Geo-Sensor Network System for Industrial Pollution Monitoring

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***Abstract*—** Air pollution is a major environmental health problem in today's life. For pollution free environment it's necessary to monitor the environment phenomena by using Environment Observation and Forecasting System (EOFS). An air pollution monitoring system provides a context model which is use for understanding status of pollution in air. System provides acquisition policy which contains corporate actions against pollution problem. Pollution status is calculated by measuring amount of CO2, NO2 and SO2 in air. Depending on context model condition provides safety guidelines and alarm facility. System provides a flexible sampling interval. As per context model pollution condition the interval is change. It also use for saving batteries of geo-sensors.

Keywords- *Air pollution monitoring, context model, EOFS, Geo-sensor network, sensor.*

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I. INTRODUCTION

Many business application causes harm to environment by producing different gases which is more dangerous for human health. For environmental monitoring wireless sensor network have been deployed, basically sensor are used calculate the amount of air pollution produced by the industrial areas which includes collecting the large amount of data over time across a volume of space large enough to exhibit significant internal difference. Geo-sensor network is a type of sensor networks which is designed to measure data related to geospatial information. It could be useful to detect the conditions of remote place as a new instrument for environmental monitoring in the physical world. For example, there are various kinds of applications such as seabird micro climate, habitat monitoring, intrusion detection, and building comfort. System design and implement an air pollution monitoring system based on geo-sensor network. It employs the context model for understanding the status of air pollution on the current and near future pollution region. It is necessary to give an alarm and safety guideline for a near future risky situation, because avoidance is better than the problems which will be faced in future. It can reduce recovery cost and severe damage. It also helps the flexible sampling interval change depending on the pollution conditions of the context model. The interval change is useful for keeping the geo-sensor network, because of the limited batteries. The power efficiency is increased depending on the flexibility of the tradeoff between sampling rates.

As shown in figure 1 air quality monitoring system gives industrial smoke as row data and take readings of NO, NO2, O3, CO, SO2 etc for calculating quality of smoke present in air. These readings are handles by software applications for calculating quality of air polluted due to smoke. It also help in understanding the sources of pollution and for managing solution for industries in remote area.

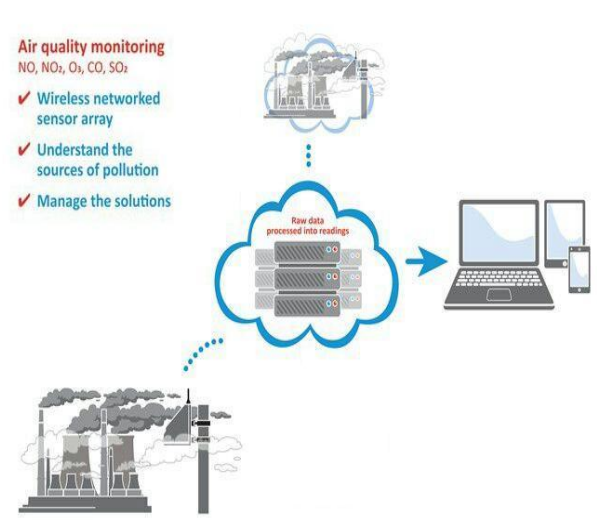

Figure 1: Air Quality Monitoring System

II. LITERATURE SURVEY

Mostly for monitoring environmental changes wireless sensor networks is use in weather forecasting application and other. It involves gathering of the observed data above instance across a volume of space big sufficient to display sign [1]. Geo-sensor network can be loosely defined as a sensor networks. It is designed to measure data related to geospatial information. Using advance sensor technology statistical analysis of data is collected [2]. It could be helpful to notice the circumstances of isolated position as a new instrument in the physical world for observing environmental changes [3]. There are a variety of applications such as microclimate chaparral transects seabird habitat monitoring, building comfort, and intrusion detection. It design and implement a geo-sensor network air pollution monitoring system. It employs the context model for understanding the status of air pollution. It is necessary to offer an alarm and safety instruction for a next to future unsafe situation, as avoidance is superior to cure. It can reduce severe damage with recovery cost. It also helps the flexible sampling interval change depending on the pollution conditions of the context model. This interval change is useful for keeping the geo-sensor network. The power efficiency is increased depending on the exibility [4]. A one of the big extent sensor networks for forecasting. Alert gives important air pollution data of environment [5]. Applications involving sensor network require the understanding of earth science that are shared with sensor, interactions and computer methods [6]. A Sensor Network comprises an array of sensor node for environment. A communication system allows data to reach at server. A data network is typically used to bypass data to single or added base stations. A number of systems pass commands to the nodes in a way to carry the information, whereas others agree to the nodes to send data out autonomously. The characteristics of EOFS are a centralized processing, a huge data volume, and an autonomous operation, etc. The sensor network can be used for environmental monitoring system [7]. System employ for PODS project, microclimate monitoring, habitat monitoring, Glacs Web project [9], etc. GLACSWEB project monitors the behavior of ice caps and glaciers for understanding the Earth's climate [8]. The PODS project observes the uncommon and in danger of extinction species of plant life in a solar radiation sensors, volcano adjacent with high-resolution cameras and temperature. The seabird habitat observing project discussed the requirements for observing system structure and the sensors assets. The microclimate monitoring application checks the climate data such as radiant light, relative humidity, barometric pressure, and temperature throughout the volume of giant trees. Sensor network is also utilized in the old monitoring to provide warnings and the monitoring of coastal erosion around small islands (EnviSense-SECOAS) [10]. The Automated Local Evaluation in Real-Time

(ALERT) was developed for providing important real-time rainfall and water level information to evaluate the possibility of potential coding [11]. There are lots of challenges in the EOFS which includes wireless communication, a data acquisition, data processing, and regular response by the context model. Sensor system receives the measured data from sensor network and provides the useful information for users by understanding the condition of the remote place for context awareness the proposed monitoring system structure is based on the framework [12]. To control the geo-sensor network and to monitor air pollution, we use two system; sensor network control system and air pollution monitoring system.

III. SYSTEM OVERVIEW

A. Air Pollution Monitoring System

Sensor data monitoring system receives the measured data from sensor network and provide the useful information for users by understanding the condition of the remote place. For the context awareness the proposed monitoring system structure is based on the framework. In order to control the monitor air pollution and geo-sensor network, it uses two system; sensor network control system and air pollution monitoring system. Control system supports the operators which control sensor network such as sampling interval change and network status check. In geo-sensor network the operators are useful for keeping the good status of data transmission. The air pollution monitoring system supports sensor data abstraction and air pollution prevention models for understanding the pollution level and area.

The observed data which is transmitted from the geo-sensor network is processed and abstracted by user defined rules with the abstraction model. The abstracted data is used for defining the pollution and the potential polluted area with the air pollution prevention model. It provides alarm message depending on the detected pollution area. In order to extract the status of the air pollution from sensor data, it also design the sensor data, context model, and air pollution prevention model as shown in figure 2. The context model defines facts, events and their relationship for understanding the context of the remote place. It is used in mobile and small sensor network applications such as SOCAM (Service-oriented Context- Aware Middle ware), CASS (Context-awareness sub-structure), CoBrA (Context Broker Architecture). As per given below figure 2 it collect all background information and all relative corporate action regarding data sense by sensor in abstract manner. Context

 ISSN: 2321-8169
4145 - 4149

information manager consist of knowledge base which contain all context information and rule manager which include spatial temporal operators. Context acquisition and information manager connected to alarm message and safety guideline applications for requesting and returning data. Air pollution monitoring system connected to sensor network control system for requesting and the observed data. Then sensor network control system communicates with geo-sensor network by commanding or observing data.

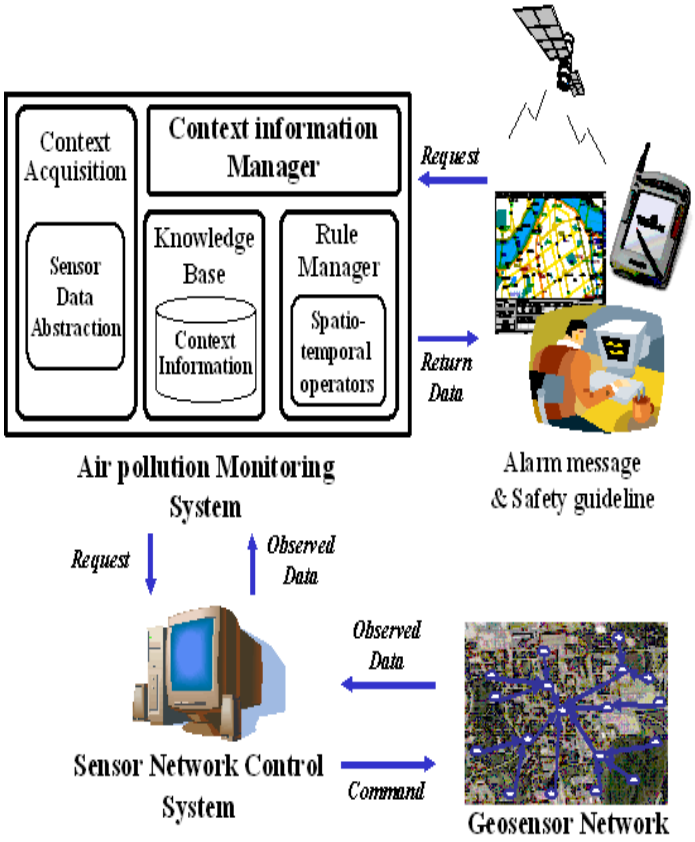

Figure 2: Air Pollution Monitoring System Architecture

B. *System Flow*

System flow contains complete working of system for finding pollution in air. Figure 3 shows complete flow of system in which air pollution detected by using geo-sensor network. Different type of industrial applications registered for air pollution monitoring system for calculating pollution occurs due to industry. Then sensors present in system can sense the different harmful gases present in smoke of industries like NO2, CO2 and SO2 etc. and keep record of those gases for finding the pollution. All record of generated gases are stored into the database and then compare values of those gases with existing record. In comparison if current value is less then stored value then only pass value to the database and if it is grater then threshold value then it will send alert to Municipal pollution control board and company owner also.

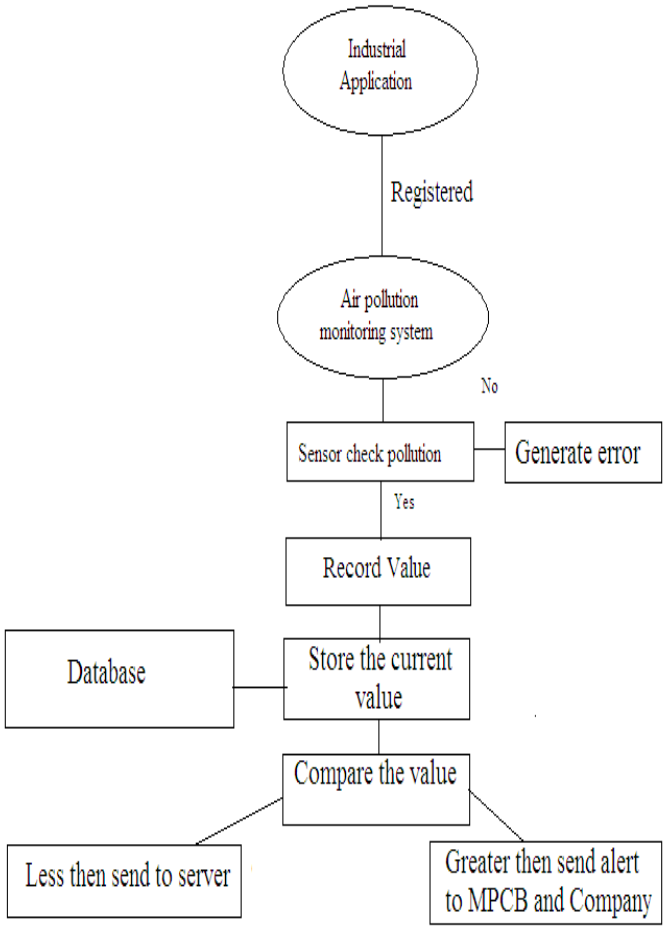

Figure 3: System Flow Diagram

IV. IMPLEMENTATION STRATEGY

A. *Algorithm for smoke detection is as follows*

Algorithm describe how the industrial smoke produces pollution and what is the actual amount of gases like CO2, NO2, SO2 etc. which is harmful for human health.

1. Start application for detecting smoke (Measure amount of smoke as input)
2. Check the sensor is properly work or not
If (working =proper)
Then accept the input from sensor
Else generate error message
3. Store the current smoke value in one temporary variable temperature
4. Check the current smoke value with the company threshold value
5. If current smoke value is less than company threshold value
Then send the current smoke value in the server

```
If (air pollution>=limit)
{
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 ISSN: 2321-8169
4145 - 4149

```
        Alert=authority+government;

}
Else
{
        Check (air pollution limit);
        Time (1 min);
}
```

Else if smoke value is greater than company threshold value Then generate alert send e-mail and sms to company director
MPCB Admin department

6. Stop

B. Pollution Control Board

The complete details about the pollution control board are stored in following format.

Figure 4: Reading panel of pollution control board

The above figure 4 shows, the threshold value, current reading of smoke, recent reading. MPCB or user can check all recent reading or history. The threshold limit is decided according to the pollution created by the industries. After every time interval it takes the current reading. When current value increases as per the given threshold value it gives the warning, after the three times warning it send SMS or email to the company owner and MPBC. Then penalty is them. All the reading is stored in the database. History can be viewed as per the choice. For all this process system needs internet connection. A common person can also view the readings of polluted area and take action on them.

V. CONCLUSION

Main purpose of given system is to find pollution present in air. Mostly this application is use for industry to find pollution. System is supported by context model for finding polluted area. System utilizes to analyze amount of gases like SO2, NO2 and CO2 in air. Context model is use to find amount of gases in air. Calculated amount of gases is compared with threshold value if it is greater than alarm message is generated otherwise it is stored in database system. Mostly system use to reduce recovery cost and severe damage.

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