are rapidly rising, posing a health risk to humans. Particulate matter is one of the most significant factors contributing to the rise in air pollution. This necessitates real-time air quality monitoring and analysis in order to make informed decisions in a timely manner. A real-time standalone air quality monitoring system is presented in this paper. The internet of things is now widely used in almost every industry, and it plays a critical role in our air quality monitoring system as well. The setup will display the air quality in PPM on a webpage, allowing us to easily monitor it. You can use your computer or mobile device to monitor the pollution level in this IoT project. The setup will display the air quality in PPM on a webpage, allowing us to easily monitor it. Using your computer or mobile device, you can monitor pollution levels from anywhere. The setup will display the air quality in PPM on a webpage, allowing us to easily monitor it. You can use your computer or mobile device to monitor the pollution level in this IoT project. The air quality is extremely polluted. Car emissions, factory chemicals, smoke, and dust have all become more prevalent in recent years. As a result, air conditioning is now heavily polluted. Air pollution has a negative impact on our health, particularly in areas where we take in air for breathing. Some diseases, such as asthma, cough, and lung disorders, can be caused by bacteria in our lungs. Human feelings are unable to detect air pollution. Many dangerous substances, such as LPG gas, carbon monoxide, and methane, can be found in air pollution. Polluted air contains hazardous substances. For example, if carbon monoxide levels exceed 100 parts per million, humans will become dizzy and nauseous within minutes. They might perish. This research enables humans to determine which aspects of the air are polluted. We can monitor air pollution remotely with the Node mcu esp8266 module because it has a Wi-Fi connection. As a result, the air quality can be monitored at all times. Hospitals are reservoirs of critical resources and knowledge. The length of time patients spend in hospital beds is known to be a good representation of the number of resources utilized, for example, bed capacity, staffing, and equipment. When resources are limited and demand exceeds supply, allocation becomes a problem. Demand forecasts are essential for management. The demand for Hospitals are reservoirs of critical resources and knowledge. The length of time patients spend in hospital beds is known to be a good representation of the number of resources utilized, for example, bed capacity, staffing, and equipment. When resources are limited and demand exceeds supply, allocation becomes a problem. Demand forecasts are essential for management. The demand for medical care is more complex than the demand for many other goods. Length of stay (LOS) is the number of days that an in-patient will remain in the hospital The Los for the same diagnosis may vary from 2 to 50+ days between patients. This variation can be due to several factors such as a patient's characteristics, social circumstances, or treatment complexity. Patient hospital length of stay (LOS) can be defined as the number of days that an in-patient will remain in the hospital during a single admission event The primary thing of hospital managers is to establish appropriate healthcare planning by allocating facilities and necessary human resources required a for efficient hospital operation by patient needs. The goal of this project is to create a model that can predict the length of stay for patients upon admission to a hospital.

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**Existing System**

For example, the Fluke CO220 carbon monoxide metre for CO, the AmphoraC02 metre for CO2, and the Forbix Sem icon LPG gas leakage sensor alarm for LPG leakage detection are commercial metres available on the market. Various air quality monitoring systems based on WSN, GSM, and GIS have been proposed by researchers in this field. Now, each technology has limited applications based on its intended function, such as ZigBee, which is only for users who have a ZigBee transceiver, and Bluetooth, which is only for users who have a Bluetooth transceiver. A GIS-based system was designed, implemented, and tested to monitor the pinpoints of air pollution in any area. It is made up of a microcontroller, gas sensors, a mobile unit, a temporary memory buffer, and an internet-connected web server that collects data from various locations as well as coordinates at specific times of the day. In closed system time and space, the readings for a specific location are averaged.

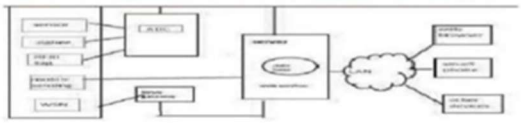

Figure 1:Block diagram of existing system

**Proposed System**

We used the Thingspeak IoT platform and defined the derivations in detail, including the correct ppm on the screen and proper calibration. We implemented it at a lower cost, as there is no need to view the output on an LCD when pushing data to the cloud, which adds to the project's cost. When using IoT as a platform, our goal should be to present the idea on the internet using platforms like thinger.io, thingspeak, or the Cayenne website, which are all beautifully designed and allow you to download the dataset. There is no need to use LPG or methane detecting sensors for air quality monitoring because they are used for home or office safety. Rather than using a GSM or GPRS module, we used WiFi to push data to the cloud. The issue in another paper cited is that the sensor was not calibrated, and the sensor output value was not even converted into PPM. According to UN Data guidelines, a value of 0-50 PPM is considered SAFE, while a value of 51-100 is considered moderate. Delhi is the world's most polluted city, with a pollution level of around 250 parts per million. Because we're using two sensors, each of which has an internal heat element, it consumes more power (P = V*I). As a result, even when both sensors are turned on, their output voltage levels fluctuate and show unpredictable values due to insufficient power drive. For the CO sensor MQ7, we used a 9V battery and a 7805 family LM7805 Regulator.

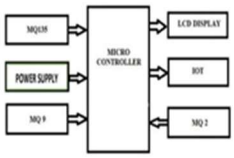

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Figure 2:Block diagram of proposed system

**Literature Survey**

Air Pollution Monitoring System Based on IoT Using Node MCU: Arduino Poonam Pal1, Ritik Gupta2, Sanjana Tiwari34, Ashutosh Sharma The level of pollution has risen over time due to a variety of factors such as population growth, increased vehicle use, industrialization, and urbanisation, all of which have negative effects on human wellbeing by directly affecting the health of those who are exposed to it. In order to keep track of things, in this project, we will create an IoT-based Air Pollution Monitoring System in which we will monitor the air quality over the internet via a web server and set off an alarm when the air quality drops below a certain threshold, i.e. when there is a sufficient amount of harmful gases in the air, such as CO2, smoke, alcohol, and so on. It will display the air quality in PPM on the LCD and on the webpage so that we can easily monitor it. You can use your computer or mobile device to monitor the pollution level in this IoT project. Every nation's biggest problem, whether developed or developing, is air pollution. Health problems have been increasing at a faster rate, particularly in developing countries' urban areas, where industrialization and an increase in the number of vehicles has resulted in the release of a large amount of gaseous pollutants. Mild allergic reactions such as irritation of the throat, eyes, and nose, as well as more serious issues such as bronchitis, heart disease, pneumonia, lung disease, and aggravated asthma, are all harmful effects of pollution. According to a study, air pollution causes 50,000 to 100,000 premature deaths per year in the United States alone. In the EU, the number is 300,000, with over 3,000,000 worldwide. The IOT-based Air Pollution Monitoring System monitors air quality via the Internet and will send out an alert if the air quality drops below a certain threshold, which means there are enough harmful gases in the air such as CO2, smoke, alcohol, benzene, NH3, LPG, and NOx. It will display the air quality in PPM on the LCD as well as on the webpage so that it can be easily monitored.

**Hardware components**

**A. ESP32**

The ESP32 Microcontroller is a low-cost, low-power device with built-in Bluetooth and Wi-Fi. It is the replacement for the low-cost Wi-Fi microchip known as the ESP8266, though it has much less functionality.

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Figure 3:ESP 32

## B. LIQUID CRYSTAL DISPLAY (LCD)

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that makes use of polarizers and the light-modulating capabilities of liquid crystals. Liquid crystals do not directly emit light; instead, they use a backlight or reflector to create colour or monochrome images. LCDs can show arbitrary images (as on a general-purpose computer display) or fixed images with low information content that can be shown or hidden. Examples of gadgets with these displays include preset words, digits, and seven-segment displays, such as those found in digital clocks. They both make use of the same fundamental technology, but some displays have larger components, whereas others use a matrix of tiny pixels to create random images. Depending on the polarizer configuration, LCDs can be either normally on (positive) or off (negative). A character negative LCD will have a black background with letters that are the same colour as the backlight, while a character positive LCD will have black lettering on a background that is the opposite of the colour of the backlight. Blue LCDs have optical filters added to the white to give them their distinctive appearance.

Figure 4:Liquid crystal display

## C. GAS SENSOR:

Without focusing on the numerous underlying techniques like optical absorption, electrical conductivity, electrochemical (EC), and catalytic beads at this time, it is generally understood that gas sensors provide a measurement of the concentration of some analyte of interest, such as CO, CO2, NOx, or SO2. However, and many other gas sensors measure a physical characteristic of the environment in which they are located. These characteristics can be as straightforward as temperature, pressure, flow, thermal conductivity, and specific heat or as complex as heating value, super compressibility, and octane number for gaseous fuels. In the latter, expensive equipment (engines) or destructive testing, such as combustion, may be needed. It may also entail measuring a number of parameters to be used as inputs in the correlation with the complex property of interest. We refer to a sensor as a gas analyzer when it has multiple outputs, such as optical or mass spectrometers (MSs). Additional examples include nuclear magnetic resonance (NMR), differential thermal analysis (DTA), ion mobility, and gas chromatography (GC). Such analyzers—the author's preference—should not be confused with sensor arrays, in which each element of the array is covered in a different type of sensing material (typically polymers and metal oxides), and the array as a whole must adhere to stringent stability requirements.

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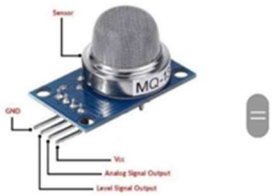

Figure 5:Gas sensor

**SOFTWARE CONSTRAINTS**

**INTRODUCTION TO ARDUINO IDE:**

Arduino is an open-source prototype platform built on simple hardware and software. It is made up of a circuit board with a microcontroller that can be programmed and ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload computer code to the actual board. The implementation phase is less creative than the system design. It is primarily concerned with user training, and file conversion.

**ARDUION PROGRAMMING STRUCTURE:**

This chapter will cover the Arduino programme structure in detail and teach you some new terms that are used there. Open-source software is available for the Arduino. The LGPL governs the licencing of C/C++ microcontroller libraries, while the GPL governs the source code for the Java environment.

**BLYNK APP:**

For both Android and IOS operating systems, Blynk is a highly accessible smartphone application. It offers an interactive dashboard where users can arrange components to create their own Internet of Things projects. As a result, a mobile app that allows users to control microcontrollers connected via WiFi will be created. LEDs, relays, electric motors, and a lot more can all be controlled. Building your project in Blynk doesn't require any internal programming. It only takes a little dragging and placing to arrange your electronic parts. As a result, using Blynk to build your IoT projects is incredibly simple and time-consuming.


Figure 6:Air ranges of MQ2, MQ9, MQ135

**Results And Discussion**

When the ESP32 wifi connection is successful, the Thingspeak account is established with the aid of the supplied API key from our account. For Thingspeak to push the data, there must be a 15-second refresh interval. The field charts of MQ135 and MQ9 sensor values that were

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converted to PPM are shown in Fig.

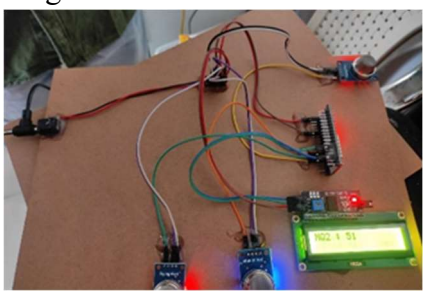

Figure 7:LCD display of air arrange MQ2 sensor

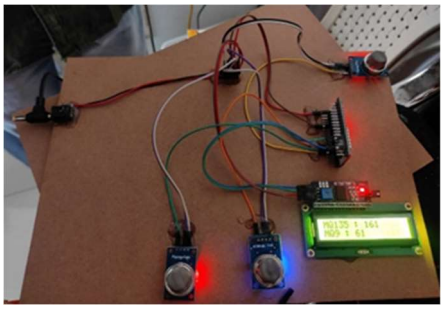

Figure 8:LCD display of air arrange MQ135 & MQ9

**Conclusion And Future Scope**

Previously, air quality monitoring systems for indoor and outdoor air quality monitoring were designed using Bluetooth, GPS, and GPRS wireless technologies. In previous work, the WASP module was used, which is quite expensive. Different sensors could be used instead. The suggested system was created for remotely monitoring indoor air quality. Request and response are low-cost and low-energy protocols. The paper provides a summary of the various air quality monitoring techniques. The paper goes into great detail about these techniques. One of the most preferred techniques in the proposed system is a cloud-based air quality monitoring system. A website is hosted and data is displayed on it using the same cloud data.

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