



Air Pollution Monitoring Index Using Sensors

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Abstract: 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 source 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) This paper discuss about real time monitoring of Air pollution using IoT

Keyword: *Air Pollutant, IoT, C++*

I. INTRODUCTION

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 source 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. This system can only be installed in key monitoring locations of some key enterprises, thus system data is unavailable to predict overall pollution situation. Using empirical analysis, conventional air automatic monitoring system has high precision, but large bulk, high cost make it impossible for large-scale installation. Nowadays, air pollution is monitored by static air quality measurement stations which are highly reliable and can measure the pollutants in air to a high level of accuracy and precision using analytical instruments, such as mass spectrometers, operated by official authorities. However, extensive cost of acquiring and operating such stations limits the number of installations. To monitor air quality, wireless sensor networks (WSNs) might be a great tool, because they can automatically collect air quality data. It will also help us to keep a working staff away from danger and a high security can be achieve and it will also help the Government authorities to monitor the air pollution.

The proposed system will focus on the monitoring of air pollutants concentration with the help of combination of Internet of things with wireless sensor networks. The analysis of air quality can be done by calculating air quality index. This information will be displayed on the webpage via internet in real time. By the combination of internet of things and wireless sensor networks for purpose of air pollution monitoring it becomes easy to keep the air quality data updated in real time. Also the system is cost effective which make its installation possible in various areas. The system existing before was

based on microcontroller based toxic gas detecting and alerting system and the developing system will have a complete monitoring system which is IOT based. Also the information will be directly sent to the internet from system; no need of computer for transmission purpose which reduces the cost further.

II. MOTIVATION

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 and has hazardous effects on human health. It becomes a need to control the air pollution. It will become easy to control it by monitoring the concentration air pollutant parameters in air. The conventional air pollution monitoring and analysis methods are quite costlier and bulky which is not suitable to install at large scale. Also it is hard to analyze the air quality at real time monitoring in previous systems.

III. LITERATURE REVIEW

Walter Fuertes and team have developed a low-cost wireless monitoring system that capable of measuring CO, CO₂ and the density of dust parameters based on a multilayer distributed model with an Arduino platform .Agile methodologies such as Scrum and Extreme Programming were used in software. They have developed a low-cost wireless monitoring system that enables air quality referential parameters measurements based on a multilayer distributed model with an Arduino platform. This is an Internet of Things application, of which a physical object is embedded with electronics, software, sensors and wireless connectivity to allow monitoring air pollution on real-time. Agile methodologies such as Scrum and Extreme Programming were used in order to ensure software quality. The electronic device is equipped with three sensors, which determines carbon monoxide (CO) as well as carbon dioxide (CO₂) concentrations and powder density, using an API developed in C++ language.

IV. OVERALL ANALYSIS OF REPORTED WORK

Though previous air pollution monitoring systems based on IOT and different platforms are cost effective in some cases, they are time consuming. Some of them have used microcontroller for monitoring purpose. For uploading data on web previous systems have used Computer for a transmission purpose which is costlier. For analysis purpose they have used various technologies like Artificial Neural Networks [2] which needs mass data as

the input and algorithms like ID3 [4], makes system complex. The system in [3] is mobile hence to monitor air pollution of any area it is necessary to take the system in that area manually. Since the information is sent to PC and then it is uploaded on web the system is quite time consuming and not real time.

V. PROBLEM DEFINITION / FORMULATION

Using laboratory analysis, conventional air automatic monitoring system has relatively complex equipment technology, large bulk, unstable operation and high cost. This system can only be installed in key monitoring locations of some key enterprises, thus system data is unavailable to predict overall pollution situation.

The proposed system will not only detect the concentration of pollutants in the air but also gives the information about quality of air. This information will be stored on a webpage with the help of internet. The user with access key of webpage can view the information and monitor it while sitting at far distance from the system.

VI. OBJECTIVES

- The main objective of this system is to monitor air pollution by using internet of things application.
- Also to obtain cost effective system that will help to keep track of concentration of pollutants in air.
- To find effect of concentration of pollutants on air in terms of air quality index.
- To achieve real time monitoring by continuously updating the data on webpage via internet.

VII. PROPOSED METHODOLOGY

The proposed system will not only detect the concentration of pollutants in the air but also gives the information about quality of air. This information will be stored on a webpage with the help of internet. The user with access key of webpage can view the information and monitor it while sitting at far distance from the system.

VIII. PROBABLE OUTCOME

Since we are using raspberry pi, the size of this system will be reduced as compared to previous systems. Also this system is cost effective. The operating speed of the system will be fast. The time required for complete process will be less as we uploading the information on internet directly from system. As we are doing analysis of

air quality the prediction related to the environment can be done in terms of Air Quality Index.

IX. TOOLS / PLATFORM TO BE USED

Internet of Things (IOT)

The Internet of Things (IOT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network. The problem is, people have limited time, attention and accuracy -- all of which means they are not very good at capturing data about things in the real world. If we had computers that knew everything there was to know about things -- using data they gathered without any help from us -- we would be able to track and count everything and greatly reduce waste, loss

and cost. We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best.

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