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Air Quality Monitoring System for City: A Review

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Abstract - *Objective of this paper is to design and implement a system for air quality monitoring using Internet of Things called as IoT. The model initiates from sensor devices that can sense, compute, and communicate data in a network. This study measures real-time PM2.5, temperature, humidity, Air Quality Index. Monitored data is wirelessly transmitted via Wi-Fi module to a server. When the sensor node reads pollutant gases composition, temperature and humidity it will be displayed on the website. The monitored data with date and time can be retrieved as a tabular data for future analysis. With implementation of this work, precautionary alerts can be given to public on the designed website to wear anti-pollution mask, change paths while transporting where there is high air pollution ensuring high reliability. It will promote the public awareness about state of air pollution and how much important it is to reduce it. There will be news, surveys regarding pollution in different countries, different ways to reduce air pollution on the website.*

***Key Words*: IoT , Air Quality Index , Cloud ,Wi-Fi node , Sensor data , smart City.**

1. INTRODUCTION

Air pollution has been common health concern not only for humans but also for animals, plants, oceans, aquatic life worldwide. In most of countries air quality monitoring is done manually via centrally located station. Meanwhile, many populated areas of the world lack Continuous, long term air quality measurement. To date, the Geographic coverage of air quality monitoring networks has been constrained due to the implementation cost, architecture, and individual requirements for monitoring stations.

Internet of Things (IoT) has become a very popular paradigm in the modern wireless communication era. The basic idea of the IoT is the distribution of all-over "objects" or "things", which collects and exchanges data in order to achieve a common objective by means of mutual interactions. The networked connection of these physical objects to the Internet provides access to monitored remote sensor data, so that it is possible to control the physical world from a distance.

A fundamental aspect of the Internet of Things is the integration with the Cloud infrastructure, which hosts interfaces and web-based applications that enable the communication with sensors and external systems [5]. Therefore, the Cloud computing infrastructure might provide data access and management features, with the aim of collecting and managing data made available by smart objects [5].

A real time monitoring of the existence and the concentration of air pollutants is necessary, in order to check air quality status and trends. By continuous real time monitoring of outdoor pollutant levels, IoT might help health departments to take the most suitable and effective decisions in case the environmental conditions become incompatible with the public health.

In this paper, will present a system for monitoring the air pollution based on Arduino and will implement a prototype of this system, deploy it in Dept. of civil Engg. Dept. of Electronics, Dept. of Computer & IT, college hostel, Main entrance, Government College of engineering, Amravati. Moreover, we will design a website on Cloud-based platform that manages data collected from sensors and will display it on the website. A comparison between five Cloud computing service models will be performed. Finally, will design and investigate the system performance in terms of long-term operability, real-time measurement accuracy compared with nearby stations, and feasibility for application in other location.

1.1 Literature Review

Some of the existing methodologies for the air pollution monitoring are described as below, In plug and sense device method, it Uses multiple sensors with location co-ordinate, AQI LED indicator is actuated as per pollution level and the Real time pollution level visualized using line graph [2].In distributed sensor data computing, it uses distributed intelligence for the sensor nodes and uses spatial database for locations [3]. In Arduino based method it uses sensor devices for data, Uses ESP8266 Wi-Fi module for connection to server, Uses Node.js and Node RED for displaying data on the server side [4].In personal assessment methods, Biochemical dose assessment methods are used Ex .Biomarkers [5].In ZigBee technology, ZigBee transmitters and receivers are used, GPS module is used for locations for pollution level on map [6].

1.2 Proposed System

The proposed system includes Arduino based temperature, transmitting monitored data to cloud based server. In detail, the following environmental parameters are collected with the aim of measuring air pollution levels: Carbon Monoxide

(CO), Carbon Dioxide (CO2), Nitrogen Dioxide (NO2), Methane (CH4), Hydrogen Sulfide (H2S), Ammonia (NH3), Particulate Matter (PM), Moreover, Other parameters like temperature, humidity are measured. In this section, the implementation of the proposed system is discussed.

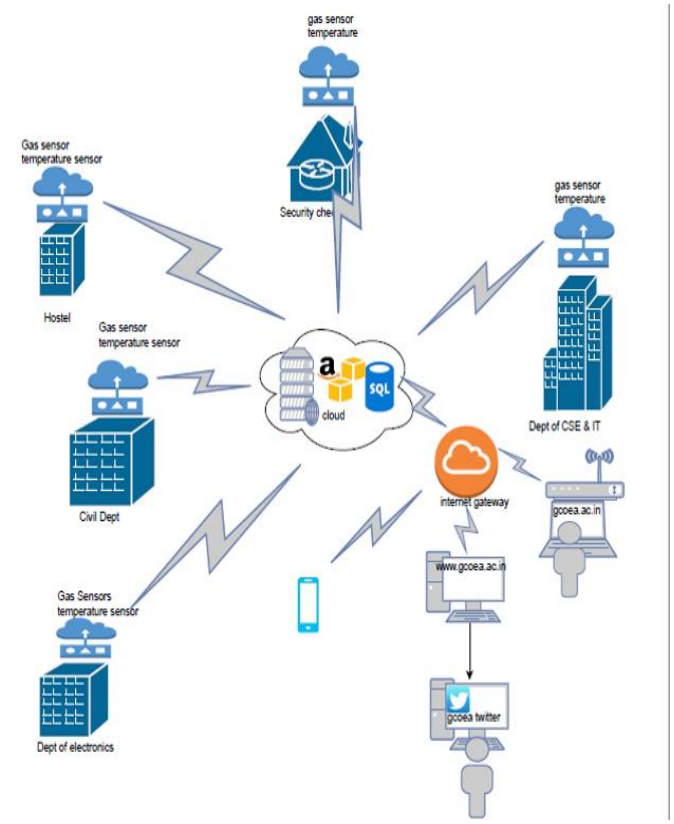

Fig -1: System Architecture

Arduino is an open source micro-controller which is used with other communication and sensing technologies. This single-board development environment, which allows user to read uploaded data from sensors and allows to control different devices. ESP8266 is a low cost Wi-Fi module with an AT commands library. It allows the Arduino to connect to the Internet through a Wi-Fi connection. Moreover, ESP8266 has a full TCP/IP protocol stack integrated on the chip.

There are some constraints in terms of resolution. Indeed, the inputs uploading from analog sensors operate by default at 10-bit resolution. The on/off switching of the sensors can be operated remotely according to sensor-based data that are stored and maintained directly at the Cloud server. The Arduino collects all the data uploading from sensors and transmits it to the Cloud server by using the Wi-Fi module ESP8266, which is mounted on Arduino through an on-board serial port.

The data on the cloud server will be displayed location wise. The designed website will be hosted on the same cloud using python programming language. Website will contain the location wise separate dashboards and news, surveys related to air quality etc. will be updated on the website. The website link will be provided on the college website.

3. CONCLUSIONS

This paper presents the summary of various techniques of air quality monitoring. These techniques are elaborately discussed in the paper. In the proposed system, one of the most preferred technique is cloud based air quality monitoring system. Using the same cloud data, website is hosted and data is displayed on the website.

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