A
Project Seminar
On

"IOT based Air & Sound Pollution Monitoring System Using Rasberry Pi"

Under the Guidance of
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Contents

☐Introduction

☐Objective

☐Literature Review

☐Problem Statement

☐Block Diagram & description

☐Algorithm (If any)

☐Advantages

☐Applications

☐Expected Result

☐References

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Introduction:

Air and sound pollution is a growing issue these days. It is necessary to monitor the air and sound pollution levels to ensure a healthy and safe environment. With the rapid increase in infrastructure and industrial plants, environmental issues have greatly influenced the need of smart monitoring systems. Due to its low cost, high efficiency and versatility, Internet of Things (IoT) has become very popular now these days. Internet of Things (IoT) allows interaction between devices and humans. It forms a communication medium from human to machine. Previously, data collectors had to travel long distances to the various locations to collect data after which the analysis was done.

This was lengthy and time consuming. But now, sensors and microcontrollers connected to the internet can make environmental parameter monitoring more flexible, accurate and less time consuming. When the environment merges with sensors and devices to self -protect and self - monitor it forms a smart environment. Embedded intelligence makes the environment interact with the objects.

In this model, we are using a Raspberry Pi 3B microcontroller, which will have gas sensors and noise sensors connected to it, to monitor the fluctuating environmental parameters.

Objective:

- To Study Various Sensors and related technology.

- To Study IOT for efficient communication between sensors and processor.

- To Develop & Deploy low cost sensor based processor for air pollution measurement.

- To develop a centralized supervising/monitoring system for air pollution.

Literature Review

Sr. No	Paper Title	Author Name	Abstract
1.	Scalable Measurement of Air Pollution using COTS IoT Devices	Varun Jain, Mansi Goel, Mukulika Maity, Vinayak Naik, Ramachandran Ramjee	Air pollution levels have been rising at an alarming rate for the past ten years. The situation is considerably worse in developing nations, such as India. The average concentration of PM10 in Delhi has increased by over 66% between the years 2007 and 2010 and continues to increase further. Rising air pollution has been shown to have a detrimental effect on human health.
2.	A Fuzzy Interface System for Determining Air Quality Index	Archit Aggarwal, Tanupriya Choudhary, Praveen Kumar	Majority of the pollution is caused by road dust and industries. The Air Quality Index(AQI) is the standardised way of describing the level of pollutants and overall air quality. AQI is dependent on the measurement of eight pollutants. The traditional method used is linear interpolation where only one pollutant is considered to calculate AQI.

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Literature Review

Sr. No	Paper Title	Author Name	Abstract
3.	Air Quality Monitoring System Based on IoT using Raspberry Pi	Somansh Kumar, Ashish Jasuja	This paper presents a real-time standalone air quality monitoring system which includes various parameters: PM 2.5, carbon monoxide, carbon dioxide, temperature, humidity and air pressure. Internet of Things is nowadays finding profound use in each and every sector, plays a key role in our air quality monitoring system too. Internet of
4.	Extracting Patterns and Variations in Air Quality of Four Tier I Cities in India	Alka Yadav, Durga Toshniwal	In the present work, the air quality data from New Delhi, Mumbai, Chennai and Bengaluru has been used. Initially, dimension reduction has been performed on the data. After that, the data has been de-seasonalized.

Literature Review

Sr. No	Paper Title	Author Name	Abstract
5.	A Raspberry Pi Controlled Cloud Based Air and Sound Pollution Monitoring System with Temperature and Humidity Sensing	Arnab Kumar Saha1 , Sachet Sircar2 , Priyasha Chatterjee3	In today's world, the continuous rise in air and sound pollution has become a serious problem. Controlling and carefully monitoring the situation has become necessary in order to take the necessary steps to alleviate the situation. This research has proposed an IOT-based technique for monitoring the air quality index and noise intensity of a region.
6.	Design and Implementation of Portable Sensory System for Air Pollution Monitoring	Xuan Zhao, Siming Zuo, Rami Ghannam	Air pollution is becoming a more significant concern, resulting in a slew of environmental issues such as the fog-haze weather phenomenon, which can be hazardous to human health. The design and manufacturing of a portable sensory system for air pollution monitoring that can detect temperature, humidity, and particle matter is the topic of this research (PM).

Literature Review

Sr. No	Paper Title	Author Name	Abstract
7.	I2P Air Purifier with Air Quality Monitoring Device	Manisha Sharma1 , Ajay Kumar2 , Abhishek Bachhar3	Air pollution occurs when dangerous compounds are released into the atmosphere, causing an environmental impact. People dying from diseases like breathing problems and lung cancer have increased as a result of industrial development and forest loss, which are two of the biggest causes of air pollution. So, in order to combat this grave threat to humanity, we resolved to stand by this civilization and do something to detect and significantly reduce the amount of impurities in the air.
8	Integrated Pollution Monitoring System for Smart City	Baihaqi Siregar	wireless sensor network (WSN) utilizing waspmote smart cities device, connected with several sensors, such as dust sensor PM-10 (GPY21010AU0F), humidity sensor (808H5V5), luminosity sensor (LDR), and microphone (dBA). As a communication protocol we used 3G connectivity to store the data to the cloud system.

Literature Review

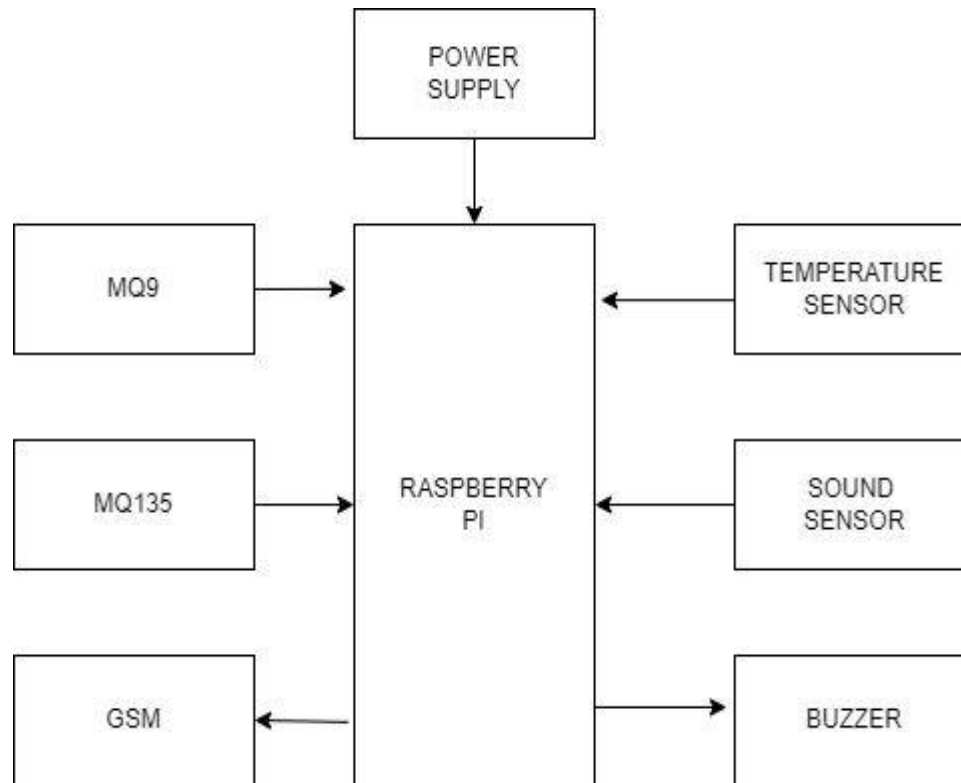| Sr. No	Paper Title	Author Name	Abstract
9.	The Acoustic Theory To Measure The Volume Fraction Of Suspended Particulate Matter In The Air.i	Yong WANG, Shuyu LIN*	This paper aims to find a simple acoustic method to measure the volume of the total suspended particles. In order to measure the volume fraction of suspended particulate matter in the air, we studied the effect of the volume fraction and the density of the suspended particulate matter on the speed of the sound wave in the air. We considered the suspended particulate matter to the vibration model of the air, and get the equivalent sound velocity by solving the equation of the mass conservation and the energy conservation of the air element when they are vibrating.
10.	Multimodal acoustic models HMM applied to heart and lung sounds	P. Mayorga1	. In particular, the application of HMM models provides robustness to cope with noise and other interferences, to which the Mixture Gaussians Models (GMM) are more vulnerable. The conducted studies document that presented quantitative assessment of LS may add in more objective and economic scanning for respiratory abnormal- ities.

Literature Review

Sr. No	Paper Title	Author Name	Abstract
11	Four-Layer Wrist Worn Device for Sound level and Hazardous Gases Environmental Monitoring	Mostafa Haghi, Kerstin Thurow	In this paper, we introduce the device "MLMS-EMGN-4.0" which is wrist worn and monitors several physical and chemical environmental parameters (air humidity, temperature, air pressure, sound level, CO and NO2) as well as motion tracking. The device is based on a multi-layer approach where the sensors are located appropriately on top of each other through a board to board connector.
12	An Efficient Tracking System for Air and Sound Pollution using IoT.	K. Cornelius1 , N. Komal Kumar , Sagar Pradhan , Priyesh Patel, N. Vinay Department of Computer Science and Engineering	The level of air and sound contamination is growing all of a sudden. To make it under inspection and surveillance is highly preferred. To conquer this problem, we are establishing a structure through which the growing issue of sound and the pres- ence of dangerous gases in the environment can be identified.

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Problem Statement:

The incessant increase in air and sound pollution prove to be an alarming problem. It has become mandatory to control and appropriately monitor the situation so that the required steps to curb the situation can be undertaken. In this project, an IOT-based method to monitor the Air Quality Index and the Noise Intensity of a region, have been proposed. , the Air Quality Index is measured considering the presence of the five criteria air pollutants. Then the sound intensity is detected using respective sensor. After that, the Cloud-based Monitoring Module ensures the process of acquiring the data with the help of Wi-fi-module present in Raspberry Pi.

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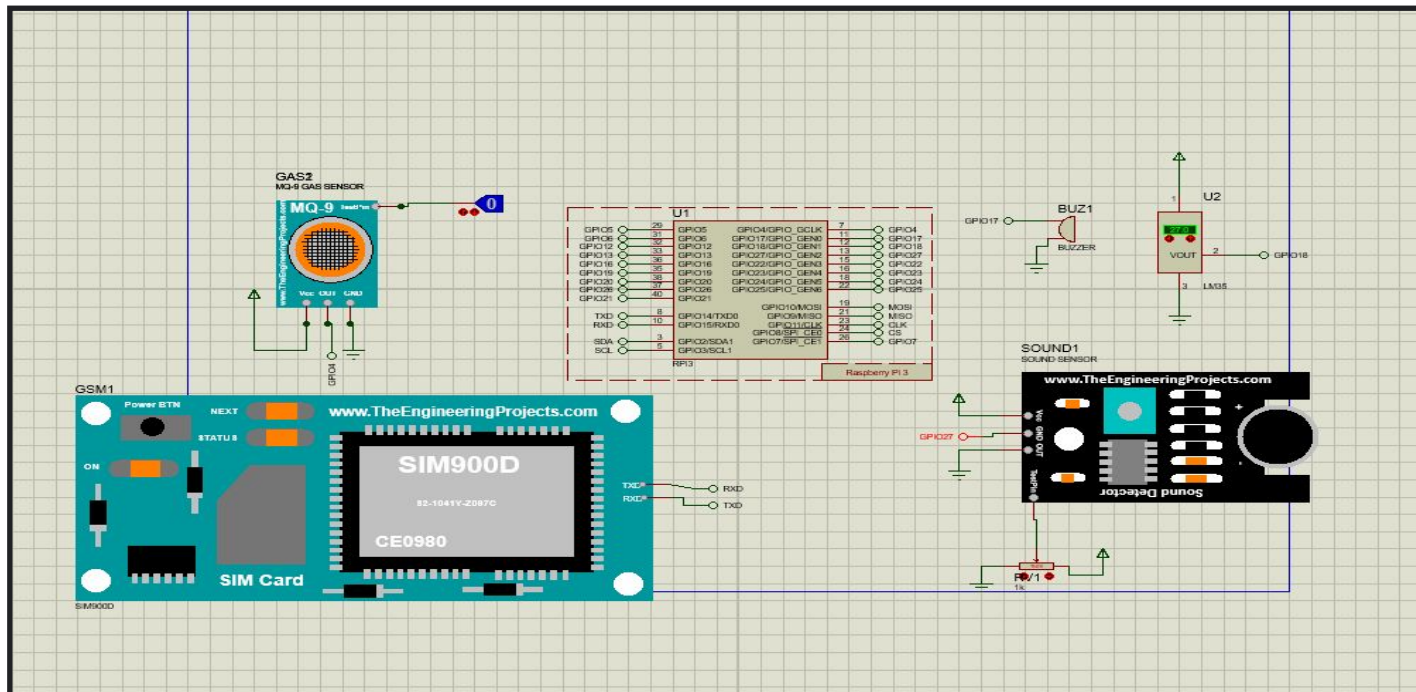
Block Diagram And Description:

Description:

In the system Raspberry Pi is used as main processor. Also there is use of gas sensor, temperature sensor and sound sensor to detect the pollution from environment. All the reading of the sensor is provide to the Raspberry Pi . System detects the gas pollution, temperature and sound pollution using gas sensor , temperature sensor and sound sensor respectively.

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Circuit Diagram:

Circuit Diagram Description:

System detects air and sound pollution. Raspberry Pi is the main processor. Raspberry pi has GPIO pins where all the sensors and output devices are connected. In the project MQ9 and MQ135 are the two sensors used to detect the air pollution. MQ9 is the sensor which detects air pollution due to gasses like methane, carbon monoxide. MQ135 is the gas sensor which detects NH3, CO2 , NOx gases . These sensors are given as input to the raspberry pi. Sound sensor used to detect the sound pollution and given as input to the raspberry pi. Buzzer is attached to the system which gives an alert if the pollution level rises too high. Also the system is featured with the technology that sends alert messages on the municipality mobile. So the required action will be taken.

Advantages:

- This system allows authorities to monitor air pollution in different areas and take action against it.

- Also authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas.

- If system detects air quality and noise issues it alerts authorities so they can take measures to control the issue.

Applications:

- Industrial pollution monitoring.

- Public places.

- School area.

- Environmental Section.

- Installed in Vehicles.

Scope of Project:

- Aims to keep a track of air quality of a surrounding and keep the data updated over internet.

- Highly accurate when used with high quality sensors.

- Data recorded is of immense use to control pollution.

- A step towards leaving a better environment.

Expected Result:

The type of gas the sensor could detect depends on the sensing material present inside the sensor. Normally these sensors are available as modules with comparators as shown above. These comparators can be set for a particular threshold value of gas concentration. When the concentration of the gas exceeds this threshold the digital pin goes high. The analog pin can be used to measure the concentration of the gas.
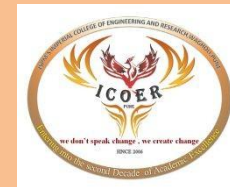
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