WIFI Based Remotely Environment Monitoring System

Amitkumar Mishra[1], Shriharsh Muramkar[2], Sheetal Adki[3] Prajakta Walunj[4], Pranav Shriram[5]

[1,2,3,4,5]*School of Computer Engineering and Technology, MIT Academy of Engineering, Alandi Pune, India*

Abstract— During last few years, monitoring challenges and control of remote environmental parameters accurately has become a new era for researchers. The concept of Internet of Things (IOT) has become boon and is emerging very fast where everything is interconnected and also has 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 work that we proposed, we design an environment monitoring system, capable of monitoring and control of environmental parameters like temperature, pressure and humidity. Also, we focus on design of a low cost system that is capable of not only remotely monitoring the environmental variables but also initiate some control action like switching devices ON/OFF from the internet. This system makes use Wireless sensor Networks for observing and monitoring the environmental factors in the area under observation. Sensors Node is designed to measure the temperature, pressure and humidity. The Control node is designed to initiate the control action. The Central Monitoring is based on Wemos D1 mini board. Temperature and humidity are updated on the android app. it will notify user when temperature, humidity or gas value exceeds some predefined threshold. A no. of users can access data with their authorised credentials like username and password. With the proposed system we are planning to monitor environmental conditions like temperature, humidity, to predict rainfall and to alert authorized people about increasing level of carbon monoxide gas. The proposed system will be able to predict current environmental conditions and update the condition along with sensor value on the server.

Keywords—Temperature sensor, Co Sensor, Humidity Sensor, Node Multipoint Control Unit, Internet of Things

1. INTRODUCTION

Environment monitoring system is an arrangement that is efficient of calculating several environmental factors like temperature, humidity, pressure, illumination and quantity of gasses like CO etc. These factors are important in many implementations like factories, prediction of climate, smart homes, etc. Advanced Air Quality Monitoring system provide many characteristics like isolated access to the calculated data and also can start some control action from far location. These structures use Wireless sensor Networks for sensing the natural parameters. Wireless Sensor Network (WSN) uses sensors for sensing and the physical parameters, they are interconnected for exchanging information wirelessly. They have a system for monitoring which is connected to and uses internet to remotely access the data.

Various sensors are equipped in every location to calculate environmental parameters and these readings are sent to the server for storage and analysis purpose. In addition, the administrator can give command to various locations for output control execution. These features allow generating caution if any abnormal behaviour like exceeding of any of the parameters occurs.

A WSN allows implementation of number of sensor terminals which configure themselves relying upon the network topology and neighbourhood situation. After the physical environment has been sensed and processed the acquired data, nodes transmit their information (or an extract) towards a network admin, where information is processed again and made available to be displayed. As broadcasted information should find the most efficient path towards its target automatically, the matrix can be remotely controlled and therefore be handled as one large measurement instrument. Some systems also offer the remote logging facilities that are the parameters can be stored at regular intervals at the remote server so that they can be referred any time

2. RELATED WORK

After going through the background of this study we have reported several related work as bellows,

Nihal Kularatna and B.H.Sudantha (2008) [1] stated in their paper which was published in 2008. The system was based on the IEEE 1451 standard. In this paper they developed smart transducer interface module which is composed of microcontroller and collection of various sensors like temperature sensor, humidity sensor and moisturizer sensor. This also used Personal computer for pictorial representation. Smart Transducer Interface Module connected to the PC via transducer independent interface which uses IEEE 1451 standard. update rate by synchronising the active beacons.

Y.J.Jung and Y.K.Lee (2008) [2] is developed air pollution monitoring system using Geosensor network in 2008. They used geosensor network for detecting the condition of distant place. In this system context model and flexible sampling interval change concept was introduced to increases the battery lifetime. Context model designed which evaluates the contaminated areas and accordingly notifications and precaution measures send to the localities in that region .

Octavian A.Postolache, J.M.Dias and P.M.B Silva Girao [3] they designed smart network of sensors for monitoring indoor as well as outdoor air quality. This system proposed that sensor terminals are deployed in different rooms and they used tin dioxide sensors which were either hardwired or connected wirelessly to the administrator unit. It also calculated the aggregation of

temperature and humidity for precision. The authors stated the concept of several input single output neural networks to compensate influence of other physical parameters on gas concentration. Wireless Fidelity technology was used for interaction.

A.R.Al-Ali, Imran Zualkernan and Fadi Aloul [4] Designed GPRS sensors (mobile) for monitoring the pollution. This included DAQ unit, General Packet Radio Service modem, and GPS module and contamination server. In this Data Acquisition unit, both the other components were connected to the microcontroller via RS-232 interface and finally collected information was sending to the pollution server

Raja Vara Prasad et al [5] proposed a real time track of pollution (wireless). The system used some hoping data aggregation algorithm. Interfacing Calibrated gas sensors with wireless sensor motes, Libelium WASP mote which consist of processing and communication unit was used. A sensor board is connected to all the sensors on rotational basis. The collected data were sending to base station. Multihop data aggregation algorithm was used to evatuate a monitoring range.

Jen-Hao Liu et al (2012) [6] Introduced micro-scale air quality observatory program for densely populated areas in 2k12. This arrangement was designed to monitor the presence of level of carbon monoxide (CO) emitted by heavy vehicles. In highly populated areas, they deployed sensor nodes. Arrangement was combined with the global system for Mobile for data transmission. Gateway gathered the information from all sensor nodes and transmits to control office by GSM network.

Anuj Kumar et al (2013) [7] author and the team organized a review on monitoring environmental parameters. The review included various techniques and different hardware components used in the environment observatory technologies. Factors like low cost, low power consumption, and signal to noise ratio and RF interference are also considered.

Abdullah Kadri et al (2013) [8] proposed real time monitoring of air pollution based on Machine-Machine communication. The system uses various monitoring stations which include different gas and meteorological sensors. Communication between back end server and monitoring station is done through M2M communication which uses GPRS network.

3. SYSTEM ARCHITECTURE

The system is placed in two locations. The system which we are proposing consists of the WSN for acquisition of climatic data locally. In WSN various sensors used for environmental parameters monitoring are placed in the field, sensors include temperature sensor, gas sensors & humidity sensor. Using this data, environment monitoring factors calculated remotely at control system and display on the remote station android application wirelessly. This

Unit consists of a Wireless Fidelity module, a microcontroller, power sources and sensors. Several Wireless Sensor Units can be deployed inside the field for monitoring as a distributed wireless network of sensors for monitoring the accurate environmental system. This setup can be used to measure atmospheric temperature using temperature sensor, humidity level using humidity sensor, Gas related information.
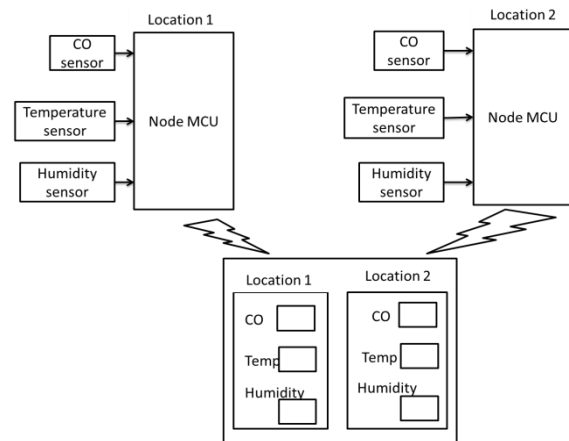

Fig 1. Proposed System

Every unit is depended on the microcontroller that controls the Wi-Fi module and then processes information coming from the all sensors. We are using node MCU as a controlling unit and as a Wi-Fi module.

Temperature and humidity are updated on the android app. It will notify user when temperature, humidity or gas value exceeds some predefined threshold. Any no. of users can have an access to the data with the valid user ID and password provided to them by the service provider.
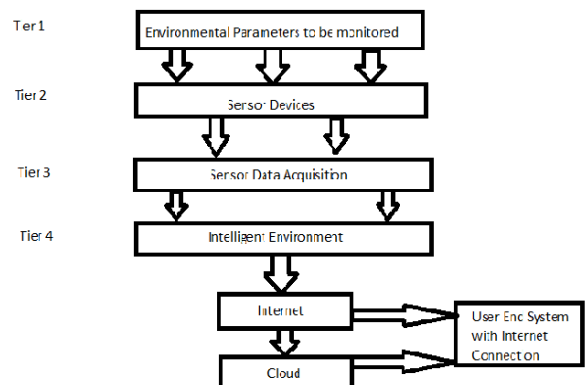

Fig 2: System Architecture

HARDWARE COMPONENTS

223

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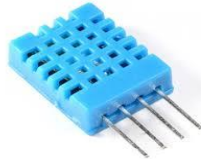
Fig 3: Node MCU (Chip)

Fig 4: DHT 11

Fig 5: ESP 8266 sensor

Fig 6: MQ-5

a. Node MCU

NodeMCU is a cost efficient controller which can be programmed using LUA and Arduino which is being developed with inbuilt wifi module ESP8266. Node MCU is greatly compatible to ESP8266.Node MCU provides us with 6 extra GPIOs similar to ESP-12 module.

b. DHT 11

DHT11 sensor is used for monitoring of both Temperature and Humidity. It has integrated temperature and humidity sensors and it gives output in the form of digital signal. It ensures high reliability and long span stability. It includes a resistive type humidity measurement component and NTC temperature component

c. ESP 8266

ESP8266 is a Wi-Fi module which comes inbuilt with Node MCU. The purpose of Wi-Fi module is to transmit the acquired data.

d. MQ-5 sensor

It has high sensitivity to LPG, natural gas, town gas and small sensitivity to alcohol and smoke. Its response is fast, stable and it has a long life. MQ-5 has 6 pins, 4 of them are used to fetch signals and other 2 are used for providing heating current.

4. DISCUSSIONS

Wireless Sensor Network is designed and implemented for the purpose for which it has been designed. On observation of the performance it is concluded that the present system is reliable and variety of applications can be applied. Application factors aggregation and observation is accurate and automatic regardless of the area under observation. Application can be observed universally using uploaded information over cloud. Threshold values can be varied depending upon the atmospheric conditions.

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