IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM

A PROJECT REPORT

Submitted by

Ramya Ramakrishnan (RA1711003040001)

K. Saivarun (RA1711003040117)

M. Kishore (RA1711003040141)

Under the guidance of

DR. A. KATHIRVEL, B.E., M.E., PhD

(Professor, Department of Computer Science and Engineering)

In partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE & ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Vadapalani Campus, Chennai - 26.

MAY 2021

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

BONAFIDE CERTIFICATE

Certified that this project report "IOT Based Smart Industry Monitoring and Alerting System" is the bonafide work of Ramya Ramakrishnan (RA1711003040001), K. Saivarun (RA1711003040117) and M.Kishore (RA1711003040141) who carried out the project work under my supervision.

SIGNATURE OF THE FACULTY

Dr.A.Kathirvel B.E.,M.E.,Ph.D

Professor

Department of Computer Science and Engineering
SRM Institute of Science & Technology
Vadapalani Campus

SIGNATURE OF THE HOD

Dr.S.Prasanna Devi, B.E.,M.E., Ph.D.,
PGDHRM.,PDF(IISc)
Professor

Department of Computer Science and Engineering
SRM Institute of Science & Technology
Vadapalani Campus

ACKNOWLEDGEMENT

First and foremost, we would like to thank God Almighty for giving us the strength, knowledge, ability and opportunity to undertake this project work and to persevere and complete it to the best of our ability

.

We place our deep sense of gratitude and thank our management for providing us with a good infrastructure and learning environment throughout the course.

We take the opportunity to extend our heartfelt thanks to our respected Dean (E & T), Dr. K. Duraivelu, Ph.D., for his support throughout the four years of our BTech course.

We like to express our special thanks to our Head of the Department, Dr. S. Prasanna Devi, B.E., M.E., Ph.D., for encouraging and helping us throughout towards successful completion of our course.

We would also like to show our greatest appreciation to our Project Coordinators Mr. D. Manikkannan B.E., M.E. and Dr. P. Mohamed Fatimal, B.E., M.E., PhD., for the tremendous support and help offered every week when we had project discussion. Without their encouragement and guidance, this project would not have materialized.

We thank our Project Supervisor Dr.A.Kathirvel B.E.,M.E.,Ph.D for his / her supervision, feedback, and mentoring. Without his/her support, it would have been tough for us to finish this project in a timely manner. Thus, we feel deeply obliged for his / her support.

We would like to thank the guidance and support received from all the members including our parents and friends who contributed towards successful completion of this project.

TABLE OF CONTENTS

ABSTRACT

With the mechanization and automation, industrial revolution has occurred in all parts of the world. This has increased the living standards of the common man and also contributed to the economic growth of the country. IoT has transformed itself to suite various fields namely home automation, smart buildings, smart cities and also significantly contributing towards health monitoring. IoT provides a perfect solution reducing the cost to 1/10. IoT aims at increasing the productivity and efficiency of any industry, but environmental responsibility should be the prime factor of concern. The concept of Industrial IoT (IoT) gained sufficient propaganda with the introduction of automation. IoT has become the most sought-after area of research since it aims at increase in productivity and efficiency. The number of vehicles and machines has increased to double fold within a span of twenty years. A Prototype of IoT Based Smart Industry Monitoring and Alerting System to monitor, locate and successively alert gas leaks of a complex factory environment. Unlike Traditional Systems, we've used IoT technology to make a Smart Industry Monitoring and Alerting System and to perform data analytics on sensor readings using cloud service successively. This will detect any leakage of harmful gases, supporting and displaying the level and the location of the leakage. The aim of this project is to develop such a device that can automatically detect and alert the corresponding officials thus, stopping gas leakages in those permeable Throughout the demonstration, the technological advantages of our prototype – "IoT Based Smart Industry Monitoring and Alerting System" are explored.

LIST OF FIGURES

CHAPTER - I

INTRODUCTION

1.1 Overview

With the boom of mechanization and automation, industrial revolution has occurred in all parts of the world. This has increased the living standards of the common man and also contributed to the economic growth of the country. IoT has transformed itself to suite various fields namely home automation, smart buildings, smart cities and also significantly contributing towards health monitoring. The concept of Industrial IoT (IoT) gained sufficient propaganda with the introduction of automation. IoT has become the most sought-after area of research since it aims at increase in productivity and efficiency. The number of vehicles and machines has increased to double fold within a span of twenty years. This in turn adversely affected the environment by increase in air and water pollution which resulted in bad impact in healthy life of people. Gas leakage and location of leakage was detected by deploying mobile and stationary nodes in the monitoring area. A gas leakage monitoring system was developed for detection and locating the point of leakage in real time. Refer - [10] D.Yaswanth, Dr Syed Umar,-" A Study on Pollution Monitoring system inWireless Sensor Networks",-D.Yaswanth IJCSET |September 2013 | Vol 3, Issue 9, 324-328. Arduino based gas detection system was developed which could detect the presence of toxic gases and alert the personnel concerned. The developed prototype can record the readings which can be analysed.. The proposed model aims at analysing the type of industry, studying the nature of processes involved and identifying the probability of gas leakage. In addition to gas leakage, fuel leakage can also be addressed. Potential points can be identified and corresponding sensors can be installed which can monitor and record the data. Refer - [1] A Boubrima, W Bechkit, and H Rivano 2017 A new WSN deployment approach for air pollution monitoring, 2017 14th IEEE Annu. Consum. Commun. Netw. Conf. CCNC 2017, pp. 455– 460. IoT provides a perfect solution reducing the cost to 1/10. IoT aims at increasing the productivity and efficiency of any industry, but environmental responsibility should be the prime factor of concern.

1.2 Objective

The proposed project aims at analysing the type of industry, studying the nature of processes involved and identifying the probability of gas leakage Potential points can be identified and corresponding sensors can be installed which can monitor and record the data. The big data can be sending to Google Cloud which facilitates monitoring by authorized personnel from any part of the globe. Initiating preventive actions by alarms in case of any abnormalities found in the received data can save the precious lives of many.

CHAPTER – II

SYSTEM ANALYSIS

2.1 Problem Statement

The concept of Industrial IoT (IoT) gained sufficient propaganda with the introduction of automation. IoT has become the most sought-after area of research since it aims at increase in productivity and efficiency. This in turn adversely affected the environment by increase in air and water pollution which resulted in bad impact in healthy life of people. As per the environment reports, due to tremendous increase in population and industries increase of environmental pollution has increased day by day.

2.2 Problem Analysis

In this Project, we can sense that level of pollution has increased with times by lot of think just like the increase in population, increased vehicle use, industrialization and urbanization which results in harmful effects on human well-being by directly moving health of population exposed there to it. To overcome this issue, we tend to introducing a system through that the extent of sound and therefore the existence of the harmful gases within the surroundings can be detected.

2.3 Existing System

In this existing system is IoT based industry monitoring system. Sensor are using to monitoring pollution level and also update to server room. Monitoring the gas leakage level from any part of the globe can be achieved by integration of big data to the Google Cloud via web servers. A prototype based on Raspberry Pi was developed which could sense the concentration of gases. The real time data obtained from the different sensors has been uploaded to Google cloud.

2.4 Proposed System

A prototype of IoT Based Smart Industry Monitoring and Alerting System to monitor, locate and successively alert gas leaks of a complex factory thus, controlling the pollution. The proposed model - has two server sections one is factory server and another one is TNPCB server. Sensors are used to monitor the pollution level and update to both factory and also TNPCB Server respectively. Potential points can be identified and corresponding sensors can be installed which can monitor and record the data. The obtained data is being sent to Cloud which facilitates monitoring by authorized personnel in TNPCB. Initiating preventive actions by alarms in case of any abnormalities found in the received data. Thus, by regulating their actions successively.

CHAPTER – III

LITERATURE SURVEY

3.1 Identifying Weather and Monitoring Systems

Title: AN IOT BASED SMART INDUSTRY MONITORING SYSTEM BY USING RASPBERRY PI
Author Name: Venkata Subbaiah.B, Venkata Sreekanth Reddy.
Year Of Publish : 2018

In Industry Weather Conditions Places a Major Role, If there is any Changes in Weather of the Machines or Equipment Causes Major Damages to the Industry and effects Economy of the Industry to protect from this type of Damages are introduce IOT Based Smart Industry Weather Monitoring System Using Raspberry pi 3 It is the Advanced Technology where we can Monitor Weather in the Industry from any where in the World by Using IOT Technology this System Collects the Weather Parameters from Sensors and Updated in thingspeak.com using http Protocol.

3.2 Vehicular Pollution Monitoring Systems

Title: Development of IoT based Vehicular Pollution Monitoring System
Author Name: Ramagiri Rushikesh, Chandra Mohan Reddy Sivappagari
Year Of Publish : 2016

Wireless sensors are used in most of the in real time applications for collecting physical information. The impossible measurements in typical ways have currently become attainable using the wireless technology. In this technology, the measurement of air quality is one of the difficult areas for the researchers. The main source of atmosphere pollution happens due to vehicles. The high inflow of vehicles in urban areas causing more air pollution and decreasing air quality that leads to severe health diseases. The main objective of the paper is to introduce vehicular pollution monitoring system using Internet of Things (IoT) which is capable of detecting vehicles causing pollution on the city roads and measures various types of pollutants, and its level in air. This paper also reports the status of air quality whenever needed to the environmental agencies. The proposed systems also assures the existence of wireless sensors for vehicle pollution system that specialize in a straight forward accessibility of real time data through internet using IoT. The measured data is also shared to vehicle owner, traffic department and agencies of national environment. This system is a low cost and provides good results in controlling the air pollution especially in the urban areas.

3.3 Gas Leaks in Indoor Environment Systems

Title: Gas Leak Detection and Localization System Through Wireless Sensor Networks
Author Name: Petros Spachos , Liang Song
Year Of Publish : 2014

In this demonstration proposal we use a prototype of aWireless Sensor Network (WSN) to monitor and locate gas leaks of a complex indoor environment. Specifically, a mobile node is moving inside a building to monitor any leakage of carbon dioxide (CO2), supporting and displaying the level and the location of the leakage. Throughout the demonstration, the technological advantages of cognitive networking along with multihop routing are explored.

3.4 Sensor Based Alerting Systems

Title: GAS LEAKAGE DETECTION AND SMART ALERTING SYSTEM USING IOT
Author Name: Shital Imade, Priyanka Rajmanes
Year Of Publish : 2018

Internet of Things aim towards making life simpler by automating every small task around us. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards. Safety, the elementary concern of any project, has not been left untouched by IoT. Gas Leakages in open or closed areas can prove to be dangerous and lethal. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we have used the IoT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor readings. Our main aim is to proposing the gas leakage system for society where each flat have gas leakage detector hardware. This will detect the harmful gases in environment and alerting to the society member through alarm and sending notification

3.5 Air and Sound level Monitoring Systems

Title: IOT Based Air And Sound Pollution Monitoring System
Author Name: Anushka Sharma, Vaishnavi Varshney**,**
Year Of Publish : 2018

The growing air and sound pollution is one of the serious issues these days. This large amount of increasing pollution has made human life prone to large number of diseases. Therefore, it has now become necessary to control the pollution to ensure healthy livelihood and better future. The Air and Sound

Pollution Monitoring device can be accessed by the authorities and the common people belonging to the area. The device will be installed through a mobile application which will show the live updates of the pollution level of the area. This device is also capable of detecting the fire in its area and notify the same to the fire brigade authorities so that they could take necessary actions accordingly, and also the mobile applications will be installed in the fire brigades itself so that if a fire is taking place nearby, it could be controlled in time to reduce loss of people and property. This system works on the methods of IOT which is a rising technology based on the fusion of electronics and computer science. The embedded sensors in the system help to detect major air polluting gases such as CO2, SO2 and CO and level of sound pollution. The concept of IOT helps to access data from remote locations and save it in database so that we don't need to actually be present in that area.

3.6 Air Quality Pollution Monitoring Systems

Title: IOT Based Air Pollution Monitoring and Forecasting System Using ESP8266
Author Name: Vishakha Dhoble, Nikita Mankar,
Year Of Publish : 2018

Any activity involving burning things/fuels and mixing substances that cause chemical reactions may release toxic gases in the process and some activities like construction, mining, transportation, etc. produce large amounts of dust which has the potential to cause air pollution. As generation of toxic gases from industries, vehicles and other sourcesis tremendously increasing day by day, it becomes difficult to control the hazardous gases from polluting the pure air. Air pollution not only brings serious damage to human health but also causes negative effects to natural environments. The air pollution occurs due to contamination of air with Carbon monoxide (CO), Carbon dioxide (CO2), Nitrogen dioxide (NO2), Sulfur dioxide (SO2) and many other harmful pollutants. This pollutant causes serious damage to environment. It also has hazardous effects on human health. Carbon monoxide reduces oxygen carrying capacity of the body's organs and tissues which may lead to cardiovascular disease. Carbon monoxide causes visual impairment, reduced manual dexterity, reduced work capacity, poor learning ability. So it becomes more and more important to monitor and control air pollution. It will become easy to control it by monitoring the concentration air pollutant parameters in air. Using laboratory analysis, conventional air automatic monitoring system has relatively complex equipment technology, large bulk, unstable operation and high cost

3.7 Environment Quality Monitoring Systems

Title: IoT based Air Quality Monitoring

Author Name: N Setiawan , Kustiawan

Year Of Publish : 2017

Air pollution is a mixture of solid particles and gases in the air. Car emissions, chemicals from factories, dust, pollen and mold spores may be suspended as particles. Effect of air pollution has many bad things and the others may cause problems to our health, for instance, asthma, cough, and lung disorders. In addition, the pollutant can cause global warning, acid rain, and disturbing plant growth. Basically, a human cannot determine whether the air is good or not. Hence, it is necessary to have a tool that can measure the air quality. This research is purposed to design an air quality monitoring system by utilizing esp8266 module. As the result, users can monitor the air quality using smartphone connected through ESP8266 Wi-Fi. Therefore the air condition can be monitored every time. Currently, there is so much air pollution cases that actually can be changed if we are aware. In other words we can contribute as part of the solution instead part of the pollution

3.8 LPG Gas Leakage Detector System

Title: Microcontroller Based Low Cost Gas Leakage Detector with SMS Alert

Year Of Publish : 2019

Author Name: Mr. Arijit Banik Mr. Bodhayan Aich

Gas leakage is a major problem with industrial sector, residential areas and gas driven vehicles like CNG (Compressed Natural Gas) buses, cars etc. One of the preventive methods to stop accidents related with the gas leakage is to install a gas leakage detection device at permeable places. The aim of this project is to develop such a device that can automatically detect and stop gas leakages in those permeable areas. The system detects the leakage of the LPG (Liquefied Petroleum Gas) using a gas sensor and uses the GSM to alert the person about the gas leakage via SMS. When the LPG concentration in the air exceeds a predetermined level, the gas sensor senses the gas leakage and the output of the sensor goes LOW. This is detected by the microcontroller and the LED and buzzer are turned ON simultaneously. The system then alerts the customer by sending an SMS to the specified mobile-phone

Refer - [4] K Keshamoni and S Hemanth 2017 Smart gas level monitoring, booking & gas leakage detector over iot Proc. - 7th IEEE Int. Adv. Comput. Conf. IACC 2017, pp. 330–332

CHAPTER – IV

SYSTEM REQUIREMENT SPECIFICATION

4.1 Hardware Requirements

- NODEMCU
- Arduino Uno Device
- LCD 16*2
- GAS Sensors – MQ 6 and MQ 7
- Temperature and Humidity Sensor - DH11
- Relay
- Buzzer
- Power unit

4.2 Software Requirements

- Language Programmed: C++, Java
- Compiler Used : Arduino Uno IDE
- Other Softwares Used : Android Studio, VS Code

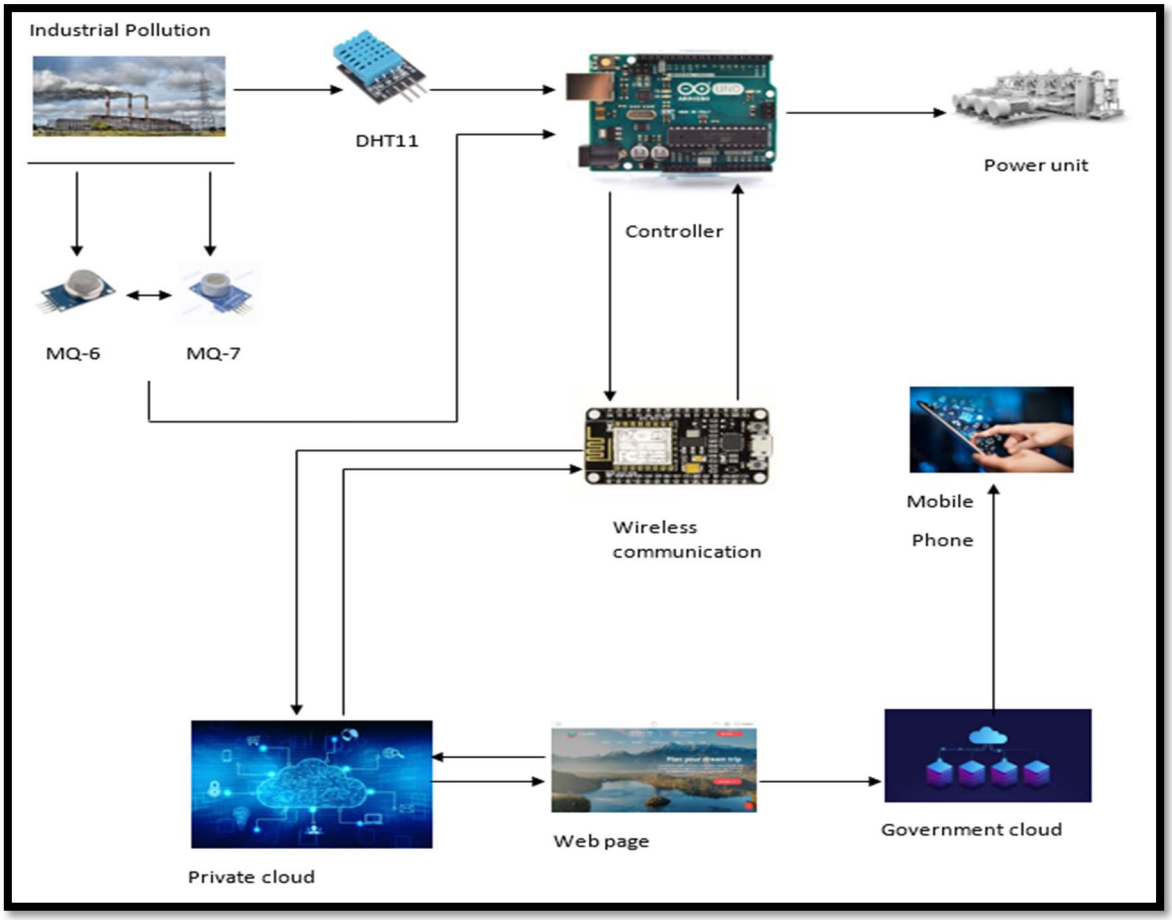
CHAPTER – V

SYSTEM DESIGN SPECIFICATION

5.1 System Architecture

The block diagram given below contains NODEMCU Unit, Arduino UNO, gas sensors, temperature and humidity sensor, power units, and a DC Motor. Sensors are connected to GPIO Pin of Arduino UNO. NODEMCU connected to UART Port of Arduino UNO, which collects the sensor values from Arduino UNO and sends them to the cloud. The Sensor Values are updated to two server rooms (Factory Server and TNPCB Government Server) and are constantly stored in cloud database using Firebase. If Processor receives abnormal values, a notification will be released in form of buzzer. TNPCB will send the warning message to respective factory official in their respective application developed for mobile. The obtained data is being sent to Cloud which facilitates monitoring by authorized personnel in TNPCB. Initiating preventive actions by relay in case of any abnormalities found in the received data. Thus, by regulating their actions successively.

Fig. 5.1 – System Architecture Diagram



5.2 Modules

Technical Modules involved in the Project

Prototype - IoT Based Smart Industry Monitoring and Alerting System

Module – 1

Implementing Sensor Integration and Calibration

Module – 2

Integration of Data between both servers (Private Cloud and Government) with sensors

Module – 3

Real Time Data Interpretation and Live Action of Power Outage Relay

5.3 Modules Description

1. Implementing Sensor Integration and Calibration

- In this system, NODEMCU acts as the internet connector and information accessing for the air quality and the sensor's are calibrated successively and attached to GPIO Pin of Arduino UNO.

- All Sensors are successively wired to PCB board and are connected directly component's window as explained in the architecture illustration.

- Then we integrate and calibrate the three sensors that detect gases and temperature and humidity respectively with Arduino UNO before the data detected is sent to the controller module.

2. Integration of Data between both servers (Private Cloud and Government) with sensors

- In this system, NODEMCU acts as the internet connector and information accessing for the air quality and the sensors are calibrated successively and attached to GPIO Pin of Arduino UNO.
- All Sensors are successively wired to PCB board and are connected directly component's window as explained in the architecture illustration.
- Then we integrate and calibrate the three sensors that detect gases and temperature and humidity respectively with Arduino UNO before the data detected is sent to the controller module.

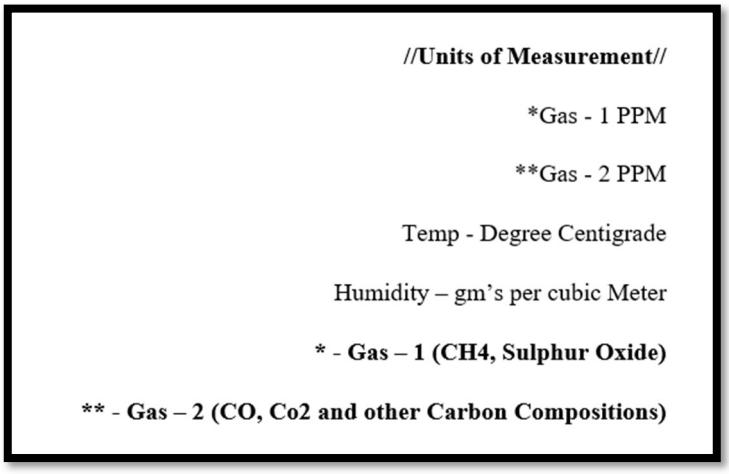
3. Real Time Data Interpretation and Live Action of Power Outage Relay

Processor getting abnormal values from sensors it will activate buzzer sound reflected from both Government's and Organization's cloud server.

The two-step process happening at this juncture are:

- TNPCB would send one warning message to factory's authoritative pollution level manager.
- In case the company doesn't make any pollution controlling process, the power supply of the Factory unit is disrupted and the license will be cancelled by TNPCB.

Fig. 5.2 – Units of Measurement for various parameters



CHAPTER – VI

SYSTEM IMPLEMENTATION

6.1 Sensor Integration and Arrangement

In current technology scenario, monitoring of gases produced is very important. From home appliances such as air conditioners to electric chimneys and safety systems at industries monitoring of gases is very crucial. **Gas sensors (MQ-6 and MQ-7)** are very important part of this system. Small like a nose, gas sensors spontaneously react to the gas present, thus keeping the system updated about any alterations that occur in the concentration of molecules at gaseous state.

This Insight covers a **methane gas sensor** that can sense gases such as ammonia which might get produced from methane. When a gas interacts with this sensor, it is first ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current. What is this sensing element? Is it kept in some chamber or is kept exposed? How does it get current and how it is taken out? Let's find out in this Insight!!!

The **Gas sensor module** consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.

DHT11 is Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

6.2 Reading Values calibration using Arduino uno

- Contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.
- Pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.
- The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery.

6.3 Factory and TNPCB Cloud Architecture

The Firebase Realtime Database is a cloud-hosted NoSQL database that lets you store and sync between your users in Realtime. The Realtime Database is really just one big JSON object that the developers can manage in real-time.

Realtime Database- A Tree of Values

With just a single API, the Firebase database provides your app with both the current value of the data and any updates to that data. Realtime syncing makes it easy for your users to access their data from any device, be it web or mobile. Realtime Database also helps your users collaborate with one another.

Authentication

Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app. Normally, it would take you months to set up your own authentication system. And even after that, you would need to keep a dedicated team to maintain that system. But if you

use Firebase, you can set up the entire system in under 10 lines of code that will handle everything for you, including complex operations like account merging.

Firebase Cloud Messaging (FCM)

Firebase Cloud Messaging (FCM) provides a reliable and battery-efficient connection between your server and devices that allows you to deliver and receive messages and notifications on iOS, Android, and the web at no cost. You can send notification messages (2KB limit) and data messages (4KB limit). Using FCM, you can easily target messages using predefined segments or create your own, using demographics and behaviour. You can send messages to a group of devices that are subscribed to specific topics, or you can get as granular as a single device can deliver messages instantly, or at a future time in the user's local time zone. You can send custom app data like setting priorities, sounds, and expiration dates, and also track custom conversion events.

6.4 Webpage and Mobile Application Development

Website is designed using PHP. The Mainframe of the pages is architected using HTML, CSS, SaSS and JS.

It consists of three webpages:

1.Home page

2.Login page

3.Registration page.

Every factory registers an account for its organisation. Once logged in, there would be a page for smart-meter which would showcase the value of gas, temperature, humidity and the status (whether it is a within or exceeding the permissible limit).

Mobile application is completely handled by the Organisation and used to have a check on the gas, temperature and humidity and to keep a check on its status. It is coded using java. There are two pages designed for login/registration and the other, once logged in shows the pollution status of the factory.

6.5 Warning Message Generation and Live Action Relay

The Webpage has three options under warning action

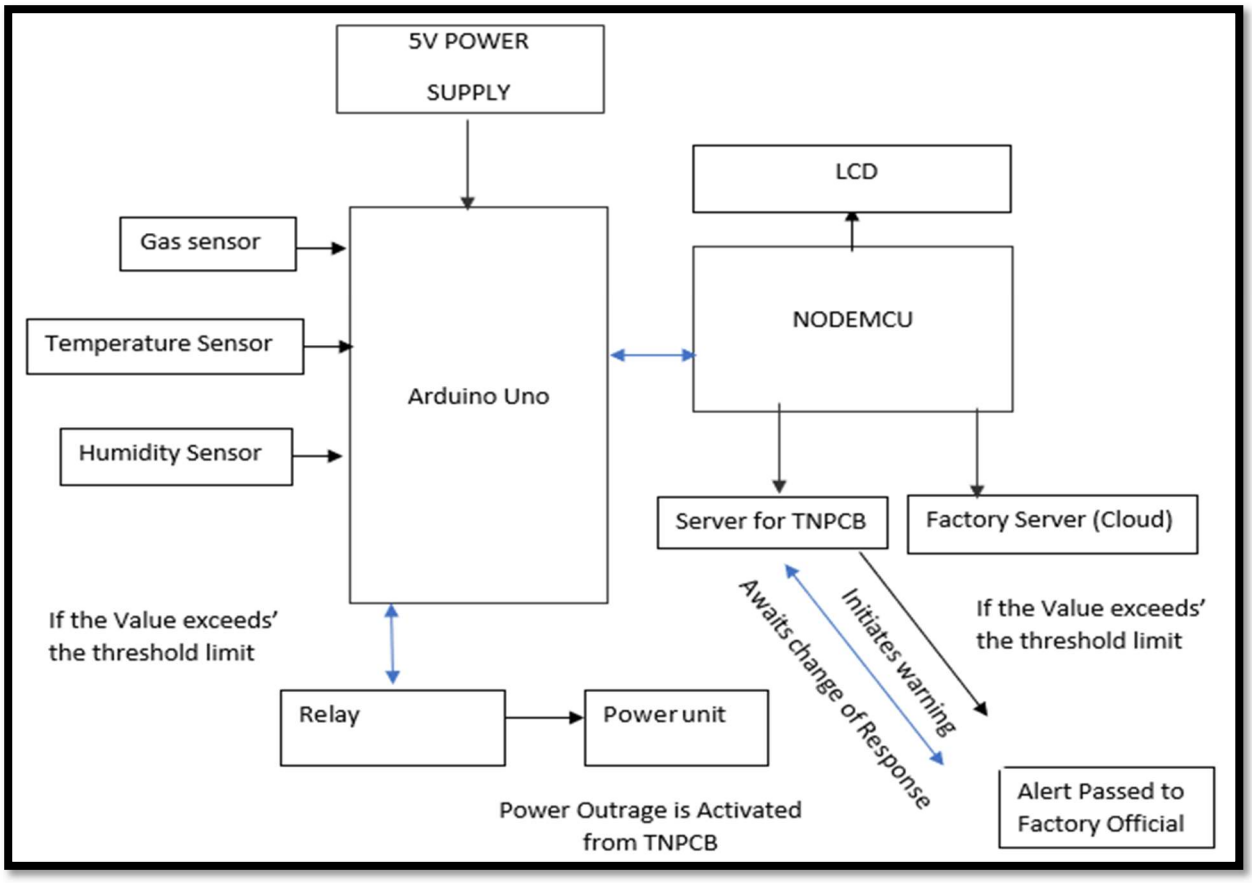
1. Sending the Email if the pollution level had exceeded

2. Switching off the power if the pollution level has still not been controlled even on receiving the e-mail and switching it on again after prior action taken by TNPCB, both ON and OFF button in the smart meter webpage are connected to the firebase. Firebase sends the corresponding Radio wave frequency to transmit the data to NODEMCU, which in-turn activates the relay to cause power outage at the factory end.

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically.

A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Relay used is of operating voltages 12V. The output section consists of contactors which connect or disconnect mechanically

Fig. 6.1 – Working Flow Diagram of Module



CHAPTER – VII

RESULTS AND DISCUSSIONS

Outcome of the Proposed System

- Potential points are identified and corresponding sensors are installed which can monitor and record the data in real time.
- Able to monitor and identify the changes.
- This work demonstrates a gas leak detection system with real time location system based on IOT.
- This IOT based Smart Industry Monitoring system gives real-time monitoring.
- Detects Temperature, humidity, level of leaked harmful gases from industrial premises successfully

Challenges Addressed

- Need an internet connection to access from anywhere in the world without cannot access | Wifi has limited range Speed of the most wireless network
- Range affected by varies medium and slower than the cable.
- Comparisons of particulate measurements are also problematic to measure
- Range of reference-equivalent methods available and the limitations, in many ways, of the reference method itself.

Results Obtained

- The Prototype of Module – "IoT Based Smart Industry Monitoring and Alerting System" is successfully designed
- Both the Clouds are synced successively and are connected directly in real-time which are used to monitor, locate and successively alert gas leaks of a complex factory thus, controlling the pollution.
- The Sensor Values are updated to two server rooms (Factory Server and TNPCB Government Server) and are constantly stored in cloud database using Firebase.
- The obtained data is being sent to Cloud which facilitates monitoring by authorized personnel in TNPCB. Initiating preventive actions by alarms in case of any abnormalities found in the received data. Thus, by regulating their actions successively

CHAPTER – VIII

SCREENSHOTS

Fig. 8.1 – Description of Various Sensors and other components in the prototype

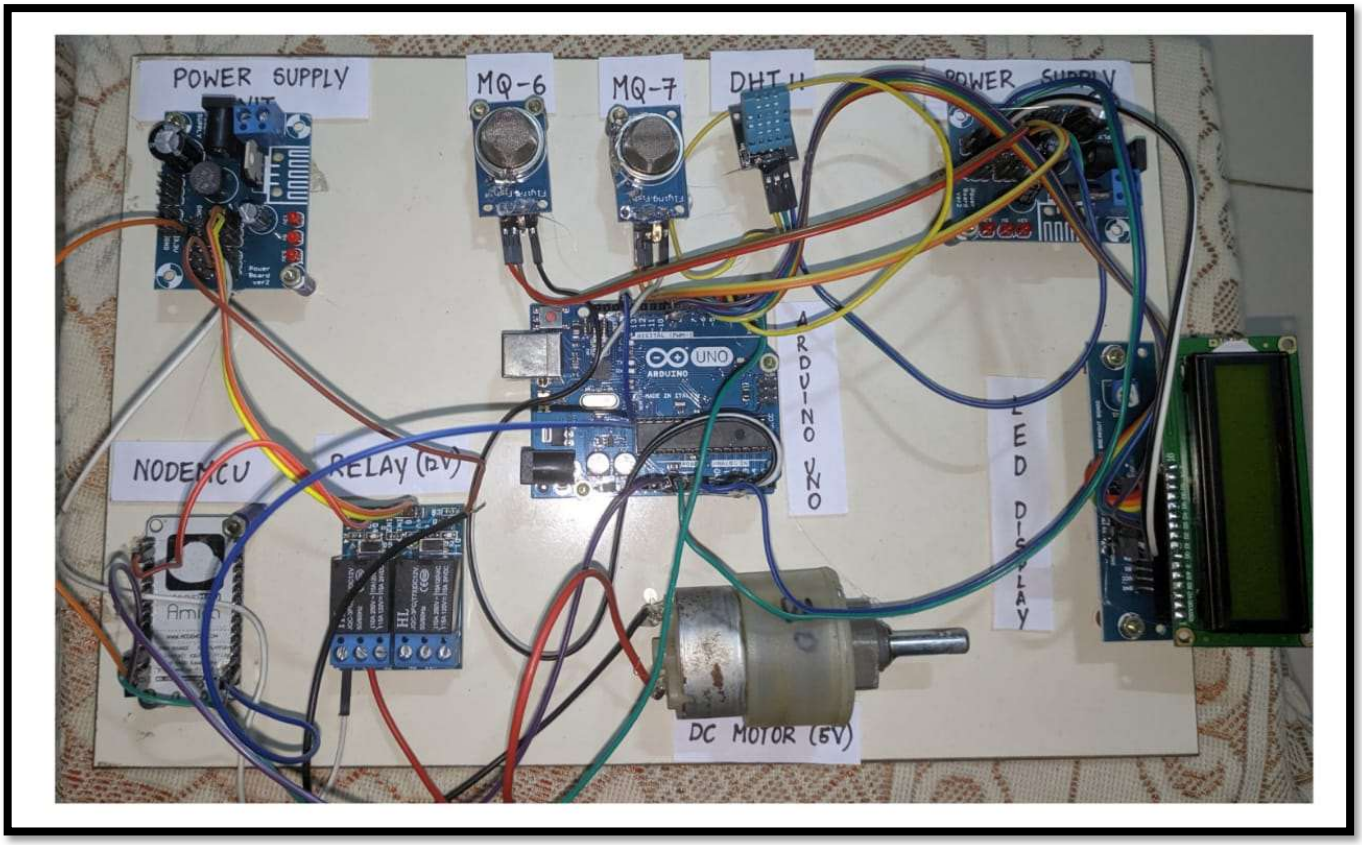


Fig. 8.2 – Readings Observed in the Prototype

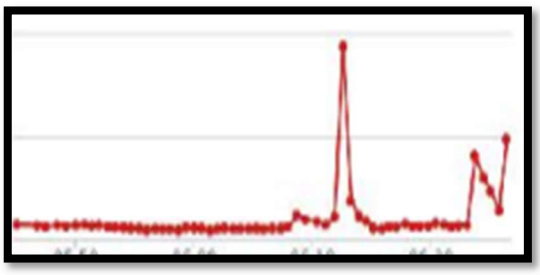


Fig. 8.3 – Module When Completely Powered ON

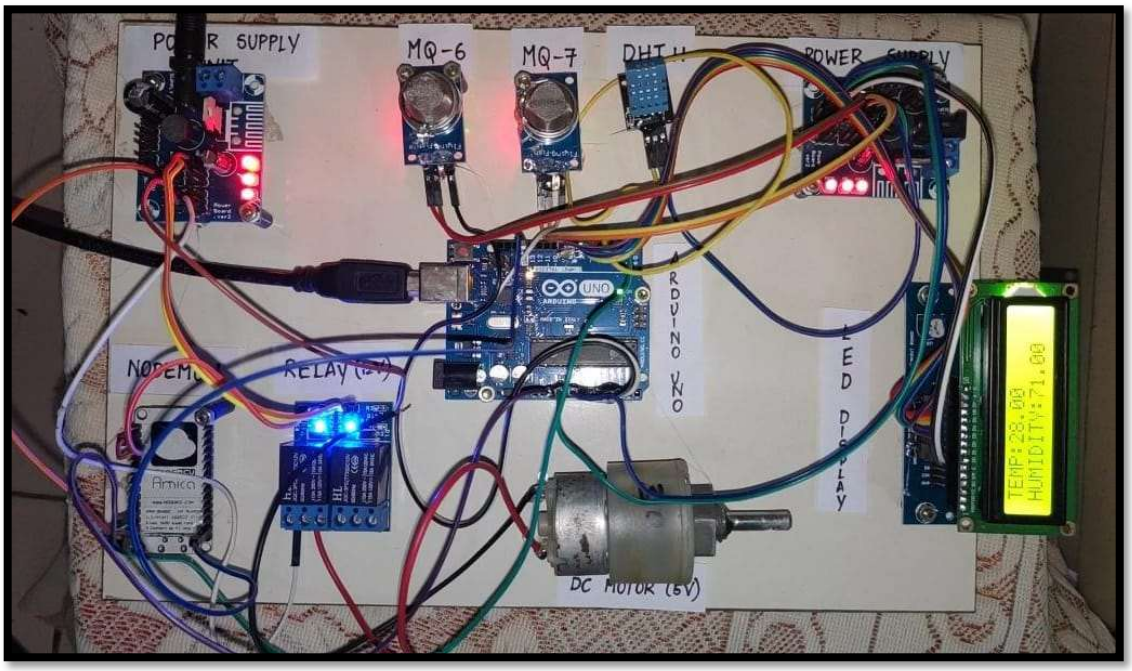


Fig. 8.4 –Webpage Created for the Government End

www.iotclouds.in/monitoringSrm

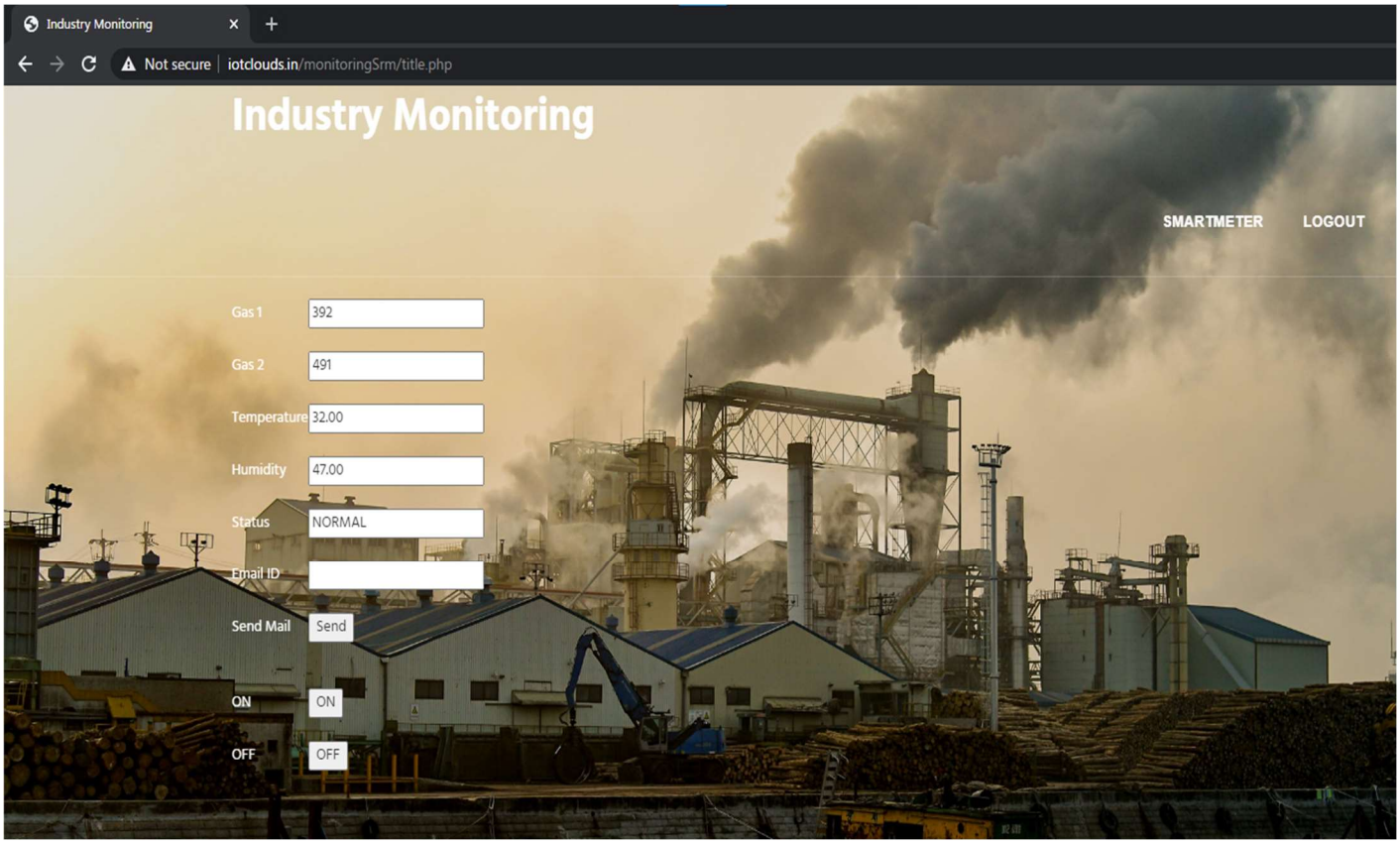


Fig. 8.5 – APK Working Screenshot and Readings

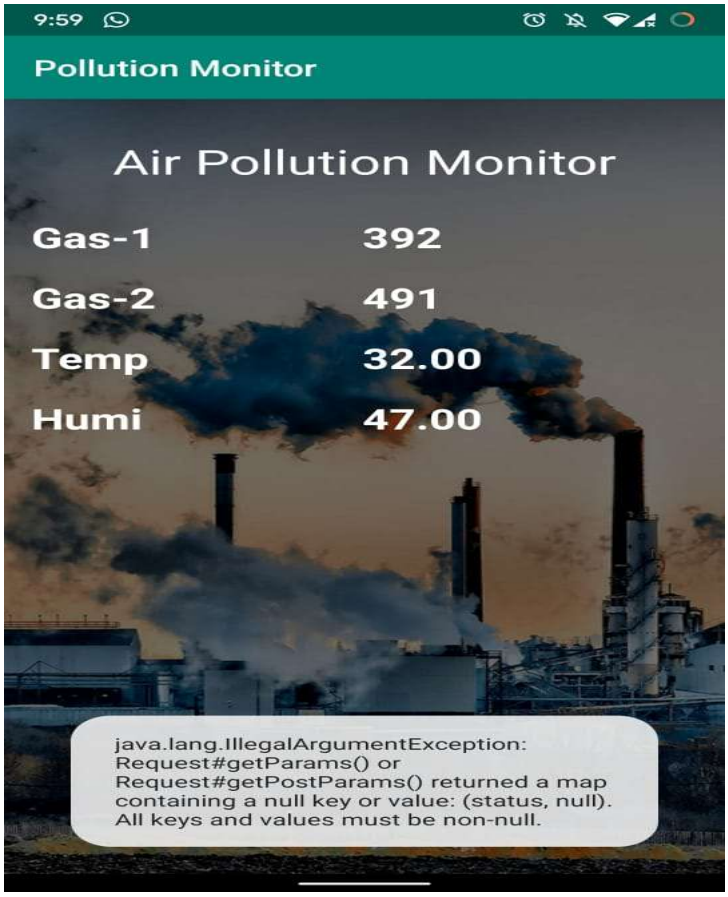
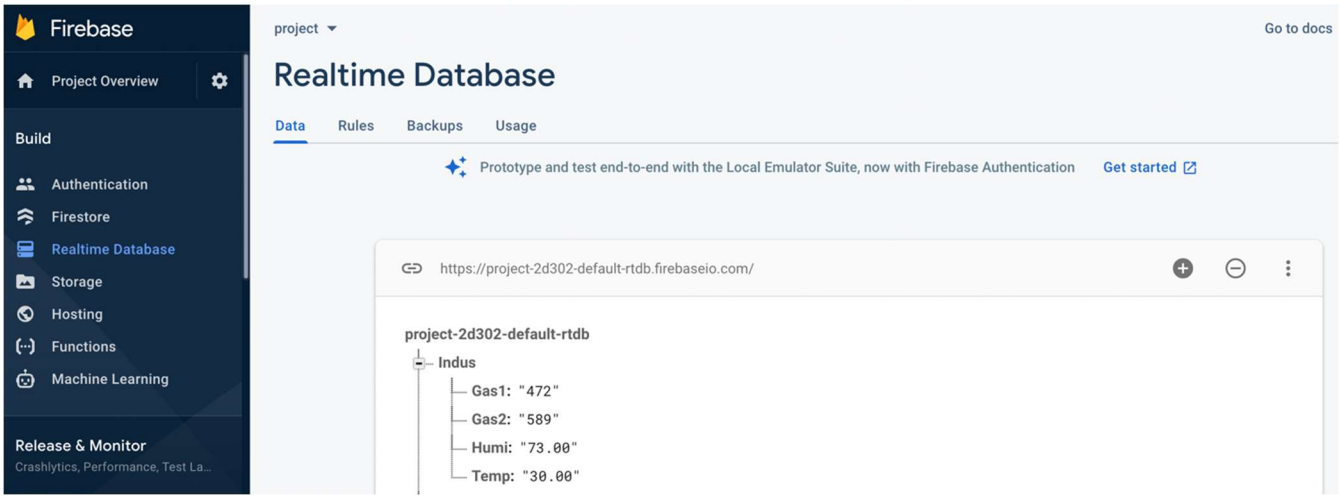


Fig. 8.6 - Firebase Realtime Database



CHAPTER – IX

CONCLUSION AND FUTURE WORK

Conclusion:

In this model an Intelligent Industry Monitoring system based on IoT is proposed which can effectively monitor the Industrial floor. A prototype based on Arduino UNO was developed which could sense the concentration of gases. The real time data obtained from the different sensors has been uploaded to Google cloud. In addition to this other parameter like temperature, humidity and light intensity were measured. This measurement process is consistent and are recorded time to time making ease of analysis and above data obtained are plotted. Provisions were also made to alert the workers in case of any emergency. This model has paved way for ease of monitoring the pollutants even if the employee is in a different location using mobile application. The system provides reliable, accurate analysis to prevent any case of accidents. This system makes use of Arduino UNO providing cheap solutions for safety. This model thereby not just improves the working of an industry but saves life and the eco system too. Technological development must widen and reach a peak along with proper precautions taken against environmental pollution.

Future Work:

This prototype of IOT Based Smart Industry Monitoring System is a great step towards a healthy livelihood. With the help of this device not only the industries can monitor the amount of pollution but even the government can participate in the process of controlling pollution and ensure safe environment. This automatic model, once installed is capable of continuously tracking the pollution level and analyses the detected information. The most highlighting feature of this device is that the output is represented in real-time and accessible on smart phones and even from the webpage. The device itself is very eco-friendly and does not harm the environment in any way. Moreover, it is based on one of the modern technologies and also inexpensive as compared to other technologies developed so far and can be installed efficiently. Predictive maintenance is an upcoming industrial need, for which the proposed model can be improvised. In case of gas leakage, the concentration of gas varies from point to point which has to be analysed. These cases can open an eye for many researchers in the near future.

CHAPTER – X

SOURCE CODES OF THE PROTOTYPE

Arduino Sensor and Pin Functioning Code

```
#include <SoftwareSerial.h>
#include <LiquidCrystal.h>
//SoftwareSerial mySerial(10, 11);
#include <dht11.h>
#define DHT11PIN 4
int PWM = 3;            //Digital pin D3 por PWM signal
int pwm = 0;
dht11 DHT11;
int G=A1;
int G1=A2;
float H,T;
String D;
const int rs = 9, en = 8, d4 = 7, d5 = 6, d6 = 5, d7 = 3;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
void setup() {
Serial.begin(9600);
//mySerial.begin(9600);
pinMode(G,INPUT);
pinMode(G1,INPUT);
 lcd.begin(16,2);
 lcd.setCursor(0,0);
```

```
 lcd.print("Industry monitoring");
 lcd.setCursor(0,1);
 lcd.print("    Sytem");
 delay(1000);
}
void loop() {
  //delay(1000);
  int chk = DHT11.read(DHT11PIN);
  H=((float)DHT11.humidity);
  T=((float)DHT11.temperature);
  int GAS=analogRead(G);
  int GAS1=analogRead(G1);
  if(GAS>900 && GAS1>900)
  {
  D="EMERGENCY";
  }
  else if(GAS<900 && GAS1<900)
  {
  D="NORMAL";
  }
lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("GAS1:");
  lcd.print(GAS);
  lcd.setCursor(0, 1);
  lcd.print("GAS2;");
```

```
  lcd.print(GAS1);
  delay(500);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("TEMP:");
  lcd.print(T);
  lcd.setCursor(0, 1);
  lcd.print("HUMIDITY:");
  lcd.print(H);
  delay(500);
  Serial.println("@"+String(H)+"#"+String(T)+"$"+String(GAS)+"%"+String(GAS1)+"^"+D+"&");
  delay(9000);
}
```

NODEMCU Connection Establishment– Cloud Side Firebase Linking Code

```
#include "FirebaseESP8266.h"

#define FIREBASE_HOST "project-2d302-default-rtdb.firebaseio.com"

#define FIREBASE_AUTH "l7JKN1pLueHMmf74eE9znD6UMdyBFSZ0bvrca7L6"

#define WIFI_SSID "iotkit"

#define WIFI_PASSWORD "123456789"

#define relay1 5

//#define relay2 9


#include <SoftwareSerial.h>

//SoftwareSerial mySerial(5, 4);//(RX,TX)

String path0="/Indus";

String path3 = "/Switch";

String S,S1,S4,S5,S6,S7,S8;

char *S2;

char *S3[5];

int i=0;

FirebaseData firebaseData;

void setup()

{

  pinMode(relay1,OUTPUT);

  //pinMode(relay2,OUTPUT);

  digitalWrite(relay1,HIGH);

  //digitalWrite(relay2,LOW);

Serial.begin(9600);

//mySerial.begin(9600);
```

```
WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  while (WiFi.status() != WL_CONNECTED)
  {
    Serial.print(".");
    delay(300);
  }
  Serial.println();
  Serial.print("Connected with IP: ");
  Serial.println(WiFi.localIP());
  Serial.println();
  Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
  Firebase.reconnectWiFi(true);
  {
   Serial.println("connected");
  }

}
void loop() {
  Firebase.getString(firebaseData,path3);
String r=(firebaseData.stringData());
 Serial.println(r);
if(r=="OFF")
{
  //digitalWrite(relay2,LOW);
  digitalWrite(relay1,LOW);
}
```

```
else if(r=="ON")
{
 //digitalWrite(relay2,HIGH);
 digitalWrite(relay1,HIGH);
}
  if(Serial.available())
   {
    S=Serial.readString();
    int e=S.indexOf("@");
    int e1=S.indexOf("#");
    int e2=S.indexOf("$");
    int e3=S.indexOf("%");
    int e4=S.indexOf("^");
    int e5=S.indexOf("&");
     S4=S.substring(e+1,e1);
     S5=S.substring(e1+1,e2);
     S6=S.substring(e2+1,e3);
     S7=S.substring(e3+1,e4);
     S8=S.substring(e4+1,e5);
     Serial.println(S4);
     Serial.println(S5);
     Serial.println(S6);
     Serial.println(S7);
     Serial.println(S8);
```

```
//String json="{\"HUMIDITY\":" + S4 + ",\"TEMPERATURE\":" + S5 + ",\"GAS1\":" + S6 +
",\"GAS2\":" + S7 + ",\"STATUS\":" + S8 + "}";
String json="{\"Humi\":" + S4 + ",\"Temp\":" + S5 + ",\"Gas1\":" + S6 + ",\"Gas2\":" + S7 + "}";
//Firebase.setJSON(firebaseData,path0,json);
Firebase.setString(firebaseData,path0+"/Humi",S4);
Firebase.setString(firebaseData,"/Status",S8);
 Firebase.setString(firebaseData,path0+"/Temp",S5);
 Firebase.setString(firebaseData,path0+"/Gas1",S6);
 Firebase.setString(firebaseData,path0+"/Gas2",S7);
 //Firebase.setString(firebaseData,"/LONGITUDE",S3);
/*Firebase.setString(firebaseData,"/Forest Fire Detection/GAS1",S6);
Firebase.setString(firebaseData,"/Forest Fire Detection/GAS2",S7);*/
Serial.println(json);
Serial.println(S8);
//Firebase.setString(firebaseData,"/Forest Fire Detection/STATUS",S8);
 }
}
```

REFERENCES

[1] A Boubrima, W Bechkit, and H Rivano 2017 A new WSN deployment approach for air pollution monitoring, 2017 14th IEEE Annu. Consum. Commun. Netw. Conf. CCNC 2017, pp. 455– 460

[2] B Bathiya 2016 Air Pollution Monitoring Using Wireless Sensor Network 2016 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE) 19- 21 December 2016

[3] A Škraba, A Kološvari, D Kofjač, R Stojanović, V Stanovov, and E Semenkin 2016 Streaming pulse data to the cloud with bluetooth le or NODEMCU ESP8266 2016 5th Mediterr. Conf. Embed. Comput. MECO 2016 - Incl. ECyPS 2016, BIOENG.MED 2016, MECO Student Chall. 2016, pp. 428–431, 2016

[4] K Keshamoni and S Hemanth 2017 Smart gas level monitoring, booking & gas leakage detector over iot Proc. - 7th IEEE Int. Adv. Comput. Conf. IACC 2017, pp. 330–332

[5] D Spirjakin, A M Baranov, and V Sleptsov 2015 Design of smart dust sensor node for combustible gas leakage monitoring Proc. 2015 Fed. Conf. Comput. Sci. Inf. Syst. FedCSIS 2015, vol. 5, pp. 1279–1283, 2015

[6] Anil H. Sonune, S.M.Hambarde,-" Monitoring and Controlling of Air Pollution Using Intelligent Control System",- International Journal of Scientific Engineering and Technology ISSN: 2277-1581,Volume No.4 Issue No5, pp: 310-313.

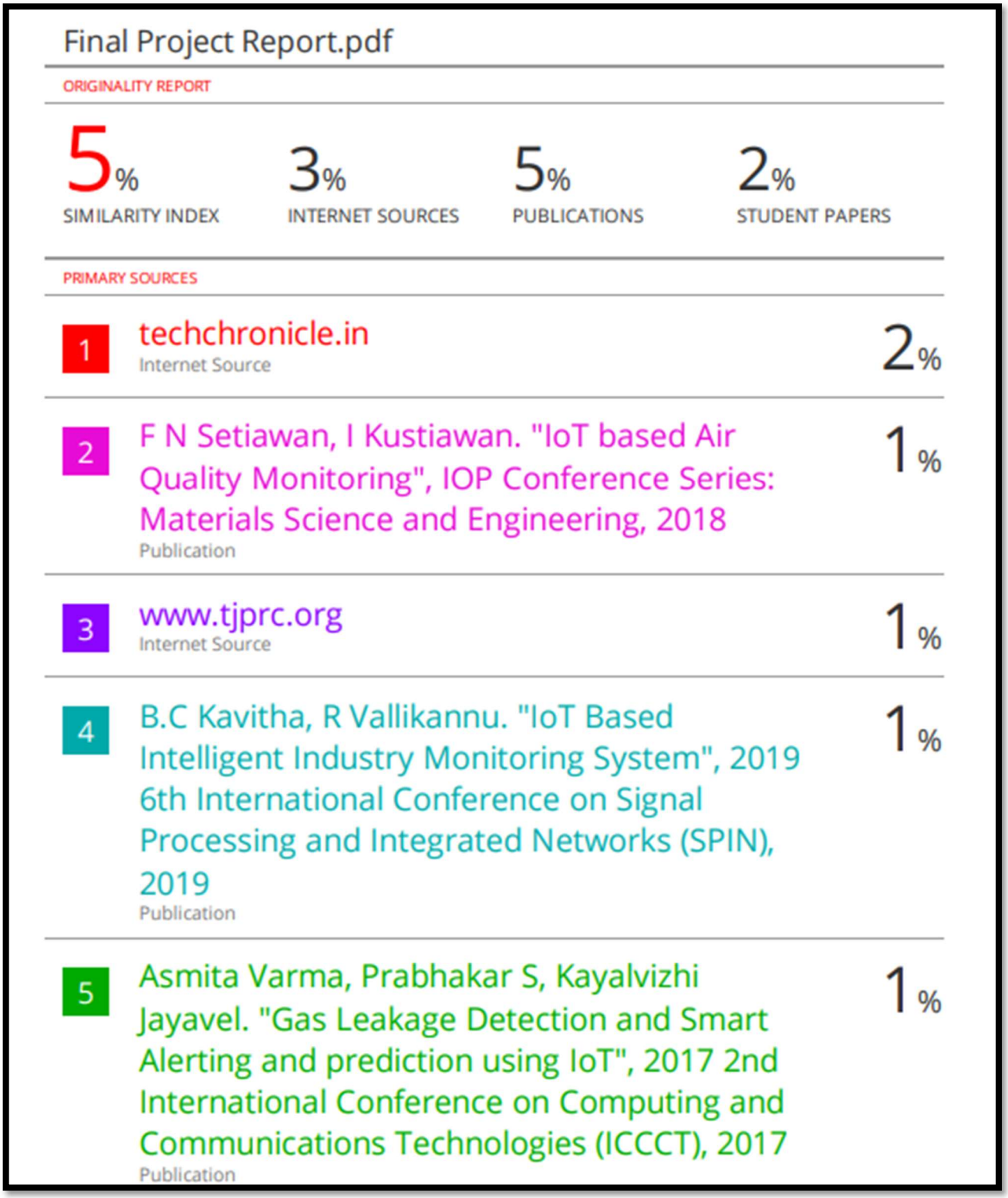
[7] Nikheel A. Chourasia, Surekha P. Washimkar," ZigBeeBased Wireless Air Pollution Monitoring" InternationalConference on Computing and Control Engineering(ICCCE 2012), 12 & 13 April, 2012

[8] Luay Friwan, Khaldon Lweesy , Aya Bani-Salma , Nour Mani. “A Wireless Home Safety Gas Leakage Detection System”, IEEE 2011.

[9] Ankit Sood, Babalu Sonkar, Atul Ranjan, Ameer Faisal, “Microcontroller Based LPG Gas Leakage DetectorUsinbg GSM Module, International Journal of Electrical and Electronics Research, Vol.3 , Issue.2 , pp: (264-269) ,Month: April- June 2015.

[10] D.Yaswanth, Dr Syed Umar,-" A Study on Pollution Monitoring system inWireless Sensor Networks",-D.Yaswanth et al | IJCSET |September 2013 | Vol 3, Issue 9, 324-328.

PLAGIARISM REPORT



Final Project Report.pdf

ORIGINALITY REPORT

5%	3%	5%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	techchronicle.in Internet Source	2%
2	F N Setiawan, I Kustiawan. "IoT based Air Quality Monitoring", IOP Conference Series: Materials Science and Engineering, 2018 Publication	1%
3	www.tjprc.org Internet Source	1%
4	B.C Kavitha, R Vallikannu. "IoT Based Intelligent Industry Monitoring System", 2019 6th International Conference on Signal Processing and Integrated Networks (SPIN), 2019 Publication	1%
5	Asmita Varma, Prabhakar S, Kayalvizhi Jayavel. "Gas Leakage Detection and Smart Alerting and prediction using IoT", 2017 2nd International Conference on Computing and Communications Technologies (ICCCT), 2017 Publication	1%

***Software Used – Turnitin (SRMIST VDP Library)**

PUBLICATION AND CONFERENCE DETAILS

1. PUBLICATION DETAILS

Journal Name : Springer: Lecture Notes in Electrical Engineering
(https://www.springer.com/series/7818)
ISSN: 1876-1100.

Conference : International Research Conference on IOT, Cloud and Data Science
(IRCICD' 21)

SRM INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University u/s 3 of UGC Act, 1956)

International Research Conference on IoT, Cloud and Data Science (IRCICD'21)

* IRCICD' 21 – BOA Souvenir Attached – Page - 27

2. CONFERENCE PAYMENT ACKNOWLEGEMENT

Date: 23/04/2021 Receipt No: IRCICD0191

Received with thanks From K SAIVARUN, RAMYA RAMAKRISHNAN, KISHORE M, Dr. KATHIRVEL A a sum of Rs. 10000 (Rs. 9500 towards Journal Publication and Rs. 500 towards conference registration) for their paper titled IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM with paper-id IRCICD_2021_paper_191 presented in the virtual INTERNATIONAL RESEARCH CONFERENCE ON IOT, CLOUD AND DATA SCIENCE 2021, Organized by Department of Computer Science & Engineering held on 23rd & 24th April 20121 vide Money Transfer.

G. Panaiarasu

Signature of Authorized signatory

3. BOOK OF ABSTRACT – IRCICD'21

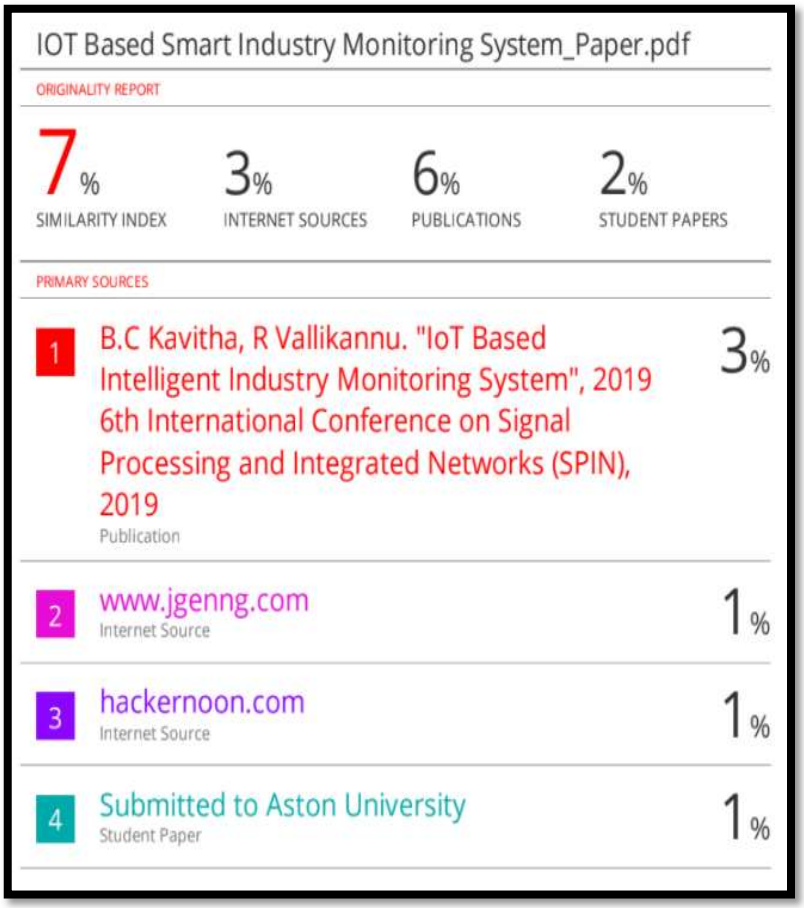
IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM

K Saivarun, Ramya Ramakrishnan, M Kishore, Dr. A. Kathirvel
SRM Institute of Science and Technology
ks9404@srmist.edu.in, rr3727@srmist.edu.in, km4444@srmist.edu.in, kathirva@srmist.edu.in

Abstract — With the advanced computer innovation and automation, the industries across the world have undergone a major revolution. This led to the increased living standards of the commoner and contributed to the country's economic growth. IoT has transformed itself to suit various fields, namely home automation, smart devices, and significantly contributing to the healthcare sector. IoT provides a perfect solution for cost reduction over to 1/10th of the conventional systems. IoT also effectively increases the productivity and efficiency of any industry, thus contributing to its development. Unlike Traditional Systems, we have used IoT technology to make a Smart Industry Monitoring and Alerting System and perform data analytics on sensor readings using cloud service successively. This will detect any leakage of harmful gases, and thus reports the details of the leakage effectively. This model's vision is to develop a system that automatically senses and alerts the corresponding officials, thus stopping gas leakages in those permeable areas. Throughout this paper, our prototype's technological advantages – "IoT Based Smart Industry Monitoring and Alerting System" are being explored.

Keywords — Air pollution, IOT, Sensors, Monitoring systems, Web-Server Based Applications, Internet, Big Data, Cloud, Wireless technology, Gas emission Sensing, Industrial applications.

4. PAPER PLAGIARISM REPORT



IOT Based Smart Industry Monitoring System_Paper.pdf

ORIGINALITY REPORT

7%	3%	6%	2%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	B.C Kavitha, R Vallikannu. "IoT Based Intelligent Industry Monitoring System", 2019 6th International Conference on Signal Processing and Integrated Networks (SPIN), 2019 Publication	3%
2	www.jgenng.com Internet Source	1%
3	hackernoon.com Internet Source	1%
4	Submitted to Aston University Student Paper	1%

5. CONFERENCE CERTIFICATES

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY

International Research Conference on IoT, Cloud and Data Science (IRCICD'21)

Certificate of Participation

This is to certify that

Ms. RAMYA RAMAKRISHNAN

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

has participated and presented a paper titled

IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM

in the Virtual International Research Conference on IoT, Cloud and Data Science (IRCICD'21) Organised by the Department of Computer Science and Engineering, SRM Institute of Science and Technology, Vadapalani, Chennai, Tamil Nadu, India held on 23rd and 24th April 2021.

Dr. M Durgadevi, Organizing Secretary | Dr. G. Paavai Anand, Organizing Secretary | Dr. S. Prasanna Devi, HOD / CSE | Dr. C. Gomathy, VP Academics (E&T) | Dr. K. Duraivelu, Dean (E&T) - VDP

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY

International Research Conference on IoT, Cloud and Data Science (IRCICD'21)

Certificate of Participation

This is to certify that

Mr. K SAIVARUN

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

has participated and presented a paper titled

IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM

in the Virtual International Research Conference on IoT, Cloud and Data Science (IRCICD'21) Organised by the Department of Computer Science and Engineering, SRM Institute of Science and Technology, Vadapalani, Chennai, Tamil Nadu, India held on 23rd and 24th April 2021.

Dr. M Durgadevi, Organizing Secretary | Dr. G. Paavai Anand, Organizing Secretary | Dr. S. Prasanna Devi, HOD / CSE | Dr. C. Gomathy, VP Academics (E&T) | Dr. K. Duraivelu, Dean (E&T) - VDP

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY

International Research Conference on IoT, Cloud and Data Science (IRCICD'21)

Certificate of Participation

This is to certify that

Mr. KISHORE M

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

has participated and presented a paper titled

IOT BASED SMART INDUSTRY MONITORING AND ALERTING SYSTEM

in the Virtual International Research Conference on IoT, Cloud and Data Science (IRCICD'21) Organised by the Department of Computer Science and Engineering, SRM Institute of Science and Technology, Vadapalani, Chennai, Tamil Nadu, India held on 23rd and 24th April 2021.

Dr. M Durgadevi, Organizing Secretary | Dr. G. Paavai Anand, Organizing Secretary | Dr. S. Prasanna Devi, HOD / CSE | Dr. C. Gomathy, VP Academics (E&T) | Dr. K. Duraivelu, Dean (E&T) - VDP