Development of Data Acquisition System Based on IoT

Shobha Poojary[1], Girija Hegde[2], Harshitha S.

[1]*Assistant Professor, Dept. of Computer Science & Engg., Nitte Meenakshi Institute of Techmology.*
[2,3]*Dept. of Computer Science & Engg., Nitte Meenakshi Institute of Techmology.*

Abstract : Environmental issues such as climate change have received much attention in recent years, and environmental monitoring, modeling, and management enable us to gain a deeper understanding of natural environmental processes. This helps to improve the quality of processing units, storage areas and save lives.
Effective monitoring of temperature, humidity and other environmental conditions within a cold storage or warehouse has become one of the important field in research and development in many developing nations across the world. In this project, we demonstrate how technology can be utilized in industry for preventing loss of instruments, lives of human beings.
In this paper we implemented our android app which is used to control the environment of the industry and continuously get the data (all the readings of the sensors)by the microcontroller with the help of Bluetooth connection. We have used eclipse required bundles for android programming. Further, we have created a database using MySQL, which gets updated when the user of the android app gets some data from the controller or when he tries to send the data to the controller. Thus the database gets updated quite often. The admin of the system can continuously monitor the system in this way.
Keywords: Remote Sensing, radio frequency identification

I. INTRODUCTION

Ecological issue such as environment change have expected a large amount awareness in topical years, and environmental monitoring, modeling, and supervision allow us to achieve a deeper appreciative of natural environmental processes.

Environmental monitoring and supervision is a wide area focusing on using technical and engineering principles to improve environmental conditions.

Effectively monitoring, modeling and managing environmental processes is a critical task for both scientists and engineers. Environmental informatics has experienced an extremely fast growth and wide application in monitoring, modeling, and managing environmental processes in the past decade. Environmental informatics involves specific environmental problems related to the applications of computer science and systems engineering techniques, management information system, and environmental information system, which were designed to collect, process, and exchange data and information.

Automatic data acquisition has been accelerated by a range of technologies, such as remote sensing, geographical information system, and global positioning system and so on.

From the 2000s, the proliferation of automatic data acquisition technologies, such as radio frequency identification and sensor technologies was introduced to create decision support systems and integrated environmental information systems , and also brought new vitality to environmental monitoring and management [1][2].

Computer communication systems and particularly the Internet are playing a significant part in the everyday life. The applications are many such as home automation, utility meters, appliances, security systems, card readers, and building controls, which can be easily, controlled using either special front-end software or a standard internet browser client from anywhere around the world its depend on the clients. Web access functionality is implanted in a gadget to allow low cost widely reachable and improved client interface functions for the device. A web server in the device provides access to the user interface functions for the device through a device web page by using internet. A web server can be embedded into any domestic device and associated to the Internet so the domestic device can be monitored and controlled from remote places through the browser in a desktop by using its application with normally connected to local host.

In this project the Central node is replicated using Android application based cell phone and the Management node is replicated using Laptop.

ARM Cortex based data acquisition system with smart wireless sensor interface based on internet of things using Wi-Fi network

Large number of embedded systems has designed with various parameters. This design is substantially designed according to their functions and applications. In this paper, well thought-out modular design concept is adopted and the system is largely composed of a single ARM Cortex microcontroller, temperature sensor, humidity sensor, smoke sensor, LDR, Bluetooth, Android cell phone and database. Apart from the database, the entire unit is placed within warehouse.

The ARM cortex microcontroller situated at the centre forms the control unit node. A program is written for controlling all the operations. This program is embedded within the microcontroller. This program instructs the microcontroller to act upon the data and perform operation depending upon the inputs provided by the output of the temperature sensor, humidity sensor and smoke sensor.

The ARM cortex microcontroller processes the input voltages from various sensors according to the program embedded within it. The output of the ARM cortex microcontroller is transmitted to Android based cell phone via Bluetooth connection. From the Android based cell phone the data is then transmitted to the local server.

Sensor data remote acquisition

In this project data from the various sensors such as temperature sensor, humidity sensor and smoke sensor is sent to the ARM Cortex microcontroller. Further microcontroller transmits the data to Android based cell phone and later to the remote server which is cloud. The sensed data gets updated to the cloud. All the users of the system who are registered and can obtain access to the cloud can observe the variations in environment and if the change is not anticipated, user can perform necessary action and control it by taking appropriate action [6],

reneas based data acquisition system with smart wireless sensor interface based on internet of things using Wi-Fi network

A. Design

In this project design, structured modular design concept is adopted and the system is uses a single Renesas microcontroller, temperature sensor, humidity sensor, smoke sensor, LDR, Bluetooth, Android based cell phone (this is used as Control node) and database (this is used foe management). Apart from the database, the entire unit is placed within warehouse.

The Renesas microcontroller situated at the centre of the block diagram is the control unit each node. Embedded within the microcontroller is a program that instructs the Renesas microcontroller to take action based on the inputs provided by the output of the various sensors. The block diagram is shown in Fig (3.1).

The microcontroller located at the centre of the block diagram forms the control unit each node. Embedded within the microcontroller is a program that helps the microcontroller to take action based on the inputs provided by the output of the sensors.

The temperature and humidity sensor checks for any change in temperature and humidity within the warehouse or cold storage facility, whereas smoke sensor is used to detect gases emitting from decaying or decomposing food or food products in food storage.

Certain food products such as food grains require appropriate lighting facility for maintaining of their usage quality; hence LDR sensors are positioned at such locations.

The sensors generate an output voltage with change in their surrounding environment. These output voltages are fed to the pins of ADC unit of the Renesas microcontroller.

All these sensors output values are in analog. To convert these output analog values an analog to digital conversion unit is used. Automatic ON/OFF cooling fan is ON when there is increase in smoke and temperature or else it will in off condition.

The Renesas microcontroller processes the incoming voltages from the sensor depending on the program embedded within it. The output of the microcontroller is transmitted to Android based cell phone through Bluetooth connection. From the Android cell phone the data is then transmitted to the local server by the use of Wi-Fi network. A database is created using MySQL software, which maintains the data on the local server. Java coding using Eclipse, along with Android 4.0 SDK is utilized to create the front-end of the server.

B. Working

The temperature and humidity sensor checks for any change in temperature and humidity within the warehouse or cold storage facility, whereas smoke sensor is used to detect gases emitting from rotting or decaying food or food products. Certain food products such as food grains need proper lighting facility for maintaining of their quality, hence LDR sensors are placed at such locations. The sensors generate an output voltage with change in their surrounding environment. These output voltages are fed to the pins of ADC unit of the microcontroller. In the present work we have used temperature sensor, smoke sensor and LDR sensor for feeding the data into Renesas microcontroller.

The Renesas microcontroller processes the incoming voltages from the sensor depending on the program instruction embedded within it. The output of the renesas microcontroller is passed to Android based cellphone through established Bluetooth connection. Then Android cellphone transmits data to the local server using Wi-Fi network. A database is created using MySQL software, which maintains the data on the local server. Java coding using Eclipse, along with Android 4.0 SDK is utilized to create the front-end of the server.
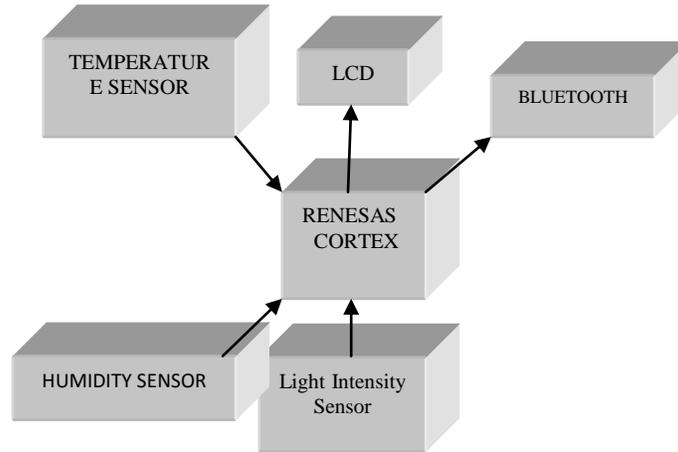

Fig. (3.1) Block diagram

Android app which is used to control the environment of the industry and continuously get the data(all the readings of the sensors)by the microcontroller with the help of Bluetooth connection. In the present work we have used eclipse required bundles for android programming. Further, we have created a database using MySQL, which gets updated when the user of the android app gets some data from the controller or when he tries to send the data to the controller. Thus the database gets updated quite often. The admin of the system can continuously monitor the system in this way.
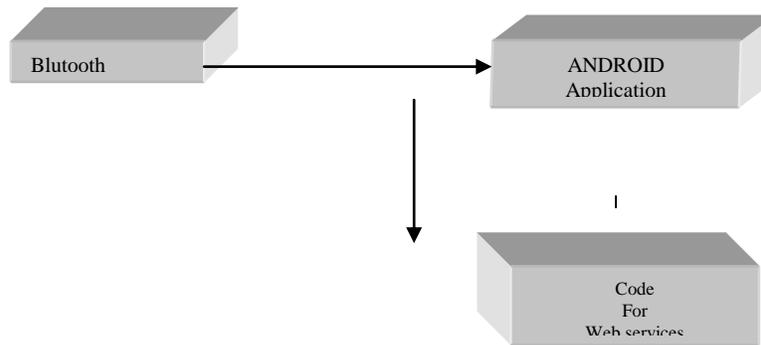

Fig (3.2): Data Updating at server

3.3 Advantages of present system over existing systems

The advantages of present work are Renesas microcontroller consumes less power than ARM cortex. With respect to the programming Renesas based systems is self programmable, high performance and has high reliability requirements. Renesas provides high functional safety and embedded security features. Using web server for data storage it is risky because sharing one cloud by many people can cause failure of the system. The present system is cost effective as compared to the existing systems this is cost effective.

II. IMPLEMENTATION

Android is a mobile operating system that is based on a modified version of Linux. The main advantage of adopting Android is that it offers a unified approach to application development. Developers need only develop for Android, and their applications should be able to run on numerous different devices, as long as the devices are powered using Android. In the world of smart phones, applications are the most important part of the success chain. Device manufacturers therefore see Android as their best hope to challenge the onslaught of the iPhone, which already commands a large base of applications [6]. The fig (4.1) shows the registration page using which the user can register in order to monitor the environmental parameters.
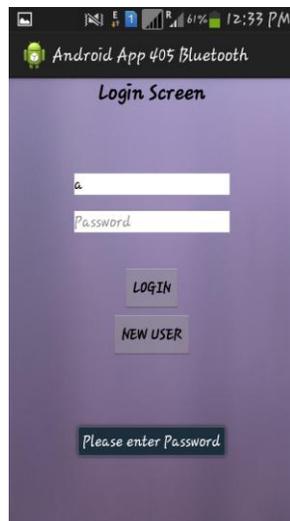

Fig (4.1) Registration page

Fig (4.2) Login Page.

The Fig 4.2 is login page. Using this the user can login to the Android application. If the login is successful the user will get the display shown in Fig (4.3).
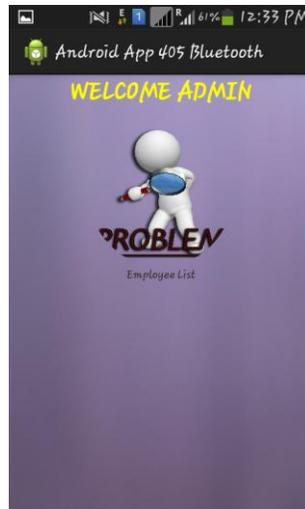
Fig (4.3) Successful login

III. CONCLUSION

In this paper design and implementation of Reneas based industrial data acquisition system with smart wireless sensor interface based on internet of things using Wi-Fi network is discussed. In future work the processing of data acquired can be implemented.

IV. REFERENCES

[1]   A Reconfigurable Smart Sensor Interface for Industrial WSN in IoT Environment, Qingping Chi, Hairong Yan, Chuan Zhang, Zhibo Pang, and Li Da Xu, Senior Member, IEEE
[2]   Intelligent Food Management System: Maintenance of Agro and Non-Agro Foods in Cold Storage/Warehouse
[3]   An Integrated System for Regional Environmental Monitoring and Management Based on
[4]   Internet of Things,Shifeng Fang, Li Da Xu, Senior Member, IEEE, Yunqiang Zhu, Jiaerheng Ahati, Huan Pei, Jianwu Yan, and Zhihui Liu
[5]   http://finalyear-projects.com/arm-cortex-based-industrial-data-acquisition-system-with-smart-wireless-sensor-interface-based-on-internet-of-things-using-wifi-network/
[6]   http://www.jacn.net/papers/119-R039.pdf
[7]   Professional android application development-Reto Meier
[8]   MySQL.wikipedia