JOURNAL OF COMPUTATION IN BIOSCIENCES AND ENGINEERING

Journal homepage: http://scienceq.org/Journals/JCLS.php

Research Article Open Access

Monitoring Climatic Changes by Cloud Computing

Monika R, Pranith Jain R, Salmaan N

Department of Biomedical Engineering, Adhiyamaan College of Engineering, Hosur-635109, India.

*Corresponding author: Monika R, E-mail: monz.r22@gmail.com

Received: July 4, 2014, Accepted: August 2, 2014, Published: August 12, 2014.

ABSTRACT

Monitoring Climatic changes is an important parameter as global warming is increasing at an alarming rate there are a lot of predictions on the climatic changes. We propose designing of a model which involves a monitoring system and a data acquisition method so that it can forecast the climate changes and indicating it to the processing center. The monitoring is based on automatic alarm whenever there is a big change in the climatic condition and even air pollution on the pretext that climatic change of a particular region is specified in prior. A set of different sensors are used here such as flux sensor, Temperature sensor, Humidity sensor.

Keywords: Climate monitoring, Cloud usage, Pollution monitoring, Sampling Rate Check, Sensor network,

INTRODUCTION

There have been a lot of instances where wireless networks have been used to transmit data with higher speed providing convenience to the user, but there has not been much implementation for Environment benefits, we propose implementation of such a system which would provide the monitoring benefits to not only monitoring station or unit but to large number of users, it uses a network that will deploy collection of observed data over a long period of time, the time along which it collects data varies according to the situation or in simple the climatic changes of a place. The suggested system does require combination of about three sensors, one to measure air pollution, the other to determine the temperature, and another to show the humidity of the required place, the major application of this device is that the conditions of a placed can be monitored remotely, it can also be used to determine the habitat of a place, field conditions to Specify which cultivation is suitable for that region, and also intrusion detection. Based on the geosensor network the system is designed.

The system is designed to indicate higher pollution level with an alarm and is programmed to determine the future levels of pollution and temperature change, in order to achieve lower power consumption the device must have automated checking intervals in order to provide a higher lifetime for the batteries.

Since it monitors all the parameters of provided environment the battery tend to wear off soon hence the system is provided with a powerful battery, the efficiency of which can be increased by altering the checking or operating intervals [2].

ENVIRONMENTAL MONITORING NETWORK FOR INDIA

Environmental Monitoring Network for India [3] is a data collection network which monitors the climatic change and the effect of global warming across vast regions of the Indian subcontinent. A similar program called the FLUXNET [3] is global collection of more than 300 micrometeorological terrestrial-flux research sites, which monitors the flux of Carbon dioxide, water vapor, energy thus providing the effect of global warming on India. Another project INDOFLUX [3] monitors the flux change in Oceans, it helps to assess the status of the environment in the Indian Subcontinent and surrounding oceans and creates a baseline from which it evaluates future environmental changes.

Climate changes will alter the regional biosphere-climate feedbacks and land-ocean coupling. Global models reliably predict the trend in the impact of climate change on India's forest resources, the magnitude of such change is uncertain, the Indian Ocean has shown higher-than- surface global warming, especially during the last five decades. This warming may have global impacts, even though the impact on the Indian summer monsoons is not well understood. These uncertainties highlight the need for regional model driven by regional data.

Just like projects mentioned above like FLUXNET [3] and INDOFLUX [3] this project suggests uploading of the crucial parameters obtained so that it can be monitored by the network

We also suggest laying of a baseline so that it may be useful for the network to collect a huge data and form a database based on which it may decide the peak temperatures and the lowest temperatures for the region where the data is acquired from. There are a lot of problems in ongoing projects like proper and accurate data acquisition and also proper communication with the server, but in our project we are going to concentrate on the understanding and estimating of the air pollution, climate and temperature changes in the external environment. Usage of cloud computing gives us an additional advantage of accessing data from anywhere in the world that is the data is not only limited to the processing station but it is also available to large number of users.

POLLUTION MONITORING

Air pollution in India has become one of the major problems due to sources of fuel wood and biomass burning, fuel adulteration, vehicle emission, traffic congestion and high sulfur emission from factories. In autumn and winter crop burning is one of the major contributors for the pollution as instead of mechanical tilling. About 50% of the children suffer from Asthma in Bangalore [4] [11]. Fuel wood and biomass burning is the primary reason for near-permanent haze and smoke observed above rural and urban India and in the satellite pictures of the country [11]. The data acquisition system acquires the data of temperature, humidity, pollution of air including Illumination, dust, carbon dioxide, ultraviolet, wind direction, wind speed, air pressure and the altitude from remote sensing areas. The proposed monitoring system uses two systems; an environmental data acquisition system which acquires all the environmental parameters and a decision making system which monitors the pollution level.

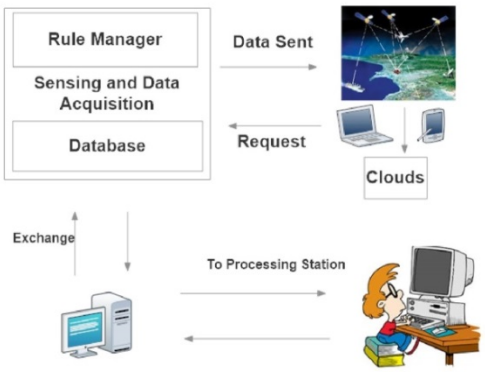

Figure 1: Architecture of monitoring system

The data acquisition system collects the data from the sensing system over a long period of time and forms a database from which the severity of climatic change and environmental pollution is recorded. The decision making system analyze the data collected in the database by a set of user defined rules with abstraction model [5]. The rules are formed based on the minimum(), maximum(), average() levels of climatic changes. During the analysis of the observed data, the data is compared against the preset user defined rules. Whenever the temperature and pollution exceeds the normal range of the user defined rule it alerts the monitoring stations by an alarm indicating high levels of pollution. This model gives the facts, events, preventive measures, control methods and the relationship to understand the status and severity of polluted area.

The model we proposed thus extracts the polluted area from the abstracted area depending on user defined rule. It also provides the dangerous rate of the polluted area with its area type and schedule we construct a safety guideline by creating awareness among the mass. By using the sensed data we can classify two types of air pollution areas such as the current dangerous area and the near future dangerous area. Current dangerous area is the one which has the problems associated with the higher than normal pollution levels for a longer time. It is utilized in applications like SOCAM [6]

Preventive measures are to be taken in that area immediately, we also consider the pollution area in near future dangerous area because prevention is better than cure this is useful for preventing the region from irreversible damage of pollution and also we can reduce the cost which would incur in case of damage by pollution. Initially we extracted and processed data from the polluted region, other factors are taken in to consideration such as priority of affected regions, a constant for danger probability and the reaching probability to the critical point.

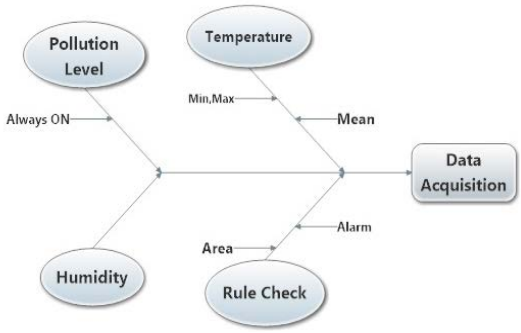

Figure 2: Data Acquisition Policy

It is also necessary to frequently update so that the monitoring station can promptly decide whether to react or not react against that particular damage.

FREQUENCY OF ACQUIRING THE DATA

Data must be acquired frequently for the complete analysis of the environment and its condition. It is very hard to constantly acquire the data and at the same time have a high battery life hence we propose a method that conserves battery by effective acquisition and gathering data when required essentially. If the frequency of recording interval is short correspondingly the battery usage will be more but if the interval is more it can keep the electronic power in a long time [7]. Our concept mainly focuses on saving the battery life. We have an extra mode of operation known as “standby” mode [8], this mode can be set by the user who is monitoring. In this mode all the sensors excluding the one which is sensing air pollution is in the ON state others are all shutdown and gets ON only when sensor senses some pollution.

Another way of increasing battery life is to have a control on the parameters recorded especially on the longevity of its recording must be taken care. The interval is of course defined by the user himself and the condition whether it has to more frequently update the data to the database is defined by the user.

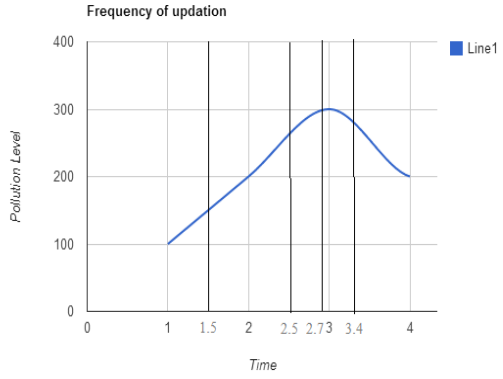

Figure 3: Interval in which data is updated

Just for an instance if we consider the pollution level 200 to be critical then the interval of data collection increases as soon as the pollution begins to increase and reaches the critical point,

and as the pollution rate begins to drop then the interval gets increased that is the next instance at which data is collected is going to be longer. If there is no pollution in the near future, it could be longer for saving the batteries.

CLOUD COMPUTING

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility over a network. It relies on sharing of resources to achieve coherence and economies of scale similar to utility over a network [9][12].

We focus of using it is to broaden the impact of the result of the data received and what is interpreted from the data. The only way to have a control over pollution does not only involve framing of strict laws, monitoring the pollution. The control over pollution can only be achieved when the common man knows about the harmful effects of pollution.

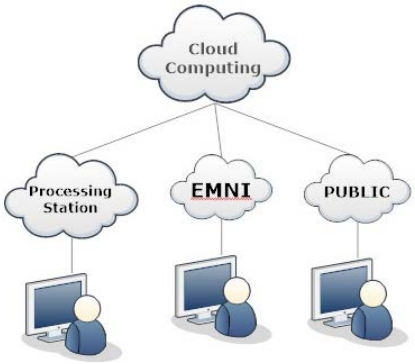

Figure 4: Implementation of Clouds

Sending the data to the EMNI will only result in the prevention efforts taken by the officials. Pollution can be eradicated in a more efficient way when public realizes the harmful effects of pollution this is possible only when people will know the rate of pollution where they live.

When people will come to know about the pollution levels in their regions the people will themselves change their practices which may add up to already changing climate. Thus more pollution may be avoided.

IMPLEMENTATION

About 10 routers and 24 sensors were installed by a research firm in a field to detect only the air pollution levels in that particular field they were able to get accurate data on the pollution [10] we suggest implementation of additional sensors like temperature, humidity to obtain the effect of global warming in a particular region. We also suggest altering the sampling rate of data acquisition in order to obtain higher battery life all this is provided with a broad database and the rules are set according to maximum and minimum levels of pollution, humidity, temperature.

They are classified according to the usual temperature of the region and also whether the region has schools, hospitals or factories. When the pollution rate exceeds and it finds a factor to make a dangerous case in the near future, it shows an alarm message.

CONCLUSION

Our proposed model utilizes a monitoring system and a data acquisition method to forecast the climate changes and indicating it to the processing center. It provides alarms and safety guidelines based on the condition of the remote place which is derived from the database. Currently we are focusing on the heterogeneous network system for data abstraction and combination for a higher context.

ACKNOWLEDGMENT

This work was actively supported by the staffs of Department of Biomedical Engineering, Adhiyamaan College of Engineering.

REFERENCES

1. Young Jin Jung, Yang Koo Lee, Dong Gyu Lee, Heun Ho Ryu, Silvia Nittel, “Air pollution Monitoring System Based on Geosensor Network” IGARRS, Boston, 2008
2. Mainwaring, A., Polastre, J., Szewczyk, R., Culler, D., Anderson, J. ”Wireless Sensor networks, pp. 3-20, 2004
3. P.V Sundareshwar, “Environmental Monitoring Network for India” POLICY FORUM.
4. Air Pollution http://en.wikipedia.org/wiki/Air_pollution_in_India, 27 July 2014
5. Y. J. Jung, Y. K. Lee, D. G. Lee, M. Park, K.H. Ryu, H.C. Kim, K. O. Kim, “A Framework of In-situ Sensor Data Processing System foe Context Awareness,” ICIC, pp. 124-129, 2006.
6. Tao G., Xiao H. W., Hung K. P., Da Q. Z., “A Middleware for Context-Aware Mobile Services,” IEEE Vehicular Technology Conference. Milan, Italy, 2004.
7. Xu, N. “A Survey of Sensor Network Applications,” IEEE Communications Magazine, Vol.40, No.8, pp. 102-114, 2002.
8. A. Cerpa, J. Elison, D. Estrin, L. Girod, M. Hamilton, J. Zhao.”Habitat Monitoring: Application driver for wireless communications technology,” ACM SIOCOMM Workshop on Data Communications, San Jose, 2001.
9. Cloud Computing http://en.wikipedia.org/wiki/Cloud_computing, 27 July 2014.
10. Mike B., “Sensor Web Enablement, “http://www.opengeospatial.org/
11. “7 million premature deaths annually linked to air pollution” World Health Organisation, 25 March 2014.
12. “The NIST Definition of Cloud Computing”. National Institute of Standards and Technology. 24 July 2011

Citation: Monika R, et al. (2014) Monitoring Climatic Changes by Cloud Computing. J. of Computation in Biosciences and Engineering. V1I3. DOI: 10.15297/JCLS.V1I3.07