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Development of IOT Based Air Pollution Monitoring system

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ABSTRACT:

Companies, urbanisation, population growth, and increased automobile usage are all contributing to a rise in pollution levels that threaten people's health. In order to keep tabs on the state of the air we breathe, we employ an Internet of Things (IoT) based air quality monitoring system that accesses data from a server online. If the concentration of pollutants in the air reaches a certain threshold, an alarm will sound. This includes gases like carbon monoxide (CO2), cigarette smoke, ethanol, benzene, ammonia, and nitrogen oxides (NOx). It will make it easy to keep tabs on air pollution thanks to its LCD and online displays that provide the current PPM reading.

The People . human / MQ6 sensors are used to measure and track the concentration of airborne pollutants.

INTRODUCTION:

No country, developed or developing, is immune to the devastating effects of air pollution. Particularly in metropolitan regions of emerging nations, where industrialisation and an increase in the number of cars contribute to the production of a great deal of gaseous pollutants, the incidence of health issues has been rising at an alarming rate. Pollution causes difficulties ranging from modest allergic reactions like burning of both the throat, eyes, and nose to severe issues including bronchitis, heart disease, pneumonia, lung, and worsened asthma. A recent study estimates that between 50,000 and 100,000 Americans lose their lives too soon each year as a direct result of breathing polluted air. As compared to the approximately 3,000,000 people that live in the world, the number in the EU is a relatively small 300,000. When dangerous levels of pollutants including carbon monoxide (CO2), cigarette smoke (PM2.5), ethanol (ethanol), benzene (BZ), nitrous oxide (NOx), and liquid petroleum gas (LPG) are detected, an IoT-based air quality surveillance system will sound an alert via a web server connected to the internet. The LCD and website both display the pollution levels in parts per million, making it easy to keep tabs on any changes. The system is usually utilised in homes, hence an LPG sensor was integrated onto it. Humidity and temperature readings will be displayed. The system sends a warning message if the threshold limit is exceeded and may be put anywhere, however it is most common in factories and homes.

LITERATURE SURVEY:

Design and Implementation of an Economic Gas Leakage Detector

Leakage of natural gas is a serious safety issue in homes, businesses, and vehicles that use gas as an energy source. Installing a water leak detector in potentially hazardous areas is one precaution that may be taken to avoid harm from gas leaks. The study here aims to describe the design of a low-cost automatic alerting system that could also detect the presence of liquefied petroleum gas leaks in a variety of settings. The alarm system developed has a particularly high sensitivity to compressed gas, which is also supplied in bottles as a portable fuel source for camping stoves and grills. The technology being suggested is made to conform to British health and safety regulations in the workplace. The results of tests on a USB-powered gas leakage identification system are shown; the device provides notifications promptly under less extreme forms and triggers a high-pitched siren in emergency scenarios to protect its users.

Electronic design of liquefied petroleum gas leakage monitoring, alarm, and protection system based on discrete components

For many municipal, industrial, and agricultural uses, as well as for residential ones like heating and dining, liquefied petroleum gases (LPG) is a vital energy source in developing nations. Because of its potential for causing injury or death through suffocation and its flammability, it is crucial that LPG gas leaks be constantly monitored and appropriate action taken in the event of a leak. Both microcontroller-based and computer-based systems, using wireless data transfer technologies, have been presented as viable options for high-performance gas leakage tracking and 's organizational in several studies. The primary drawbacks of these systems are their high price and complexity. This paper provides a different engineering approach to a very straightforward system by way of a comprehensive electrical analogue design built from individual, discrete components. The suggested electronic system

functions by continuously monitoring the amount of LPG gas leakage via a suitable gas detector, and then, based mostly on electronic design, producing a gas valve servo controller and sound alert signal at the occurrence of the gas leakage. The Nat'l Instruments NI Multsim programme is used to build electrical circuits and to perform simulations that utilize separate components. The simulation findings show that the proposed design is successful, and they point to a viable prototype of a system to monitor and defend against LPG gas leaks in residential and commercial settings.Design and Development of Gas Leakage Monitoring System using Arduino and ZigBee

Many people's health is negatively impacted by gas leaks in manufacturing areas. Consequently, to avoid such catastrophes, it is important to keep the air clean at the workplace by routinely monitoring and controlling the atmosphere. The absence of scientific methods for determining the kind and concentration of airborne pollutants has hampered attempts to improve industrial air quality. As a result, there is a requirement for the creation of a gas leak detection monitoring system. Methane (CH4) and hydrogen sulfide (CO) gas detection were integral to the design of this system, hence a toxic gases sensor (MQ9) was utilised (CO). Using Arduino Uno as the system's microcontroller, this sensor will function in alarm systems, autonomous control systems, and monitoring systems to detect gas concentrations based on the voltage output of the sensor. Comparatively, the gas sensor's readings will be sent by Zigbee to a monitoring system and shown via the LabVIEW GUI (GUI). In the case that the user does not respond to the leak within 10 minutes, the supply line and the apparatus will be switched off automatically.

EXISTING SYSTEM:

We haven't had a way to track how often pollution is in the air throughout past initiatives. We propose a new technology in this project that will allow us to track and record data on the polluted air around us.

PROPOSED SYSTEM:

Toxic gases released by industry segments, vehicle emissions, and an increase in the composition of poisonous gases and aerosols all contribute to deteriorating air quality. Industries, urbanisation, population growth, and increased vehicle use are all contributing to a rise in pollution levels that threaten human health. One of the most crucial characteristics contributing significantly to the rise in air pollution is particulate matter. Therefore, it is important to measure and analyse air quality in real time so that effective decisions can be made as soon as possible. In this study, we provide an independent, real-time method for measuring air quality. These days, IoT-connected devices can be found in just about any industry, and that includes the field of environmental science where we collect and analyse data on air quality. So that we can keep tabs on the air quality with ease, the system will display the readings in parts per million on a website. With this Internet of Things project, we can check the air quality wherever we happen to be, on any device.

METHODOLOGY:

The Richter Scale (AQI) and its associated ranges of definition and interpretation are completely defined. As long as concentrations are below 100 parts per million, people can breathe easy. When the ppm reading goes beyond 100, the environment is no longer considered safe. As the ppm level climbs beyond 200, it poses a serious threat to human health. The DHT11 detector is utilised to determine the ambient moisture and temperature. The air quality around you may be evaluated with the help of the MQ-135 gas sensor. Calibration standards include ambient air, ethanol, CO2, H2, and CH4. A calibration against ambient air quality has been performed for this application. An explanation of how NodeMCU exerts its control has been included. This study demonstrates how to utilise C++ as a programming language for coding software. It's built-in Wi-Fi module makes it simple to integrate IoT into any project. To carry out the project's coding, Arduino IDE is utilised. For this purpose, we utilise ThingSpeak cloud. The free version includes a 15-second upload timeout and can only save one message in the cloud at a time. Due to the employment of two sensors in this project, both of which contain internal warming element and so use more power than they put out (P=V*I), the output voltage levels of the sensors fluctuate and display unexpected readings even when they are both turned on. As a single NodeMCU is insufficient to power two sensors, we had to resort to an external power source.

BLOCK DIAGRAM:

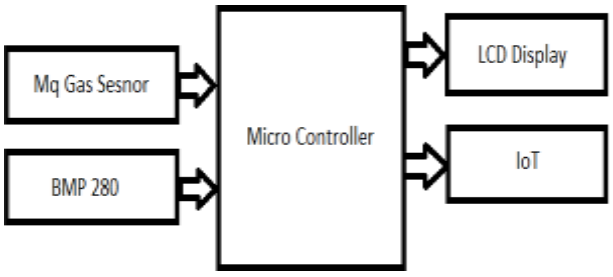

Figure 1 Block diagram

Applications:

It is possible to establish an LPG leak detection system based on the Internet of Things and the Arduino microcontroller in any building that stores LPG cylinders, including private residences, hotels, and storage facilities. This project's key benefit is its capacity to detect leaks and upload that information to a blog, so that it may be watched and corrective measures made if necessary. By taking prompt action after receiving a report through the IOT, people and wealth can be saved.

HARDWARE COMPONENTS REQUIRED:

Air Quality sensors

Electronic devices called gas sensors (or gas detectors) are able to detect and classify various gases. They are frequently employed in the detection and measurement of gas concentration, especially that of potentially dangerous or explosive gases. Methane sensors are utilized for identifying gas leaks in commercial and industrial settings, as well as to monitor for the presence of smoke and particulate matter in private residences. The range, sensitivity, and portability of gas sensors can vary greatly. They are often linked to some sort of alert message or interface and are used as part of larger embedded systems, such as hazmat & security cameras.

Figure 2 Air Quality sensor

BMP 280:

The BMP280 is a very accurate and portable altimeter sensor. This sensor module comes in a little packaging. Phones, Global positioning system (gps, and even watches can all benefit from its incorporation due to its tiny size and low use of electricity.

Figure 3 BMP 280

Lcd Connections:

There are both 8-bit as 4-bit Screen modes available, with the difference coming down to the number of lines needed to connect to the mcu. At this first stage, known as "initialization," the correct mode is selected. As was previously mentioned, in this scenario, data is sent via outputs D0-D7. While using 4-bit LED mode, only the higher-order bits (D4-D7) are linked for connection, freeing up additional I/O pins on the arduino for other purposes.

Figure 4 notification display on LCD

Hence, all data is transmitted to the LCD in two stages: the upper four pieces (which will also ordinarily go down lines D4 -D7) are transmitted first, followed by the lower four bits. LCD may be properly connected and interpreted by the user with the aid of initialization. Furthermore, as data are seldom acquired from Tv (data are mostly sent from mcu to LCD), an additional I/O pin may indeed be conserved by hooking the R/W pin to Ground. Costs still exist despite the savings. If the display is busy, the message will still be displayed normally, but the busy flag cannot be read.

RESULT:

Figure 5 Project kit connections

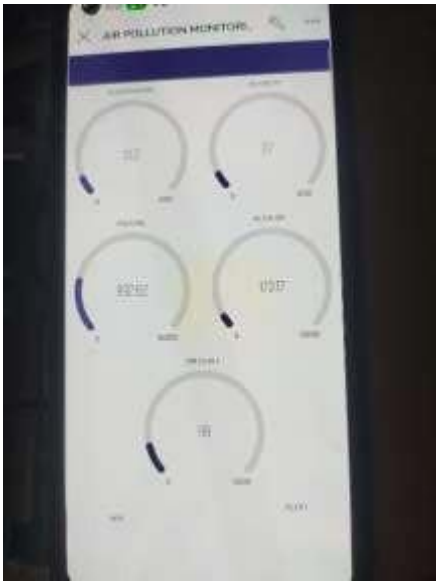

Figure 6 Air pollution display

CONCLUSION:

Industries, urbanisation, population growth, and increased automobile usage are all contributing to a rise in pollution levels that threaten people's health. In order to keep tabs on the state of the air we breathe, we employ an Internet of Things (IoT) based air quality surveillance system that accesses data from a server online. If the concentration of pollutants in the air reaches a certain threshold, an alarm will sound. This includes gases like carbon monoxide (CO2), cigarette smoke, ethanol, benzene, ammonia, and nitrogen oxides (NOx). It will make it easy to keep tabs on air pollution thanks to its LCD and online displays that provide the current PPM reading.

The MQ135 as well as MQ6 sensors are used to measure and track the concentration of airborne pollutants.

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