Smart Environmental Monitoring System Using Labview

V.Anupriya [1] A.Manimozhi[2],D.Nivetha[3],P.Nivethitha[4]
Assistant professor, Department of Electronics and Communication Engineering
Sri Ramakrishna Engineering College, Coimbatore, Tamil Nadu, India
UG students, Department of Electronics and Communication Engineering
anupriya.v@srec.ac.in ,manimozhi.1302101@srec.ac.in ,nivetha.1302120@srec.ac.in,
nivethitha.1302123@srec.ac.in

Abstract: The rapid growth in infrastructure and industrial plants creating environmental issues like climate change, malfunctioning and pollution. The project shows the estimated values of environmental parameters by using the adaptable and smart monitoring systems. The solution includes the technology Internet of Things (IoT).The existing model describes the original value of the environmental parameters with the help of the sensor networks. The proposed model comprises of lcd displays or alarms which displays the exceeded value of the environmental parameters .The implementation is tested for CO_2,noise,temperature,humidity,acid rain detection in rain.
Keywords: Internet of Things (IoT); Embedded ;Arduino UNO; LabVIEW Software; Sensors, Smart Environment.

1.INTRODUCTION:

Present innovations in technology mainly focus on controlling and monitoring of different parameters. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters (e.g., noise, CO, temperature, humidity and radiation levels). When the objects like environment interfaced with sensor devices, microcontroller and various software applications becomes a protecting and monitoring environment and it is also called as smart environment. In such environment when some event occurs the alarm or LED alerts automatically .Projecting the embedded intelligence into the environment makes the environment interactive with other objectives.. Initially the sensor devices are deployed in environment to detect the parameters (e.g., noise, CO and radiation levels etc.) while the data acquisition, computation and controlling action brings awareness about the variations in the environmental parameters . Sensor devices are placed at different locations to collect the data to predict the behavior of a particular area with variations in parameters. The main aim of the this paper is to design and implement an efficient monitoring system through which the required parameters are monitored remotely using internet and the data gathered from the sensors are stored in the cloud and to project the estimated trend on the web browser.The output analysis from the cloud is plotted via LabVIEW.

2.HARDWARE DESCRIPTION

1. ARDUINOUNO:

Fig.1 ARDUINOUNO board

The **Arduino Uno** is a microcontroller board based on the ATmega328 . It has 14 digital input/output pins, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.Arduino UNO board consist of analog input pins (A0-A5), digital output pins (D0-D13), inbuilt ADC and Wi-Fi module connects the embedded device to internet. Sensors are connected to Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value the corresponding environmental parameter will be evaluated.

2. SENSORS:

The Wireless Sensor Network consists of five inexpensive wireless sensors, which are capable of collecting, storing, processing environmental information, and communicating with neighbouring nodes. The gateway acts as the network

coordinator in charge of node authentication, message buffering where you can collect, process, analyze, and present your measurement data. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center. End device is responsible for collecting wireless sensor network data, and sending them to parent node, then data are sent to gateway node from parent node directly or by router.

After receiving data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server.

A server is an instance of a computer program that accepts and responds to requests made by another program; known as a client.

3.SOFTWARE DESCRIPTION:

1.Ubidots:
Ubidots helps for the process of cloud implementation. This is used for storing the values in databases. The measured values of the data is updated for every 5 minutes.The location can also been shown .The comparison is done between the weekly data's , monthly data's and the data that has been observed at that instant of time.

2.IOT Access:
Internet of Things (IOT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity and the communication hat occurs between these objects and other internet-enabled devices and systems. 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.

3.Cloud Computing:

It is the practice of using a network of remote servers hosted on the internet to store, manage and process data, rather than a local server or a personal computer. Based on a cloud location, we can classify cloud as: Public, Private, Hybrid and Community cloud.

1)Private Cloud: It means using a cloud infrastructure solely by one customer/organization. It is not shared with others, yet it is remotely located. It is managed by third party or organization. The security and control level is highest while using a private cloud.

2) Public Cloud:
In public cloud the computing infrastructure is hosted by the cloud vendor at the vendor's premises. The customer has no visibility and control over where the computing infrastructure is hosted. The computing infrastructure is shared between any organizations.

3) Hybrid cloud:
Organizations may host critical applications on private clouds and applications with relatively less security concerns on the public cloud. The usage of both private and public clouds together is called hybrid cloud. A related term is cloud bursting.

4) Community Cloud:
It involves sharing of computing infrastructure in between organizations of the same community. For example, a community cloud can belong to a government of a single country. Community clouds can be located both on and off the premises.

4.SYSTEM MODEL:

The temperature sensor S1 is first interfaced with the Arduino UNO. Successively, the humidity sensor S2, the pH sensor S3,the CO2 sensor S4, the noise sensor S5 are interfaced with the arduino. The sensors frequently sense the environmental parameters and send the values to theArduino UNO board. The Arduino UNO send the information to the lcd display by the values being displayed in it. The data's from the lcd are send to the cloud through the Wi-Fi module. The data's from the Wi-Fi are stored in cloud in the form of the databases. These values are send to ubidots , which in turn displays the stored database values. The earlier values which are monitored can also be compared and displayed with the help of the ubidots .In the ubidots the monitored parameters are displayed along with the date and time and the values are updated every five minitues At the end the sensed values are being monitored with the help of the smart environmental monitoring system.
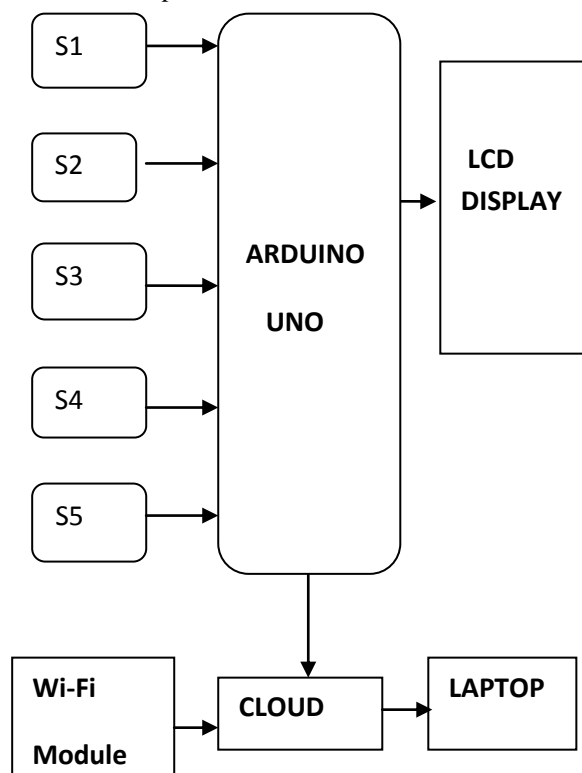
Fig.2 Block diagram of System Model

5.EXISTED SYSTEM MODEL:

The environmental parameters are sensed primarily by the respective sensor devices.The sensor devices are based on three parameters.They are threshold value ,duration which Time or Space and Alarm or Buzzer or LED.If the monitored value exceeds the fixed value then there is an indication given by the buzzer. The next target is done by the data acquisition and the decision making devices. These devices specify the condition which represents the parameters.The intelligent environment identifies the variations in the sensor data and fix the threshold value depending on the identified level of CO or noise levels.The sensed data will be processed and then stored in the cloud .In other words the data's are stored in the Google spread sheets and also it will show a trend of the sensed parametes with respect to the specified values.The end users can browse the data using mobile phones, PC's etc.

6.HARDWARE MODULE:

The temp,CO2,humidity,noise,acid rain values are moniterd via the respective sensor and then the values are
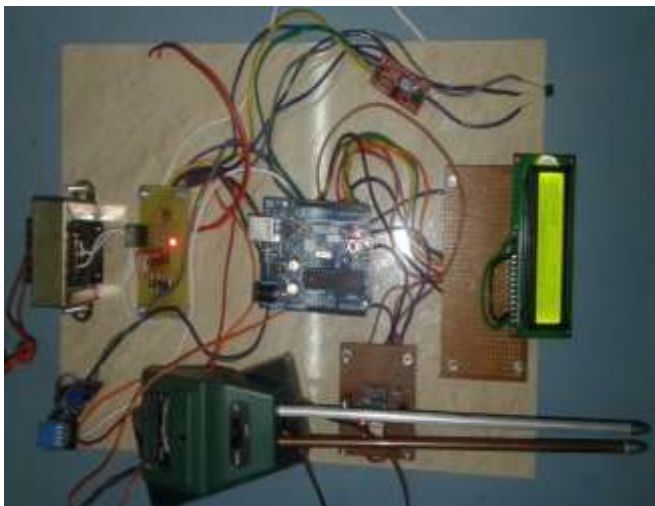send to the arduino UNO which is interfaced with the lcd displays.

Fig.3 Hardware Module

The arduino UNO has 7 input output pins.The second pin of the arduino UNO is connected to the temperature sensor .Similarily the third and fourth pin of the arduino is connected to the CO2 and the humidity sensor respectively.The fifth pin is connected to the noise sensor.The sixth pin of the arduino is connected to the pH sensorrespectively.The seventh pin is grounded. The eighth pin is connected to the Vcc. The arduino send the value to the lcd and then the monitored values are displayed in the lcd .The Wi-Fi module is connected to the arduino and the lcddisplay.It transfers the values to the cloud. The Vcc is given from the step down transformer because the arduino UNO and the lcd works only in 5V but the regular power supply is 240V.So for reducing 240V to 5V step down transformer is used.

7. OUTPUT OF THE SOFTWARE MODULE:

The monitored environmental parameters are displayed in the cloud. The user can view the environmental parameters for every 5 minutes .The instant value of the parameter values are updated regularly. The values of the monitored parameters like temperature, noise, humidity, pH and CO2 are displayed in the ubidots along with the date and time in the table format such that the user can easily able to view the updated values.

Fig. 4 values updated in cloud
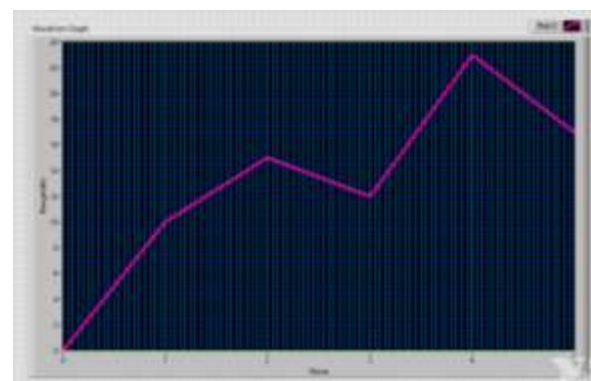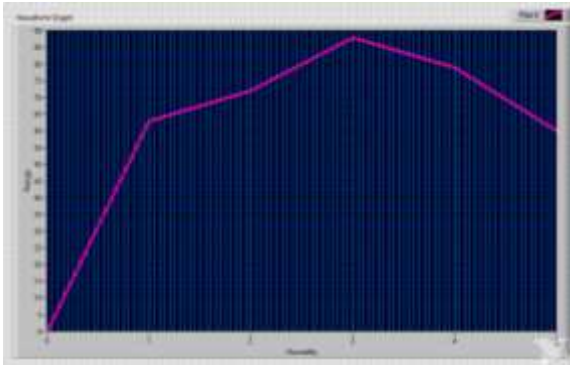
8.LabVIEW RESUTS:
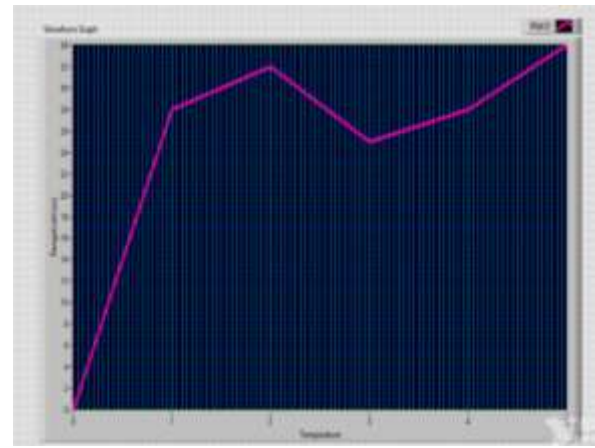
Fig.5 Noise Monitoring

Fig.6 HumidityMonitoring

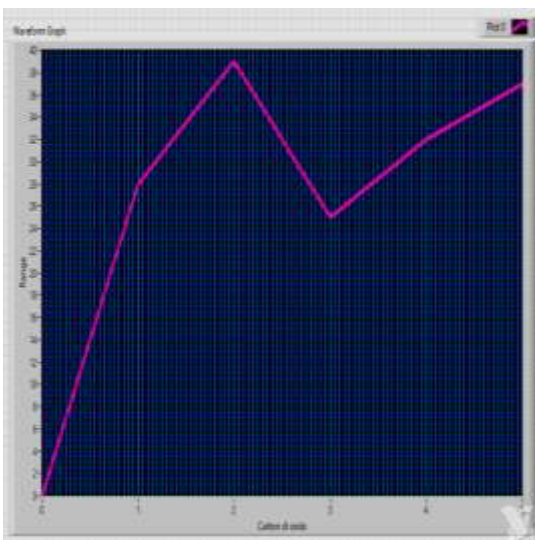
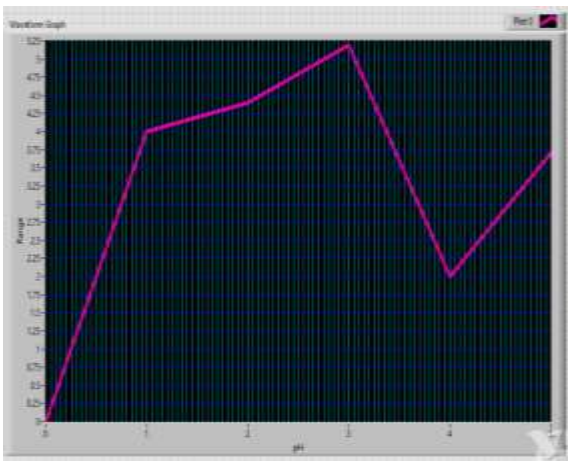Fig.7 CO2 Monitoring

Fig.8 pH Monitoring

Fig.9 Temperature Monitoring

9.CONCLUSION & FUTURE SCOPE:

In this smart environmental monitoring system the environmental parameters (temperature,humidity,noise,acid rain detection,CO2) are monitored and the values are compared with the threshold or reference value . The acquired values are send to the cloud in a regular time interval. Thus the history of acquired values will be maintained in the IoT cloud environment. If the monitored value exceeds the reference value an alert is given by the buzzer and the message is send to the operator in the pollution control board. The operator can now takes necessary steps to control the pollution in order to safeguard the public .The proposed system can be implemented in smart cities .

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