

Original Article

IoT Based Air Pollution Monitoring System

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Abstract: Our day-to-day activities and quality of life are impacted by air pollution. It threatens the planet's ecosystem and standard of living. Due to increased industrial activity in recent years, the urgent need to monitor air quality is very obvious. People need to be aware of how much their activities affect the quality of the air. The degree of contamination has expanded with times by parcel of variables like the expansion in populace, expanded vehicle use, industrialization and urbanization which brings about unsafe consequences for human prosperity by straightforwardly influencing soundness of populace presented to it. We will create an IOT-based air pollution monitoring system to keep an eye on the situation. We will be able to easily monitor the air quality because it will display it on the webpage as well. You can use your computer or mobile device to monitor the pollution level using this IOT method from anywhere.

Key Phrases: IoT, Shrewd Gadget, Contamination, Checking.

I. INTRODUCTION

Air pollution is may also result in human illness, allergies, and death; It may also harm the natural environment and harm other living things like animals and food crops. Both human activity and natural processes can pollute the air. Fundamentally, there are two sorts of air contamination exits; air pollution that is visible and invisible. A collection of gases that make up the atmosphere are responsible for the survival of all living things; the lopsidedness brought about by the increment or diminishing of the level of these gases can be destructive for endurance. The planet's ecosystems depend on the ozone layer, which is being depleted as a result of rising pollution. The greatest obstacle the world must overcome for improved survival is global warming, which is caused by an increased imbalance of gases in the atmosphere. To comprehend the factors that lead to air pollution, several divisions are made. Air pollutants can originate from either primary or secondary sources. The contaminations that are an immediate consequence of the cycle can be called essential poisons. An exemplary illustration of an essential contamination would be the discharged from industrial facilities. Auxiliary contaminations are the ones that are brought about by the entomb blending and responses of essential poisons. Vehicle emissions contribute a significant amount to air and water pollution. The produced from the ignition of non-renewable energy sources like coal, petrol and other industrial facility combustibles is one the significant reason for air contamination. Another significant pollutant is carbon monoxide, it have typically released from automobiles and is produced by improper or incomplete combustion. Air pollution has alarming effects. They are known to make a few respiratory and heart issues alongside disease, among different dangers to the body. Air pollution has been linked to the deaths of several million people, either directly or indirectly. Children who live in areas with polluted air are said to frequently suffer from asthma and pneumonia.

II. LITERATURE SURVEY

Microcontroller Based Low-Cost Gas Leakage Detector with SMS Alert," by A. BANIK, B. AICH, and S. GHOSH. Arising Patterns IN ELECTRONIC Gadgets AND COMPUTATIONAL Strategies (EDCT). YEAR, 2018

With modern area, local, and gas-driven vehicles like CNG (Compacted Petroleum Gas) transports, vehicles, and so on, gas spillage is a significant problem. Introducing a gas spillage discovery gadget in penetrable spots is one method for forestalling mishaps brought about by gas spills. A device that can automatically detect and stop gas leaks in permeable areas is the goal of this project. The system detects a leak of LPG (Liquefied Petroleum Gas) via a gas sensor and sends an SMS to the affected individual via GSM. When the concentration of LPG in the air exceeds a predetermined level, the gas sensor changes its output to indicate gas leakage.[1]



V. F. ZAVOROTNYI and Y. I. YAKIMENKO authored "Based on PSOC Smart Sensor of Gas Leakage." 32nd International Electricity Technology Spring Symposium. YEAR, 2009

A cutting-edge thin film MEMS (micro-electro-mechanical systems) structure, a novel measurement technique, and a PSOC (programmable system on chip) were used to create this brand-new natural gas leak Smart Sensor. The sensor is a continuously operating device designed to detect gas spills and infuse signals like air gas fixation. The sensor tells the warning system if concentration is dangerous. MEMS development was utilized to design a gas-sensitive piece of the sensor. The remote point of interaction is a clear sequential fringe interface that associates a solitary chip 2.4-GHz Direct Grouping Spread Range (DSSS) Gaussian Recurrence Shift Keying (GFSK) baseband modem straightforwardly to a microcontroller PSOC. The modem maintains a range of fifty meters. The physical way sensors work is the same for all of them. It guarantees the device's high level of dependability and long lifespan. The sensor is basically made on a single microcircuit with a computer interface because of the PSOC's purpose.[2]

"Execution of a Security Miniature Flying Vehicle In view of HT66FU50 Microcontroller," JONG-HANN JEAN and FENG-LI LIAN, Worldwide Congress on Cutting edge Applied Informatics, Year 2015, pp. 978-1-4799-9958-3.

Miniature elevated vehicles have been examined for an extensive variety of regular citizen mission-situated applications like inquiry and salvage, observation, and the conveyance of light-weight objects. In the paper, we endeavored to utilize a multi-sensor MAV framework for grounds, production line, or local area structures' reconnaissance and security checking. It is advantageous for this system to be able to fly over barriers, fences, and ditches. We use a commercial MAV with built-in cameras to transmit the ethereal symbolism over the Wi-Fi connection. to move out the security monitoring function, we further develop a sensing and controlling board based on a microcontroller.[3]

Abu Hasan Abdullallah, FATHINUL SAHIR AHMAD SAAD, and ZAHARI AWANG AHMAD "Esp32-Based Wi-Fi Electronic Nose Framework Improvement for Gas Chamber Repair Plant Checking of LPG Spillage" Melted petrol gas (LPG) is utilized for warming in a wide assortment of homegrown, modern, and auto applications. YEAR.2018, PP, 978-1-5386-8369

A serious health risk has been linked to atmospheric LPG leaks. If LPG exposure is not closely monitored, it could result in an explosion and harm the health of nearby residents. Gas can be detected, a warning can be issued, and spills inside the environment can be controlled with a framework known as an e-nose. Node, a wireless electronic nose that is embedded within the environment, is used to monitor the environment. Two sensors for LPG gas and a temperature sensor make up the node.[4]

"IOT Based Energy and Gas Monetary Home Computerization Framework Utilizing Raspberry Pi 3," by AHMED IMTEAJ, TANVEER RAHMAN, HOSNA ARA BEGUM, and MOHAMMED SHAMSUL ALAM. On Advances in Electrical Designing (ICAEE) Global Gathering, 2017, PP 978-1-5386-08

Energy is the most urgent need in today's world, where we either intentionally or unintentionally waste energy. In any case, we should stop abuse of our energy. In this possible system, a method for providing power has been developed that ensures that gas leaks and human existence are immediately reported.[5]

III. METHODOLOGY

A. Work Process

a) Phase 1:

Level Detection of Air Pollutants This indicates the project's infancy. An Internet of Things-based air pollution detection kit is being developed . It is concerned with the transmission of data to the cloud platform that stores it from gas sensors connected to the ESP32.

b) Phase 2:

Making this point of interaction. They stage includes in explanation of the different parts for discretionary execution. The Mobile Application is used to store, process, and monitor the collected data.

c) Phase 3:

Execution and testing the project deliverables are constructed using a variety of circuit designs and interconnected components.

IV. EXISTING MODEL

In the current technique to screen nature of air, a Remote sensor organization (WSN) based new system is proposed which depends on information procurement and transmission. The environment's parameters of temperature, humidity, CO2 concentration, and the detection of any gas leakage (smoke, alcohol, or LPG) are chosen as the ones to be monitored. The Zig bee Pro (S-2) is used to send these parameters' values to a base station where they are being monitored.

V. SYSTEM REQUIREMENTS

Hardware Description

A. Power Supply

A power supply is an electrical device that gives electric power to an electrical load. A power supply must be able to completely change the electric flow coming from a source into the right voltage, flow, and frequency to drive the heap. As a result, power supplies are sometimes referred to as electric power converters.

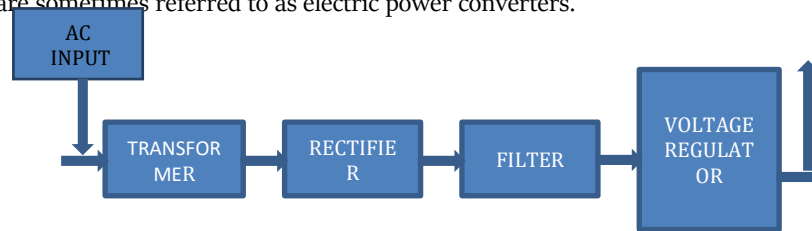


Figure 1: Hardware Descriptions

a) Transformer

A transformer is a passive electrical device that uses electromagnetic induction to transfer electrical energy from one circuit to another.

(i) Step-down transformer:

A step-down transformer is a type of transformer that converts the high voltage (HV) and low current value of the primary side into the low voltage (LV) and high current value of the second side. The most common use is to "step up" or "step down" the voltage levels between circuits. This is not the case with the step-up transformer.

b) Rectifier

An electrical gadget that converts subbing stream (AC) is known as a rectifier sporadically switches bearing, to facilitate stream (DC), which streams in only a solitary heading. The inverter is responsible for playing out the converse activity.

(c) Voltage Regulator

A system designed to automatically maintain a constant voltage is known as a voltage regulator. A voltage controller can use negative feedback or a straightforward feed-forward design. An electromechanical mechanism or electronic components could be used. It can regulate one or more AC or DC voltages, depending on the design.

B. DHT 11 Sensor

Stickiness is the amount of water fume in the air. Various synthetic, natural, and actual cycles are affected by the air's mugginess level. The company's product costs, employee safety, and health and safety can all be impacted by humidity. As a result, humidity measurement is crucial to the semiconductor and control system industries. The amount of moisture in a gas is determined by its overall dampness, which can be a mixture of water fume, nitrogen, argon, or pure gas. Based on the units in which they are measured, humidity sensors are divided into two categories. What they are is a general stickiness sensor and a flat out moistness sensor. The DHT11 is a computerized temperature and stickiness sensor.

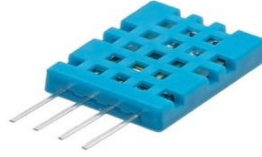


Figure 2: DHT 11 Sensor

C. MQ6 Sensor

The MQ6 gas sensor is a device that responds quickly to liquid petroleum gas. It is typically used in industrial and other work equipment to detect gas leaks. This straightforward sensor can detect LPG in the air, which typically consists of propane and butane. We can use the sensor in a variety of industrial and commercial projects because it lets us know if there are gas concentrations anywhere. This sensor's Digital Pin makes it possible for it to function without a microcontroller, which is useful when trying to catch a particular gas. Additionally, the sensor is able to identify various combustible gases.



Figure 3: MQ6 Sensor

D. Dust Sensor

The dust particles in the air are reflected in the IR LED light by the photosensor. The pulse pattern of the signal output allows the SMART Dust Sensor to distinguish between large house dust and small particles like cigarette smoke.



Figure 4: Dust Sensor

E. Module for Relay:

In a programmed control circuit, a hand-off is a programmed switch that controls a high current with a low current sign. The hand-off sign's feedback voltage goes from 0V to 5V.



Figure 5: Module for Relay

F. DC Fans

Direct current (DC) fans operate on a fixed potential, similar to the voltage of a battery. Alternating current fans, or AC fans, are powered by alternating voltages of equal positive and negative values. DC fans typically have voltages of 5V, 12V, 24V, and 48V.



Figure 6: DC Fan

G. LCD

An electronic display module known as an LCD (Liquid Crystal Display) screen is utilized in numerous contexts. A very fundamental module, a 16x2 LCD display is frequently utilized in various devices and circuits. Multi-segment and seven-segment LEDs are not as popular as these modules. The reasons being: LCDs are inexpensive; simple to program; unlike the seven segments, which limit special and even custom characters, animations, and other content

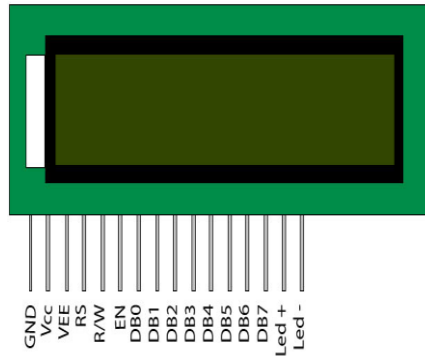


Figure 7: LCD

H. ESP32 Microcontroller:

ESP32 is the name of the chip that was created by Expressive Frameworks. Embedded devices can connect to this via Wi-Fi or dual-mode Bluetooth in some models. The manufacturer frequently refers to modules and development boards that contain the ESP32 chip as "ESP32," despite the fact that technically, ESP32 is just the chip itself.

The Ten silica Xtensa LX6 microprocessor, which can be found in both dual-core and single-core configurations on the ESP32 chip, has a clock rate of more than 240 MHz.



Figure 8: ESP32 Microcontroller

VI. PYTHON PROGRAMMING LANGUAGE

Python has strong structure and collects trash. It is compatible with object-oriented, functional, structured (particularly procedural), and other programming paradigms. It is frequently referred to as a "batteries included" language due to its extensive standard library.

Guido van Rossum started managing Python in the latter part of the 1980s as a replacement for the ABC programming language. In 1991, he released Python 0.9.0 for the first time. Python 2.0 was conveyed in 2000. Python is a Certain essential for understudies and working experts to change into a remarkable Computer programmer particularly when they are working in Web Improvement Space.

VII. PROPOSED SYSTEM

The MQ6 sensor, DHT-11 sensor, dust sensor, relay, fan, and LCD make up the system. The MQ6 sensor sends data to the controller when it finds CO₂ in the environment. DHT 11 sensor to detect the temperature and moistness. The dust particle was detected by the dust sensor Relay 1 initiates the DC fan ON trigger whenever the gas sensor detects gas in the environment. The air purifier's exchange 2 trigger. The sensor is displaying a value of 90 when there is no gas nearby; The safe level for air quality is 350 PPM, and it shouldn't go above 1000 PPM. It will result in a limit of 1000 PPM, headaches, drowsiness, stagnant, stuffy air, and more. It will include temperature and humidity, which may provide an indication of the current temperature and humidity of the air. They four sensors, according to the model, transmit information about the gas's temperature, humidity, and composition as input data. The data for the gases are displayed on LCD in ppm units. The values of temperature, gas, and humidity included in the Internet of Things indicate certain limits.

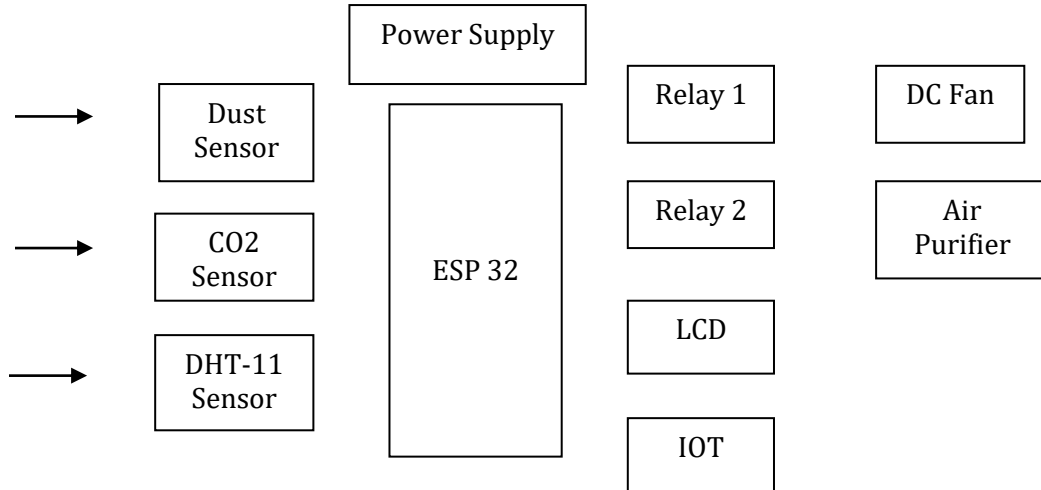


Figure 9: Block Diagram of Proposed System

A. Hardware Implementation

The hardware implementation necessitates the use of a Thony IDE. Framework on Chip (SOC) independent, the ESP8266 Wi-Fi Module that can concede admittance to any microcontroller to your Wi-Fi organization.

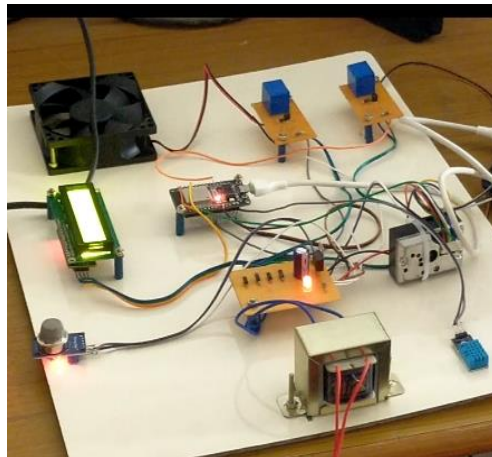


Figure 10: Hardware Implementation Image

B. Software Implementation

The product execution gives the making of Programming interface. The user must sign in to the application using the specified information.

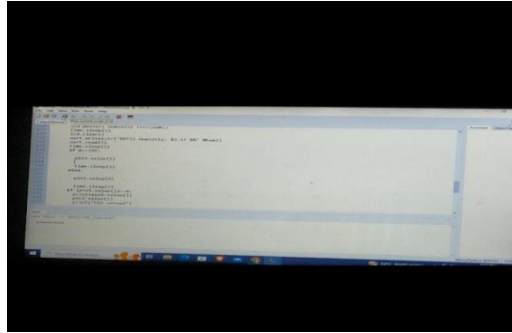


Figure 11: Software Implementation Image

X. CONCLUSION

It is proposed that the air's nature serve as the basis for IOT Innovation's framework for monitoring the mood of the climate. The project's controller is at its center, and it oversees the entire procedure. Here, various dangerous gases are detected by sensors. The entire interaction with the web and LCD is used to display the result. The Programmed Air and Observing Management System is a significant step toward addressing the greatest threat. The major issue of highly polluted areas is resolved by the air pollution monitoring system. It effectively supports the healthy life idea and the new technology. People can use an application on their mobile phones to keep track of the amount of pollution with this system's features.

XI. REFERENCES

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