International Journal of Advanced Technology in Engineering and Science
Vol. No.3, Issue 10, October 2015
www.ijates.com
ijates
ISSN 2348 - 7550

TEMPERATURE MONITORING SYSTEM

Akshada Rathod[1], VijitaMalhotra[2], Mritunjay Ojha[3]

[1, 2, 3]*Department of Computer Engineering, Fr.Conceicao Rodrigues Institute of Technology, (India)*

ABSTRACT

A temperature monitoring system is based on ZigBee networks. The system can be used to monitor temperature and humidity parameters in greenhouse environment. The system consists of a sensor device, a temperature sensor which is integrated with a ZigBee module to transmit the data measured by the sensor. Monitoring software can display and record the collected data, of the greenhouse environment. The data is received by a ZigBee module at the receiver end which monitors the values and if the value falls below a threshold the computer sends an alarm through ZigBee module and send notification through Mobile Dashboard. The system is implemented using low power wireless components, and easy to be installed. The sensing of the temperature for a room will depend on the capacity of the sensor that is implemented. For implementation of ZigBee network the use of TinyOS will be implemented TinyOS is an open-source operating system designed for low-power wireless devices, such a sensor networks. ZigBee network is basically implemented for wireless communications. This system is expected to help in green house environment, LabVIEW monitoring and also for monitoring room temperature.

Keywords: ZigBee, IEEE 802.15.4, Sensor MTM-CM5000, TinyOS.

I. INTRODUCTION

The temperature plays key role in proper growth of living organism. If temperature is too hot or cold growth of plant will be affected.So how to use technology to monitor the temperature of greenhouse which will help the owner to take proper action. For this firstly wireless sensor will be used. Wireless sensor networks become the core of networking. In order to achieve greater things on the technical requirements of the Internet of things, we adopt the technology of wireless sensor network based on ZigBee. The system consists of wireless sensor network nodes and network management platform. ZigBee node (1 to n) respectively transmits acquisition of the temperature and humidity data to the ZigBee stations of gateways node. Wireless technology for the remote temperature monitoring and recording system is proposed for mobility, low cost, low power, small size and communication over short distances in a home or industrial environment. The drawback of infrared technology is the requirement of a line of sight between sender and receiver. Bluetooth has been used in a wide range and the technology is available in the market. But due to the drawbacks in the distance parameters of the Bluetooth, ZigBee is an ideal technology for this application.

ZigBee is a new short-range wireless communication technology, which is addressing to solve the problems of low cost, low power, low complexity and low data transmission rate applying in industry control, medical care, office buildings and smart homes. When wireless sensor networks (WSN) building, how to manage a large number of data without errors from the whole system becomes quite essential especially for commercial applications.

Our aim is to develop a software system to process sending and receiving of data in ZigBee network by wireless communication technique. This system consists of data acquisition model and monitoring software model. In this paper, this two software model will be discussed in detail.

The main purpose of this system model is to make it easy for the user to analyze temperature condition based on monitored temperature data.

II. MODELING COMPONENTS

2.1 Sensor MTM-CM5000

The CM5000 TelosB sensors is IEEE 802.15.4 compliant wireless sensor node based on the original open-source TelosB / Tmote Sky platform. The included sensors measure temperature, relative humidity and light [1].

Table.1.Sensor Specification

ITEM	SPECIFICATION	DESCRIPTION
PROCESSOR		
Processor Model	MSP430F1611	MSP430 family
Memory	48KB 10KB 1MB	Program flash Data RAM ExternalFlash(ST® M25P80)
RADIO		
Frequency Band	2.4GHz ~ 2.485GHz	IEEE 802.15.4 compliant
RF Power	-25dBm ~ 0dBm	Software Configurable
Range	~120m(outdoor)& ~20-30(indoor)	Longer ranges possible with optional SMA antenna attached
Transfer Rate	250Kbps	IEEE 802.15.4 compliant
SENSOR		
Temperature	Sensirion SHT11	Range: -40 ~ 123.8 °C Resolution: : ± 0.01(typical) Accuracy: ± 0.4 °C (typical)

Humidity	Sensirion® SHT11	Range: 0 ~ 100% RH Resolution: 0.05 (typical) Accuracy:±3 % RH

2.2 What is ZigBee and why We are Using*:*

ZigBee was designed to provide high data throughput in applications where the duty cycle is low and low power consumption is an important consideration. (Many devices that use ZigBee are powered by battery.) Because ZigBee is often used in industrial automation and physical plant operation, it is often associated with machine-to-machine (M2M) communication and the Internet of Things (IoT). ZigBee is based on the Institute of Electrical and Electronics Engineers Standards Association's 802.15 specification.

It operates on the IEEE 802.15.4 physical radio specification and in unlicensed radio frequency bands, including 2.4 GHz, 900 MHz and 868 MHz.It is not intended to compete with standards such as 802.11, Bluetooth and the like. Instead it has been optimized to ensure that it meets its intended requirements, fulfilling the needs for remote control and sensing applications [2].

2.3 Main Features of the IEEE 802.15.4 Standard:

- Data rates of 250 Kbits/s in 2.4 GHz RF band
- 16 channels, 2 MHz wide in the 2.4 GHz ISM band
- CSMA-CA channel access
- 128 Bit AES encryption in Hardware
- Low power consumption
- CC2420: Transmit = 18 mA; Receive = 20 mA @1 mW
- All of PHY and part of MAC layers implemented in hardware.

2.4 What is TinyOS:

TinyOS is an event based operating environment designed for use with embedded networked sensors. More specifically, it is designed to support the concurrency intensive operations required by networked sensors with minimal hardware requirements. There are hundreds of TinyOS projects throughout the world [3].

TinyOS and ZigBee

TinyOS - Operating System, Tool Chain, Component Library

ZigBee - Hybrid-Mesh Protocol on Top of 802.15.4

- Recently Ratified
- Home-Automation Oriented
- Powered Backbone I.e., Hybrid-Mesh

The ZigBee Protocol Layer is being implemented in TinyOS by Crossbow.

2.5 How RF Wireless Connectivity Work

RF is commonly used in the wireless communications industry to describe certain types of equipment which use radio frequency waves to transmit sounds and data from one point to another. In computer networking, RF is

used to describe network devices such as hubs or bridge that transmits data signals using radio waves instead of data cables or telephone lines. Even though the phrase "RF wireless networking" might seem mysterious, the underlying technology is very common. It uses radio waves, the same type of energy used to transmit radio and television broadcasting. Two-way radios and walkie-talkies also use this kind of technology

III. EXISTING SYSTEM

In the referred paper [4], they built a prototype of an embedded wireless sensor network based on easy-to-use ZigBee module. They considered a temperature monitoring application to demonstrate the proof-of-concept of their system. The collected temperature data can be stored into the MySQL Database and retrieved later for analysis. The objective of their project is to design a wireless network using 802.15.4 and ZigBee technology.

They used ZigBee for wireless communication. It provides 20kbps data rate and 10m communication range. They used ZigBee because it provides networking topology. It provides large communication range between devices. These are two main advantages over Bluetooth so that they are using ZigBee for their project.

This paper described, XBee modules based on the IEEE 802.15.4/ZigBee Wireless Personal Area Network (WPAN). They used the Arduino board which comes with ATmega168 or 328 for easy interfacing with the ZigBee module and for easy programming (in C) of the microcontroller. The Arduino boards come with a library for interfacing with XBee module and for dealing with analog or digital inputs and outputs. For the temperature monitoring sensor, they used a low-cost analog sensor to show the proof of concept.

This referred paper [5], temperature reading is shown in computer for LabVIEW purpose. Hence the person should be present in the room for 24 hours to continuously monitor the temperature as readings are only accessible locally not remotely. The local node looks something like this.

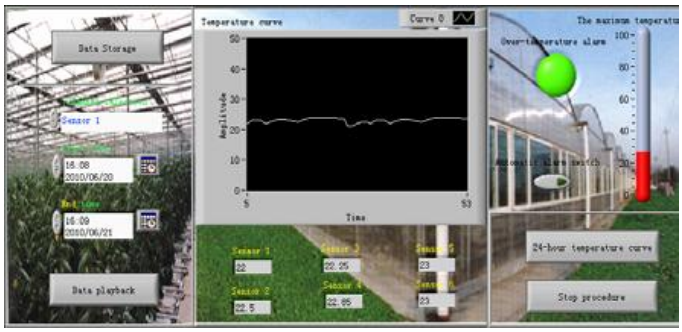

Fig.1.Temperature Waveform.

The above waveform shows temperature change curve within one day. There are 48 points in the X, one temperature is collected per half an hour. It directly shows temperature change conditions in one day. But six numbers below waveform shows current temperature by 6 sensors.

In this referred paper [6], they presented wireless sensor network for Temperature monitoring. Which can report the emergency to the users in various forms, such as pop-ups on a Computer screen, SMS on their cell phones and so on. In this cell phone can't access the local node reading.

IV. PROPOSED SYSTEM

A temperature monitoring system is based on ZigBee networks. The system could monitor temperature and humidity in greenhouse environment. This system consists of data acquisition model and monitoring software.

4.1 Data Acquisition Model

It has two phases i.e. data collection and data processing. In this model basically data is collected from the sensor of our system and given to the monitoring system.

4.1.1 Data Collection: It is the most important part of sensor or data related project. In this data for the sensor are taken and given to the data processing unit.

4.1.2 Data Processing: In this all the data collected from the sensor is filter and processed. Meaning only the data needed for monitoring are processed and stored in the database. As sensor also senses various other factor of the room which data collection send to this unit and thus it filters out.

4.2 Monitoring Software Model

This is the most vital part of our project as the name is temperature monitoring system. In this data from the data processing is display and certain action is taken i.e. alarm or notification is made if threshold range doesn't matches. We give two option, they are local and remote access possibility. In this software the current temperature of the room will be shown also data will be represented in graphical format (dashboard) which will help in accessing the previous reading.

4.3 Flow Graph

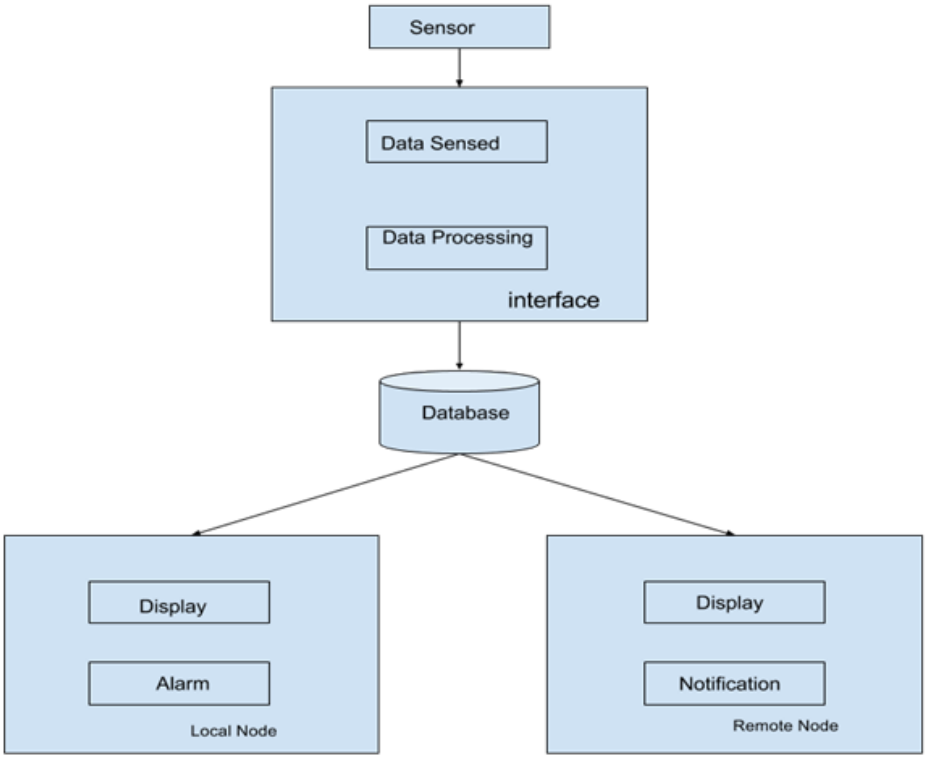

Fig.2.System Flow Chart

V. CONCLUSION

With the wide improvement of wireless technology. The system may be cost with wireless sensors may little cost but it works with more effectively. The system may be implemented with the help of many technologies but these technologies more reliable, easy to implement, works effectively and easy to operate.

REFERENCES

[1] MTM-CM5000, "www.advanticsys.com/shop/mtmcm5000msp-p-14.html".

[2] ZigBee, 'https://en.wikipedia.org/wiki/ZigBee"

[3] Tiny-OS, "http://tinyos.stanford.edu/tinyos-wiki/index.php/TinyOS_Documentation_Wiki"

[4] Vongsagon Boonsawat, Jurarat Ekchamanonta, Kulwadee Bumrungkhe "XBee Wireless Sensor Networks for Temperature monitoring".

[5] Zhihong Zheng, Kai Zhang, and Chengliang Liu, "Greenhouse Temperature Monitoring System Based on LabVIEW".

[6] B.VidyaSagar , "Green House Monitoring and Automation using GSM"