



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 3, March 2017

A Survey on WiFi Based Air Pollution Monitoring System

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ABSTRACT: For last few years, challenges of monitoring and control of distant environmental parameters accurately has emerged as new field of research. The concept of Internet of Things (IOT) is also emerging very fast where everything around us comes with an internet connectivity for monitoring and control. Monitoring the environmental parameters and initiating a control action from internet is also part of this concept. In our proposed work, we design an environment monitoring system, capable of monitoring and control of environmental parameters like temperature, CO, NO₂, SO₂, PM_{2.5} &10. Also, we focus on design of a low cost system that is capable of not only remotely monitoring the environment variables like temperature and industrial pollutants but also initiates some control action like switching devices ON/OFF from the internet. This system uses Wireless sensor Networks for sensing the environment parameters in the area under supervision. Sensors Node has been designed to measure the temperature, CO, SO₂, NO₂, PM_{2.5}&10. The Control node has been designed to initiate the control action. The Central Monitoring is based on ARM11 raspberry pi board.

KEYWORDS: RASPBERRY PI, CO, SO₂, NO₂, Temperature, PM_{2.5}, PM₁₀

I. INTRODUCTION

Environment monitoring system is a framework that is equipped for measuring a few ecological parameters like temperature, CO, SO₂, NO₂, PM_{2.5} & PM₁₀. These parameters are essential in numerous applications like in industry, savvy homes Greenhouse and climate gauging. Propelled Environment observing frameworks offer many elements like remote access to the estimation information and furthermore can start some control activity from removed area. These frameworks utilize Wireless sensor Networks for detecting nature parameters. Wireless Sensor Network (WSN) (WSN) has sensors to detect the physical parameters and they are interconnected remotely to trade data. They have a focal checking framework that is associated with the web to get to the information remotely. A few sensors are prepared in every remote area to quantify natural parameters and these estimations are sent to the focal office for capacity and examination reason. Moreover, the focal office can offer charge to remote area for yield control execution. These components offer an approach to keep up condition and permit acquiring alert on event of any irregular conditions like parameters surpassing. A WSN permits sending of number of sensor hubs which design themselves relying on the system topology and neighborhood circumstance. In the wake of detecting their physical condition and preparing the got information locally, hubs convey their data (or an extract) towards a system sink, where information is further handled and made accessible for readout. As transmitted information ought to locate the best course towards its goal naturally, the system can be remotely controlled and accordingly be taken care of as one expansive estimation instrument. A few frameworks likewise offer the remote logging offices that are the parameters can be put away at general interims at the remote server with the goal that they can be alluded at whatever time. The fast improvement and scaling down of sensor gadgets, and the current advances in remote correspondence and systems administration advances, are permitting researchers and architects to create systems of little sensors that can be utilized to persistently screen the wellbeing and solidness of nature we live in. Wireless Sensor Networks (WSNs) consist of a number of spatially distributed sensors with computing, processing and communication capabilities that can continuously sense and transmit data to a base station, where data can be processed and observed in real time. This project provides a detailed study and implementation of a WSN for real time and continuous environmental monitoring of greenhouse gases. A tree-topology WSN consisting of two sensor nodes and a base station was successfully built and tested using open source and inexpensive hardware to measure the concentration level of several greenhouse gases.



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II. MOTIVATION

One of the best issues that the world is confronting today is that Environmental pollution. It comprises of soil, water and air pollution. The above all else environmental contamination is air contamination which causes Global warming and Climate change. It likewise influence on human wellbeing. Condition observing is one of the significant use of remote sensor network. WSN comprise of various sensors which are generally disseminated to screen distinctive condition parameters like temperature, industrial pollutants. WSN comprises of sensor hubs which are minimal effort gadgets with constrained power. Energy proficiency is the most concerning issue when these sensors are utilized for vast scale condition checking as the sensors are battery controlled. Along these lines it is important to enhance the vitality effectiveness of checking framework. A few procedures are utilized to enhance the vitality utilization. This paper performs the review on different environmental air pollution monitoring systems and techniques to improve the energy efficiency of the system.

III. OBJECTIVES

In WSN various Environment monitoring sensors are placed inside the field, sensors include Gas sensors (CO , SO₂, NO₂ Temperature , PM_{2.5} , PM₁₀), temperature sensor.

1. Using this information, Environment monitoring parameters calculated remotely at control system and display on the remote station android mobile wirelessly.
2. This Unit consists of a Wi-Fi module, sensors, a microcontroller, and power sources.

IV LITERATURE SURVEY

In literature, the problem and the previous techniques of environmental system is described

NihalKularatna and B.H.Sudantha [1] displayed environmental air pollution monitoring system in 2008. The framework in view of the IEEE 1451 standard. In this paper STIM savvy transducer interface module was created which comprise of microcontroller and gathering of different sensors like CO₂, CO, NO₂, and O₃. This likewise utilized Personal PC for graphical portrayal. STIM associated with the PC by means of transducer autonomous interface which utilizes IEEE 1451 standard.

Y.J.Jung and Y.K.Lee [2] created air pollution monitoring system using Geosensor network in 2008. Geosensor network is used to the detect the condition of remote place. In this context model and concept of flexible inspecting interim change was acquainted which builds the battery lifetime. Setting model outlined which decides the dirtied ranges and appropriately caution message and wellbeing rules send to the general population around there.

P.M.B Silva Girao [3] in 2009 implemented Smart sensor network for indoor and outdoor air quality monitoring. In this framework sensor hubs are introduced in various rooms and it comprise of tin dioxide sensors which was hardwired or remotely associated with the focal unit. It additionally measured the centralization of temperature and moistness for exactness. In this the idea of various information single yield neural systems was executed to repay temperature and moistness impact on gas fixation. Wi-Fi innovation was utilized for correspondence. In the time of 2010.

A.R.Al-Ali, Imran Zualkernan and FadiAloul [4] presented Mobile GPRS sensors for pollution monitoring. This included Data procurement unit, GPRS modem, and GPS module and contamination server. In this DAQ unit, GPRS and GPS were associated with the microcontroller by means of RS-232 Interface lastly assembled information was sending to the pollution server.

Raja Vara Prasad et al. [5] in 2011 proposed a real time wireless pollution monitoring. This framework depended on the multihop information accumulation calculation. Aligned gas sensors were interfaced to remote sensor bits, in that Libelium Wasp bit was utilized which comprise of preparing unit and correspondence unit. All gas sensors were associated with sensor board on rotational premise. The collected data were sending to base station. Multihop data aggregation algorithm was used to increase a monitoring range.

Jen-Hao Liu et al. [6] Introduced micro-scale air quality monitoring system for urban areas in 2012. This System monitors the convergence of carbon monoxide co brought on by substantial vehicles discharge. Sensor hubs were sent

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in exceptionally populated ranges. Framework was incorporated with the GSM for information transmission. Gateway collected the data from all sensor nodes and sends to control centre by GSM network.

Anuj Kumar et al. [7] in 2013 conducted a review on environmental monitoring system. The review discussed distinctive procedures and different equipment utilized as a part of the earth checking frameworks. It also considered the parameters like low cost, low power consumption, reliability, and signal to noise ratio and RF interference.

Abdullah Kadri et al. [8] in 2013 displayed ongoing air contamination observing in view of Machine to machine correspondence. The system was implemented with various monitoring station which consist of different gaseous and meteorological sensors. Each monitoring station communicates with the backend server through M2M communication which uses GPRS network.

V. PROPOSED SYSTEM

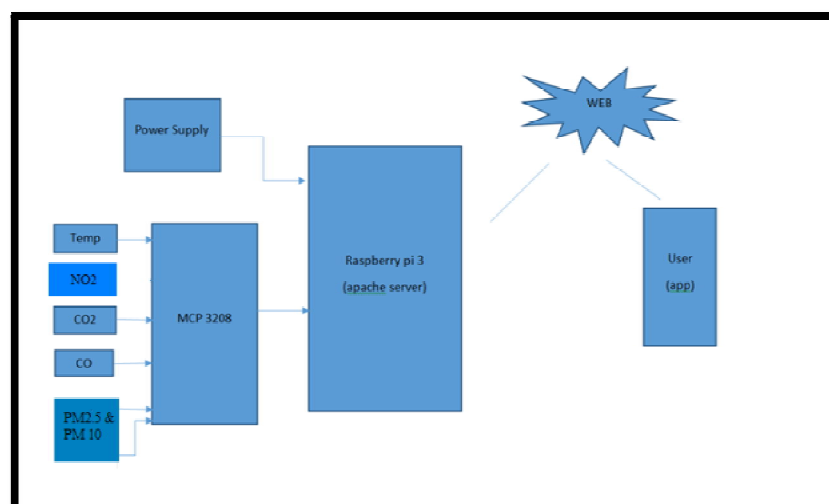


Fig: System Architecture

The proposed system consists of the Wireless Sensor Network for acquiring climate data locally. In WSN various Environment monitoring sensors are placed inside the field, sensors include Gas sensors (ie. CO, SO₂, NO₂, Temperature, PM_{2.5} and PM₁₀), temperature sensor. Using this information, Environment monitoring parameters calculated remotely at control system and display on the remote station android mobile wirelessly. This Unit consists of a Wi-Fi module, sensors, a microcontroller, and power sources. Several WSUs can be deployed in-field to monitor as a distributed sensor network for accurate Environment monitoring system. This setup can also be used to measure the temperature of atmosphere using temperature sensor, Gas related information using IR sensor & electrochemical sensor. Each unit is based on the microcontroller RASPBERRY PI LPC2148 that controls the Wi-Fi module and processes information came from the all sensors.

Advantages

- Maintain accuracy & efficiency by implementing the IEEE standard using wifi.
- This project can be used to save power.
- Enhanced for monitoring & controlling of atmosphere conditions.

VI. CONCLUSION

Averting environmental pollution is one of the tedious tasks since the humans are responsible for this hazardous nature which poses threat to whole world. And we are responsible to eradicate pollution problems. Virtually all emissions vary from time to time. It is an excellent concept that will show a new dimension. Although the general and specific objective is very similar, the Technological solutions employed are very different



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