AIR POLLUTION MONITORING SYSTEM

A MINOR PROJECT - III REPORT

Submitted by

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M.KUMARASAMY COLLEGE OF ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this 18ECP105L Minor Project - III report **"AIR POLLUTION MONITORING SYSTEM"** is the bonafide work of **"KARTHICKRAJA K (927621BEC073), KARTHIKEYAN S (927621BEC075), KAVIN V (927621BEC080), MADHESWARAN S (927621BEC106)"** who carried out the project work under my supervision in the academic year 2023 -2024 - ODD SEMESTER.

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PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	**Matching with POs, PSOs**
Air Quality Index	**PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2**

ACKNOWLEDGEMENT

Our sincere thanks to **Thiru.M.Kumarasamy, Chairman** and **Dr.K.Ramakrishnan, Secretary** of **M.Kumarasamy College of Engineering** for providing extraordinary infrastructure, which helped us to complete this project in time.

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We would like to thank **Dr.A.Kavitha, B.E., M.E., Ph.D., Professor and Head**, **Department of Electronics and Communication Engineering** for his unwavering moral support and constant encouragement towards the completion of this project work.

We offer our wholehearted thanks to our **Project Supervisor, Project Supervisor, Dr.S.Jegadeesan, B.E., M.E., Ph.D., Professor** Department of Electronics and Communication Engineering for his precious guidance, tremendous supervision, kind cooperation, valuable suggestions, and support rendered in making our project successful.

We would like to thank our **Minor Project Co-ordinator**, **Dr.K.Karthikeyan, B.E., M.Tech., Ph.D., Associate Professor**, Department of Electronics and Communication Engineering for his kind cooperation and culminating in the successful completion of this project work. We are glad to thank all the Faculty Members of the Department of Electronics and Communication Engineering for extending a warm helping hand and valuable suggestions throughout the project. Words are boundless to thank our Parents and Friends for their motivation to complete this project successfully.

ABSTRACT

Sensor networks are currently an active research area mainly due to the potential of their applications. In this paper we investigate the use of Wireless Sensor Networks (WSN) for air pollution monitoring in Mauritius. With the fast growing industrial activities on the island, the problem of air pollution is becoming a major concern for the health of the population. We proposed an innovative system named Wireless Sensor Network Air Pollution Monitoring System(WAPMS) to monitor air pollution in Mauritius through the use of wireless sensors deployed in huge numbers around the island. The proposed system makes use of an Air Quality Index(AQI) which is presently not available in Mauritius. In order to improve the efficiency of WAPMS, we have designed and implemented a new data aggregation algorithm named Recursive Converging Quartiles (RCQ). The algorithm is used to merge data to eliminate duplicates, filter out invalid readings and summarise them into a simpler form which significantly reduce the amount of data to be transmitted to the sink and thus saving energy. For better power management we used a hierarchical routing protocol in WAPMS and caused the motes to sleep during idle time.With the escalating concern regarding air pollution and its detrimental impact on human health and the environment, there is an urgent need for robust monitoring systems. This paper presents an Internet of Things (IoT)-based air pollution monitoring system designed to provide real-time and accurate data on air quality. The system employs a network of sensors strategically placed across urban areas to measure key air pollutants, including particulate matter (PM2.5, PM10), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and ozone (O_3). The sensors collect data continuously and transmit it wirelessly to a central server for processing and analysis.

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LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
WSN	-	Wireless Sensor Network
WAPMS	-	Wireless Air Pollution Monitoring System
AQI	-	Air Quality Index

CHAPTER 1

INTRODUCTION

Sensor networks are dense wireless networks of small, low-cost sensors, which collect and disseminate environmental data. Wireless sensor networks facilitate monitoring and controlling of physical environments from remote locations with better accuracy [1]. They have applications in a variety of fields such as environmental monitoring, indoor climate control, surveillance, structural monitoring, medical diagnostics, disaster management, emergency response, ambient air monitoring and gathering sensing information in hospitable locations [2, 3, 4, 5]. Sensor nodes have various energy and computational constraints because of their inexpensive nature and ad-hoc method of deployment. Considerable research has been focused at overcoming these deficiencies through more energy efficient routing, localization algorithms and system design. In this paper we proposed a wireless sensor network air pollution monitoring system (WAPMS) for Mauritius. Indeed, with the increasing number of vehicles on our roads and rapid urbanization air pollution has considerably increased in the last decades in Mauritius. For the past thirty years the economic development of Mauritius has been based on industrial activities and the tourism industry. Hence, there has been the growth of industries and infrastructure works over the island. Industrial combustion processes and stone crushing plants had contributed to the deterioration of the quality of the air. Mauritius has led to a major increase in the number of vehicles on the roads, creating additional air pollution problem with smoke emission and other pollutants. Air pollution monitoring is considered as a very complex task but nevertheless it is very important. Traditionally data loggers were used to collect data periodically and this was very time consuming and quite expensive. The use of WSN can make air pollution monitoring less complex and more instantaneous readings can be obtained [6, 7]. Currently, the Air Monitoring

Unit in Mauritius lacks resources and makes use of bulky instruments. This reduces the flexibility of the system and makes it difficult to ensure proper control and monitoring. WAPMS will try to enhance this situation by being more flexible and timely.

1.1 OBJECTIVE

Moreover, accurate data with indexing capabilities will be able to obtain with WAPMS. The main requirements identified for WAMPS are as follows:

1. Develop an architecture to define nodes and their interaction
2. Collect air pollution readings from a region finte rest
3. Collaboration among thousands of nodes to collect readings and transmit them to a gateway, all the while minimizing the amount of duplicates and invalid values
4. Use of appropriate data aggregation to reduce the power consumption during transmission of large amount of data between the thousands of nodes
5. Visualization of collected data from the WSN using statistical and user-friendly methods such as tables and line graphs
6. Provision of an index to categorize the various levels of air pollution, with associated colours to meaningfully represent the seriousness of air pollution
7. Generation of reports on a daily or monthly basis as well as real-time notifications during serious states of air pollution for use by appropriate authorities

At present, our scientific understanding of air pollution is not sufficient to be able to accurately predict air quality at all times throughout the country. This is where monitoring can be used to fill the gap in understanding. Monitoring provides raw measurements of air pollutant concentrations, which can then be analysed and interpreted. This information can then be applied in many ways. Analysis of monitoring data allows us to asses show bad air pollution is from day to day, which areas are worse than others and whether levels are rising or falling. We can seehowpollutantsinteractwitheachotherandhowtheyrelatetotrafficlevelsor industrial activity. By analysing the relationship between meteorology and air quality, we can predict which weather conditions will give rise to pollution episodes.

METHODOLOGY:

WORKFLOW

PHASE-1: Detection of Air Pollutant Level

Itindicatestheearlyphaseoftheproject.AnIoTbasedairpollutiondetectionkitis developed. It deals with the collection of data from gas sensors connected to Raspberry Pi and the information is sent to the cloud platform that stores it.

PHASE-2: Creating the interface

This stage involves the clarification of the various components for optional performance. MCP3008 is a 10 bit converter which is calibrated to convert analog datatodigitalwithon-boardsampleandholdcircuitry.Thedatacollectedisstored, processed and can be monitored using the Mobile Application. Users can review the stored data through the application.

PHASE-3: Execution and Testing

The various components are interfaced together and the project deliverables are built with the help of different circuit designs. The testing, debugging and troubleshooting of the design is performed to test the performance of the design under various conditions. If a circuit design fails to pass the tests, then a newer circuit design should be completed, implemented and tested.

1.2 HARDWARE COMPONENTS REQUIRED

1. Power supply
2. Voltage Regulator
3. Gas Sensor
4. Arduino
5. LCD Display
6. Wifi Module

MQ3 GAS SENSOR:

TheSensitivematerialusedinMQ3gassensorisSnO2.The conductivity of this material is lower in clean air. The sensor conductivity increases with the increasing concentration of target pollution gas. MQ3 can monitor different kinds of toxic gases such assulphide, ammoniagas, benzeneseriessteam and CO2. The detection range is 10- 10,000 ppm with the voltage rate of about 5.0V±0.1V AC or DC The important features are long life span, low cost, simple drivercircuitandgoodsensitivitytotoxicgases.MQ3gassensoriswidelyusedin industrial gas alarm, portable gas detector and domestic gas alarm as shown in Fig.6. MQ- 3 is used in this framework for monitoring CO2 in air. The amount of CO2 present in the atmosphere is 400.7 ppm according to which the sensor is calibrated.

Figure.no .1:MQ3 Sensor

LCD:

A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes, liquid crystal molecules are aligned in parallel with the glass surface. A liquid crystal display (LCD) has liquid crystal material sandwiched between two sheets of glass. Without any voltage applied between transparent electrodes ,liquid crystal molecules are aligned in parallel with the glass surface.

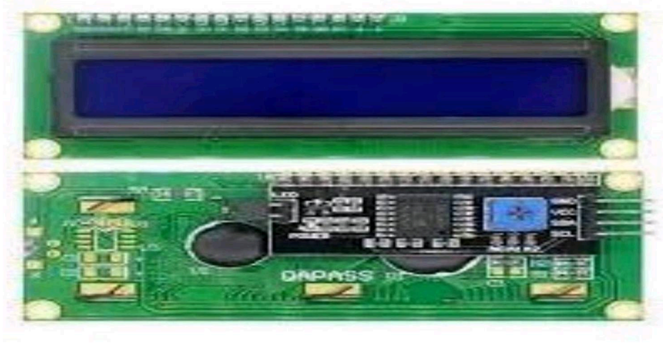

Figure.no.2:LCD Display

VOLTAGE REGULATOR

A voltage regulator is an essential electronic component used in various devices and systems to maintain a stable output voltage. Its primary function is to ensure that the voltage supplied to a load remains within specified limits, even when the input voltage or load conditions fluctuate. This regulation is crucial because many electronic components and circuits require a consistent voltage to function properly .Voltage regulators come in various types, including linear and switching regulators. Linear voltage regulators use a simple, linear control mechanism to adjust the output voltage. They are known for their simplicity, low output noise, and easy design .However, they are not very efficient, especially when there is a significant difference between the input and output voltages.

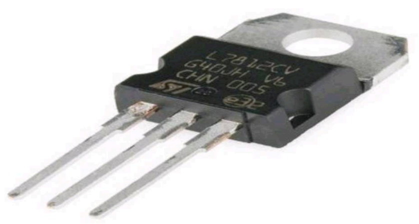

Figure.no.3: Voltage Regulator

CHAPTER 2

LITERATURE SURVEY

Air pollution is a pressing environmental concern with far-reaching implications for public health, ecosystems, and overall quality of life. The monitoring of air quality is a critical component of efforts to mitigate its adverse effects. This literature review aims to provide an overview of the key developments and findings in the field of air pollution monitoring.

Recent advances in technology have greatly improved our ability to monitor air pollution. Traditional methods, such as the use of static monitoring stations, have been complemented and even supplanted by portable and low-cost sensors, providing more granular data at various locations. These sensors candetect a wide range of pollutants, including particulate matter (PM), nitrogen dioxide ($NO2$), sulfur dioxide ($SO2$), carbon monoxide (CO), and volatile organic compounds (VOCs).

Furthermore, the integration of these sensors with data analytics and geographic information systems (GIS) has enabled real-time tracking and visualization of air quality. Such advancements facilitate the identification of pollution hotspots aiding in the development of targeted interventions and public awareness campaigns.

Studies have shown the detrimental effects of air pollution on human health, including respiratory and cardiovascular diseases, as well as its impact on climate change and environmental degradation. This underscores the importance of accurate and comprehensive air quality monitoring systems.

In conclusion, the field of air pollution monitoring has made significant strides in recent years, thanks to technological innovations and data analysis techniques. These advancements are crucial for addressing the multifaceted challenges posed by air pollution and provide a foundation for evidence-based policy making and public health interventions. However, ongoing research is necessary to refine monitoring methods and enhance our understanding of the complex interactions between pollutants and their impact on society and the environment.

2.1BACKGROUNDREVIEW

A WIFI-enabled indoor air quality monitoring and control system:- Published in Control & Automation(ICCA),201713thIEEEInternationalConferenceAuthors: Xiaoke Yang, Lingyu Yang, Jing Zhang(School of Automation Science and Electrical Engineering, Beihang University, Beijing, 100191, China)This paper proposes an open platform of a Wi-Fi-enabled indoor air quality monitoring and control system, which could be incorporated in to such a ‘smart building’ structure. The complete software and hardward sign of this system is presented , along with a series of control experiments. The proposed system operates over an existing wirelessnetworkutilizingtheMQTTprotocol.Itiscapableofmonitoringthe indoor air quality as well as controlling an air purifier to regulate the concentration of the particulate matter. Experiment results under areal-world office environment demonstrate the effectiveness of the proposed design. A low-power real-time air qualitymonitoringsystemusingLPWAN:-Publishedin:Solid-StateandIntegrated Circuit Technology (ICSICT), 2016 13th IEEE International Conference Authors: Sujuan Liu, Chuyu Xia, Zhenzhen Zhao (College of Electronic Information and Control Engineering, Beijing University of Technology, 100124, China)This paper presents a low-power real-time air quality monitoring system based on the Lo Ra Wireless Communication technology. The proposed system can be laid out in a large number in the monitoring area to form a sensor network. The system integrates a single-chip microcontroller, several air pollution sensors (NO_2, SO_2, O_3, CO, PM1, PM10, PM2.5), Long Range (LoRa) — Modem, asolarPV-battery part, and graphical user interface (GUI). As a communication module , Lo Rasends the data to the central monitoring unit, and then the data would be saved in the could. The range tests at an outdoor area show that Lo Ra is able to reach approximately 2Km.TheTXpowerisonlyabout110mAwhichislowercompared with other used wireless technology. An easy-to-use GUI was designed in the system. Based on Lo Ra technology, GUI, and Solar PV-battery part the system has several progressive features such as low cost, long-distance, high coverage, long device battery life, ease to operation. IoT enabled proactive indoor air quality monitoring system for sustainable health management: -Published in: Computing and Communications Technologies (ICCCT), 2017 2nd International Conference Authors: M.F.M Firdhous, B.H Sudantha, P.M Karunaratne (Dept. of Information Technology, University of Moratuwa, Sri Lanka)This paper proposes an IoT-based indoor air quality monitoring system for tracking ozone concentrations near a photocopy machine. The experimental system with a semiconductor sensor capable of monitoring ozone concentrations was installed near a high-volume photocopier. The IoT device has been programmed to collect and transmit data at an interval of five minutes over a blue tooth connection to a gateway node that in turn communicates with the processing node via the WIFI local area network. The sensor was calibrated using the standard calibration methods. As an additional capability, the proposed air pollution monitoring system can generate warnings when the pollution level exceeds a predetermined threshold value.

CHAPTER 3

EXISTING SYSTEM

As of my last knowledge update in January 2022, there were several existing systems and technologies used for air pollution monitoring. Please note that the field of air pollution monitoring is continually evolving, and new systems and technologies may have emerged since then. Here are some of the existing components of air pollution monitoring systems:

1. Ground-Based Monitoring Stations:

   - Air quality monitoring stations are set up in various locations to measure the concentration of various air pollutants. These stations typically use instruments to measure parameters such as particulate matter (PM2.5 and PM10), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and more.

2. Remote Sensing and Satellite Technology:

   - Satellites equipped with remote sensing instruments provide valuable data for monitoring air pollution on a global scale. These satellites can measure various pollutants and provide spatial data that helps identify pollution sources.

3. Mobile Monitoring Units:

   - Mobile monitoring units equipped with air quality sensors can be deployed to investigate air quality in different locations, especially in areas with varying pollution levels.

4. Air Quality Index(AQI)Systems:

   - Many regions have established Air Quality Index (AQI) systems that provide a simple and understandable way to communicate air quality information to the public. These indices categorize air quality into various levels, such as "Good," "Moderate," "Unhealthy," and "Hazardous."

5. Citizen Science Initiatives:

- Crowd sourced data from citizens with personal air quality monitors or smartphones can contribute to air pollution monitoring. Apps and websites often collect and display data from citizen scientists to enhance monitoring efforts.

6. Weather Stations:

- Weather data, including wind direction and speed, can be critical in understanding how pollutants disperse and affect air quality in a given area.

7. Data Analysis and Reporting:

- Advanceddataanalysistoolsandplatformsareusedtoprocessandinterpretthe collected data, generating reports and visualizations for policymakers and the public.

8. Industrial Emission Monitoring:

- Industrial facilities are often required to monitor and report their emissions. Continuous emission monitoring systems (CEMS) and periodic stack emissions testing are used to measure pollutants from industrial sources.

9. Urban Air Quality Modeling:

- Computer models are employed to simulate the dispersion of pollutants and assess their impact on urban air quality. These models help in predictingfutureair quality trends.

10. Indoor Air Quality Monitors:

- Devices and sensors designed for indoor air quality monitoring are used to track pollutants within homes, offices, and other indoor environments.

Please note that the effectiveness and coverage of air pollution monitoring systems can vary greatly from one region to another, depending on local regulations, funding, and environmental concerns. Advances in sensor technology and data analysis methods are continually improving the accuracy and granularity of air pollutiondata.Forthemostup-to-date information on air pollution monitoring systems, you should refer to local environmental agencies and organizations responsible for air quality monitoring in your area. Advances in sensor technology and data analysis methods are continually improving the accuracy and granularity of air pollutiondata.Forthemostup-to-date information on air pollution monitoring

CHAPTER 4

PROPOSED SYSTEM

Thus, installing an air quality monitoring system helps monitor the presence of pollutants, resulting in better environmental conditions for humans to reside. This also impacts their health and reduces the chances of occurring any health issues by maintaining a moderate ambiance or as required. With air quality monitoring systems industries can detect the presence of these toxic and monitor the air quality to take intelligence measures to improve the quality of air for their workers. This leads to an increase in productivity, reduced equipment damage, and effective regulatory compliance. This project will help thousands of cities worldwide to implement an effective air pollution monitoring system. A proposed system for air pollution monitoring aims to address the pressing issue of air quality by leveraging cutting-edge technology. This system will consist of a network of air quality sensors strategically placed in urban areas. These sensors will continuously collect data on various air pollutants such as particulate matter, nitrogen dioxide, sulfur dioxide, carbon monoxide, and ozone. The data will be transmitted to a central monitoring and analysis hub, where it will be processed and made accessible to the public via web platforms and mobile applications. Key features of this system include real-time monitoring, automated alerts for hazardous conditions, and historical data analysis for trend identification. Additionally, it will enable authorities to make informed decisions regarding pollution control measures and help individuals protect their health by avoiding polluted areas. This proposed system will be a vital tool in the ongoing battle to improve air quality, reduce environmental impact, and safeguard public health.

CHAPTER 5

PROJECT METHODOLOGY

Themethodologyforanairpollutionmonitoringsysteminvolvesseveralkey steps:

- ➢ Define the project scope, objectives, and deliverables. Identify the target locations For monitoring and the pollutants to be measured.
- ➢ Choose appropriate air quality sensors based on the pollutants of interest. Consider factors like accuracy, cost, and ease of maintenance.
- ➢ Install sensor sat selected locations and configure them to collect real-time data. Ensure proper calibration and quality control measures.
- ➢ Implement a data transmission system to relay sensor data to a central server. This can be through wired or wireless networks.
- ➢ Develop algorithms for data analysis and visualization. Convert raw sensor data into meaningful air quality indices.
- ➢ Set up an alert system to notify relevant authorities and the public when air quality falls below acceptable levels.
- ➢ Securely store historical data for trend analysis and regulatory compliance.
- ➢ Create periodic reports and share air quality information with the public and relevant agencies.
- ➢ Continuously assess the system's performance and make improvements as needed**.**

WORKINGPRINCIPLE

Air pollution monitoring systems operate by collecting and analyzing data on the concentration of various air pollutants in a specific area. These systems typically consist of sensors that detect pollutants such as particulate matter (PM2.5,PM10), nitrogen dioxide ($NO2$), sulfur dioxide($SO2$),carbon monoxide(CO),and ozone ($O3$). The sensors use various technologies, including

Electro chemical methods, to measure pollutant levels. Data from these sensors is then transmitted to a central database or monitoring station, where it is processed and analyzed. The information is often made available to the public in real-time, helping authorities and individuals make informed decisions to mitigate the harmful effects of air pollution and improve air quality.

MATHEMATICAL ANALYSIS OF PROPOSED MODEL:

Thelevelconcentrationofpollutantsintheairismeasuredinpartspermillion (ppm) or percentage.

Conversion factors include the following:

1 ppm = 1.145 mg/m3

1mg/m3=0.873ppm

1%=1/100

1ppm=1/1000000

1ppm=0.0001%

Table2showsPPMtopercentageconversion.

Table.no.1 :PPM to Percentage conversion

Parts per Million (ppm)	**Percent (%)**
0	0
5	0.005
50	0.005
500	0.05
1000	0.1

CHAPTER 6

RESULT AND DISCUSSION

- As a result, our project is to check the quality of the exposed level in the air pollution. The mobile application is developed by getting the source and destination address from the user.
- In this application it monitors the pollutant level through that way.

□ It is also tracks the individual’s exposure level of air pollutants for a single day.

- Our project was designed to help a person to detect, monitor, and test air pollution in a given area.
- The kit has been integrated with a mobile application that helps the user predicting the pollution level of their entire route.
- This proposed air pollution monitoring kit along with the integrated mobile application can be helpful to people to identify their exposure level to air pollutants.
- The app had following features, indices of air quality using real-time computation, air quality daily reports based on users travel distance, specific reports for air quality measures based on locations.
- Air Pollution is the major affecting factor to our environment .Not only affecting the environment and also affects the human health.
- The mobile application is developed to monitoring system it tracking the how much the human has exposed in a day.
- The gas sensors was used for identifying the Leakage Gas, Carbon Monoxide, Smoke, and Propene.
- The sensor senses the gases and convert from analog to digital and displays in the application.
- The exposed level is calculated in PPM(parts per million).

The online application used to analyze air quality data got from sensors in thir proposed system was “Thing-speak”. Thing-speak is an open source internet of things application programming interface used to store and retrieve data from interconnected things using the hypertext protocol over the internet or via a local area network. It also provides access to a broad range of embedded devices and web services. This enables the creation of sensor logging applications that can be updated regularly. Figures 4-9 show the results of various pollutants that were obtained.

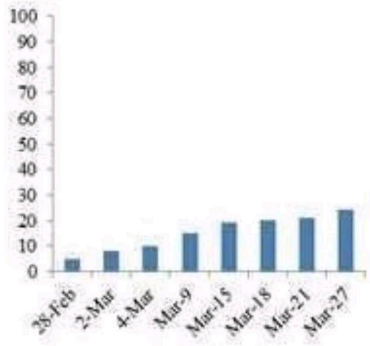

Figure.no.4 : Air Quality on Selected Days with an Aero solas Sample Pollutant

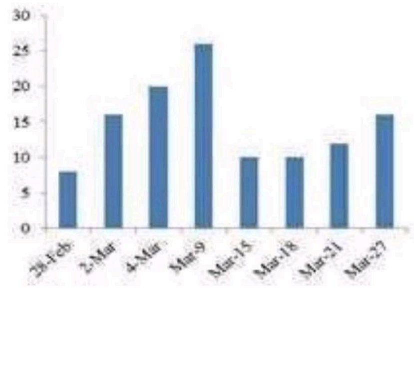

Figure.no.5 : Air Quality on Selected Days with Dust as Sample Pollutant

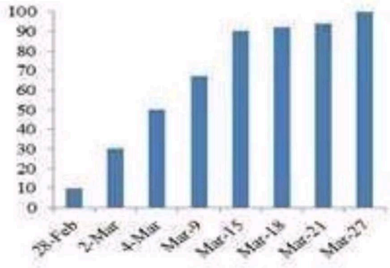

Figure.no.6: Air Quality on Selected Days with a Gas as Sample Pollutant

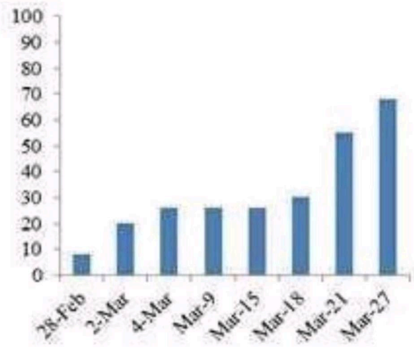

Figure.no.7: Air Quality on Selected Days with Smoke as Sample Pollutant

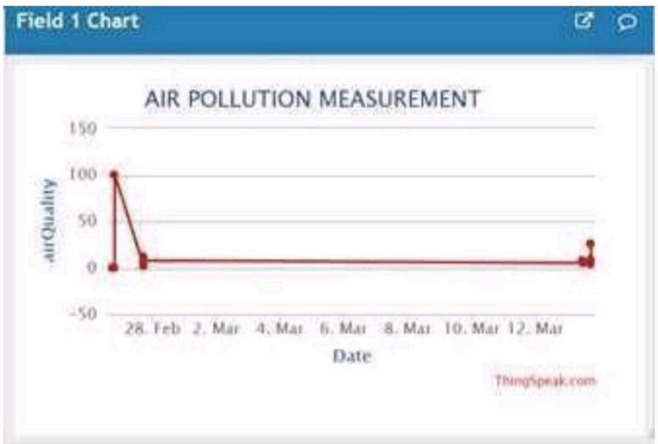

Figure.no.8: Air quality measurement as seen online

CHAPTER 7

CONCLUSION AND FUTUREWORK

In conclusion, the development and implementation of an effective air pollution monitoring system are of paramount importance in addressing the critical environmental and public health challenges associated with poor air quality. Such systems have made significant strides in recent years, leveraging advanced technology and data analytics to provide real-time, accurate, and comprehensive information on air pollution levels.The future of air pollution monitoring systems promises even more robust and insightful solutions. These systems are likely to benefit from advancements in sensor technology, satellite imagery, and machine learning algorithms, which will enhance their accuracy and coverage. Moreover, the integration of data from various sources, such as ground-based sensors, drones, and satellites, will enable a holistic view of air quality across diverse geographical areas. Furthermore, public awareness and engagement will play a pivotal role in the future of air pollution monitoring. Citizen science initiatives and accessible information platforms will empower individuals to make informed choices about their daily activities,reducing exposure topollutants.Collaborativeeffortsbetween governments, industries, and communities will be essential to drive policy changes and reduce emissions. In the coming years, we can anticipate a more interconnected, data-driven, and community-engaged approach to air pollution monitoring, which will be instrumental in combating the adverse effects of air pollution on our planet and public health.

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