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# Aerometric monitoring system for pollution control

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**Abstract—Air quality monitoring and analysis is needed in order to provide decision makers with reliable information about the pollution situation so that they can take appropriate measures to mitigate or prevent negative impacts whenever there is need. World Health Organization (WHO) has recently announced that air pollution is carcinogenic to humans. The results from the reviewed studies point in the same direction: the risk of developing lung cancer hss significantly increased in people exposed to air pollution. This finding elevates the urgency to create awareness among common people about the air, both outdoors and indoors. In our project "Aerometric Monitoring System for Pollution Control", we use a device that consists of a cluster of sensors that are used to sense atmospheric characteristics continuously. Atmospheric characteristics include Temperature, Humidity, Gas index indicating presence of poisonous gases etc. Several such devices can be deployed in places where we need to estimate air pollution. This covers public domains like bus stands, railway stations, junctions etc. and private domains like households, small scale industries and so on. The aggregated data collected by these devices are uploaded to the Internet using IoT platform by establishing a connection. The data is then displayed on the IoT platform along with various graphical representations. This enables the public to access the data anywhere, any time.**

Keywords-Aerometric Analyser, Ubidots, IOT

## INTRODUCTION

Aerometric Monitoring System for Pollution Control is a feasible and reliable analytical method to track the ambient air quality around us [1]. We are using a cluster of sensors to sense the atmospheric characteristics such as temperature, humidity and gas index continuously. Data collected from sensors are subjected to aggregation [2].Gas index is taken as a reference with some threshold value to indicate level of contamination. Collected data is then displayed in the LCD screen. Data is transferred to the server by establishing a location of the device. The data can also be visualized graphically [4].

The system has an administrator who keeps an eye on the overall functioning of the system. Our system can be adopted both in public and private circumstances. The system entitled "Aerometric Monitoring System for Pollution Control" is a user friendly platform help common people to become aware about contamination level of atmosphere and also help to adapt mitigatory measures for preventing hazardous exposure. It is developed using Arduino IDE and IoT platform, Ubidots [5]

Through this paper we are giving a complete overview of Aerometric Monitoring System.



## PROPOSED SYSTEM

Aerometric Monitoring System for Pollution Control proposes an approach to build a cost-effective standardized air quality monitoring device using the Arduino microcontroller .It extracts information about the surrounding atmosphere through sensors and uploads it directly to the internet, where it can be accessed anytime and anywhere through internet.[6]

The system enables the public to become aware of the changes in the air around them. Its capability can help saving millions of life by creating awareness among common people about the air contamination. Due to its ability to automatically upload to the internet, one correctly placed system can provide easily accessible data for the whole community. It provides monitoring services for remote areas. It can be used to predict whether the air is polluted or not. Raising the awareness of how the society is affected the region's atmospheric policies and have the basic knowledge to make changes. Thus analysis of atmospheric characteristics helps common people to adapt preventive and mitigative measures to overcome the health issues.

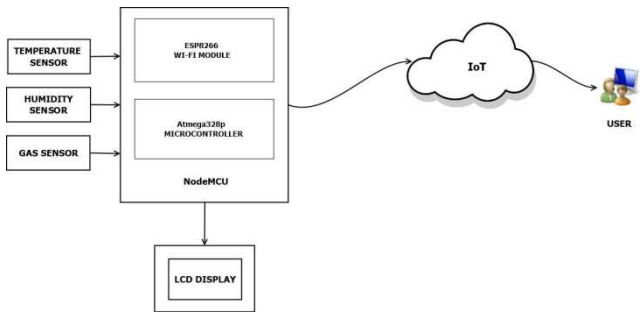


Figure 1 Architecture Diagram of the System

The different sensors extract the atmospheric characteristics. All hardware components are connected to the NodeMCU. These data is then aggregated and displayed on the LCD screen. Extracted values are sent to IoT platform via establishing Wi-Fi connection. These are then stored in their cloud database and displayed on the web page with public URL. Public URL enables users only to access the data without modifying them. Modification and Control is done by the Admin.

## IMPLEMENTATION

Implementation includes all those activities that take place to convert from old system to the new one. The new system may be completely new. Successful Implementation may

not guarantee improvement in the organization using the new system, improper installation will prevent it. Implementation uses the design document to produce code. It may take several iterations of the model to produce a working program. As programs get more complicated, testing and debugging alone may not be enough to produce reliable code. Working of Aerometric Monitoring System can be defined as:

Devices are placed in various locations

Public can view the data that is being displayed in the LCD screen
A public URL is provided

Users can go to the specified URL to view the data from the devices
Each device has location coordinates displayed on a map

Along with data, visualizations like charts, metrics etc. are provided for easy understandability

Aerometric Monitoring System for Pollution Control proposes an approach to build a cost-effective standardized air quality monitoring device using the Arduino micro-controller. It extracts information about the surrounding atmosphere through sensors and uploads it directly to the internet, where it can be accessed anytime and anywhere through internet. Our system consists of the following modules:-

**Device Setup:**

First module is Device Setup module. In this module, we use a cluster of sensors which monitors the ambient temperature, relative humidity and gas index in indoor as well as outdoor spaces. The DHT11 sensors sense the temperature level of the surroundings and provide an indication of the moisture levels in the environment. This sensor provides analog values of temperature and humidity. Gas sensors are suitable for detecting CH4, CO, Alcohol, CO2, NO etc. The digital value from MQ5 sensor is converted to analog value. These sensors sense the atmospheric characteristics continuously. The micro-controller converts the sensor values into data values. Gas index is taken as reference with some threshold value to indicate level of contamination. Then these values are displayed on an LCD screen. The important steps involved are:

Extract air characteristics

Data aggregation by micro-controller

Compare the gas index with threshold value

Display the data values on LCD  Web Data Setup :

Second module is Web Data Setup module. Data is transferred to the server by establishing a Wi-Fi connection. It is done by adding necessary library files of IoT platform, Ubidots. The device is added as client. Then the data values from micro-controller are send to the IoT plat-form. These values are stored in the cloud database on the server for future reference. Along with the data values context is also send that consists of the location coordinates. The important steps involved are:

Wi-Fi connection is established with Ubidots server

Device is added as a client

Data is send continuously to Ubidots' database

Variables are created by Admin on Ubidots
Data Access & Display:

Third module is Data Access and Display mod-ule. Atmospheric characteristics are displayed on the IoT platform along with the map indicating the location of the device. They are also visualized graphically using widgets. Widgets include different types of charts, metrics, gauges and historical table. The dashboard can be shared using a public URL. It enables the common people to access the data remotely. The important steps involved are:

Widgets visualizes the data in form of charts and metrics
Public URL for the users

Device specification along with location

Allows analysis of the current atmospheric condition

The above 3 modules are coordinated together to constitute "Aerometric Monitoring System for Pollution Control". The system enables the public to become aware of the changes in the air around them. The Aerometric monitoring system might offer several potential benefits; it provides monitoring services for remote areas. Its capability can help saving millions of lives by creating awareness among common people about the air contamination. Due to its ability to automatically upload to the internet, one correctly placed system can provide easily accessible data for the whole community. It can be used to predict whether the air is polluted or not. Raising the awareness of how society is affected the region's atmospheric policies and have the basic knowledge to make changes. Thus analysis of atmospheric characteristics helps common people to adapt preventive and mitigative measures to overcome the health issues.

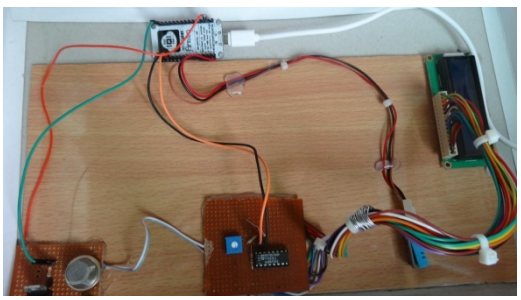

Figure 2.System Implementation

IV. CONCLUSION

Aerometric Monitoring System for Pollution Control was designed with an agenda to make people realize the

catastrophic effects of Air Pollution. The Aerometric monitoring system offers several potential benefits; it provides monitoring services for remote areas. Its capability can help saving millions of lives by creating awareness among common people about the air contamination. Due to its ability to automatically upload to the internet, one correctly placed system can provide easily accessible data for the whole community. It can be used to predict whether the air is polluted or not. Raising the awareness of how society is affected the region's atmospheric policies and have the basic knowledge to make changes. In our system the analyzer consist of cluster of sensors. The DHT11 sensors sense the temperature level of the surroundings and provide an indication of the moisture levels in the environment. Gas sensors are suitable for detecting CH4, CO, Alcohol, CO2, NO etc. These sensors sense the atmospheric characteristics continuously. The micro-controller converts the sensor values into data values. Gas index is taken as reference with some threshold value to indicate level of contamination. Then these values are displayed on an LCD screen. Then data is transferred to the server by establishing a Wi-Fi connection. These values are stored in the database on the server for future reference. Admin can add new devices and necessary variables in the Ubidots GUI. Atmospheric characteristics are displayed on the IoT platform along with the map indicating the location of the device. They are also visualized graphically using widgets. The dashboard can be shared using a public URL. It enables the common people to access the data remotely.

## FUTURE WORKS

Future works concern with expanding of the hardware capabilities and embedding data from the IoT platform to develop a website or an android application. The System can be enhanced by deploying additional sensors and monitoring additional pollutants and sending data over Low Power Wide Area net-works. Subsequently more accurate algorithms can be developed which helps reveal the change patterns of air quality to some extent.

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